

TIMES OF CHANGE IN THE DEMOSCENE A Creative Community and Its Relationship with Technology

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Abstract

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REUNANEN, MARKKU: Times of Change in the Demoscene: A Creative Community and Its Relationship with Technology

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The demoscene is a form of digital culture that emerged in the mid-1980s after home computers started becoming commonplace. Throughout its approximately thirty years of existence it has changed in a number of ways, due to both external and internal factors. The most evident external driver has been the considerable technological development of the period, which has forced the community to react in its own particular ways.

A modest body of research on the demoscene already exists, even though several topics still remain unstudied. In this thesis I approach the scene from three different angles: community, artefacts and relationship with technology. The most important frames of reference are subcultural studies, history of computing, game studies, domestication of technology and software studies. The research material is equally diverse, consisting of texts, creative works and interviews.

The study paints an uncommon picture of the scene as a meritocracy that actively and even aggressively debates technological change. Technical prowess does not imply embracing new gadgets uncritically, in particular because their perceived ease is in dire contrast with the shared ethic that emphasises individuals' skill. Practices, interests and relationships to other communities – gamers in particular – are still subject to constant change and, therefore, we should not consider the demoscene as a frozen monoculture, but rather as a group of phenomena that are linked to different periods of time, locations and computing platforms.

Keywords: demoscene, computer demos, digital culture, computer hobby, domestication, home computers

Tiivistelmä

TURUN YLIOPISTO

Humanistinen tiedekunta Historian, kulttuurin ja taiteiden tutkimuksen laitos Kulttuurituotannon ja maisemantutkimuksen koulutusohjelma Digitaalinen kulttuuri

REUNANEN, MARKKU: Times of Change in the Demoscene: A Creative Community and Its Relationship with Technology (Muutoksen aikoja demoskenessä: luova yhteisö ja sen teknologiasuhde)

Väitöskirja, 100 sivua, 88 liitesivua 17.1.2017

Demoskene on 1980-luvun puolivälissä kotitietokoneiden yleistymisen myötä syntynyt digitaalisen kulttuurin muoto. Noin kolmenkymmenen vuoden olemassaolonsa aikana se on muuttunut monin tavoin, johtuen sekä ulkoisista että sisäsyntyisistä tekijöistä. Ilmeisin ulkoinen muutosvoima on ajanjakson huomattava tietotekninen kehitys, johon yhteisö on sopeutunut omissa puitteissaan.

Demoskenestä on jo olemassa jonkin verran akateemista tutkimusta, vaikka lukuisia aiheita onkin yhä täysin kartoittamatta. Tässä työssä lähestyn skeneä kolmesta eri näkökulmasta: yhteisön, artefaktien sekä teknologiasuhteen suunnasta. Tärkeimpiä viitekehyksiä ovat alakulttuuritutkimus, tietotekniikan historia, pelitutkimus, teknologian kotoutuminen sekä uusimpana tulokkaana ohjelmistotutkimus. Tutkimusmateriaali on samoin monimuotoista, koostuen teksteistä, luovista töistä sekä haastatteluista.

Tutkimuksen myötä hahmottuu poikkeuksellinen kuva skenestä meritokraattisena yhteisönä, joka ottaa aktiivisesti ja usein kärkkäästi kantaa teknologiseen muutokseen. Tekninen kyvykkyys ei johda uutuuksien kritiikittömään omaksumiseen, etenkin kun uusien laitteiden mukanaan tuoma näennäinen helppous sotii yhteisössä vallitsevaa yksilön osaamista korostavaa etiikkaa vastaan. Käytännöt, mielenkiinnon kohteet ja suhtautuminen muihin yhteisöihin – etenkin pelaajiin – ovat edelleen jatkuvassa muutoksessa, eikä demoskeneä siten voikaan tarkastella jähmettyneenä yhtenäiskulttuurina, vaan pikemminkin ryhmänä eri ajanjaksoihin, paikkoihin ja laitteisiin kytkeytyneitä ilmiöitä.

Avainsanat: demoskene, tietokonedemot, digitaalinen kulttuuri, tietokoneharrastus, kotoutuminen, kotitietokoneet

Foreword

Getting to know the demoscene around 1990 shaped my later life in a number of significant ways: my friendships, studies and career path have all been marked – even defined – by the community that I have loved and occasionally hated throughout almost thirty years. This thesis is one of the milestones on that ongoing journey which I'm hoping to continue until the last power failure.

Needless to say, I would not have come this far without the help provided by several people. To avoid finding numerous synonyms for thanks, I hereby extend my gratitude to:

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Markku Reunanen Helsinki, January 17, 2017

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Chapter 1

Introduction

Like many 1980s kids around ten years of age, I used to play plenty of games on my best friend's Commodore 64. He knew a slightly older boy, who would copy us the latest hits on tapes, so we got to know the classics of the time: *Commando*, *Bubble Bobble*, *Pitstop*, *Rambo*, and many others. We never quite knew where the games originally came from, but copying them was a normal thing to do, and never raised any further questions. Some of the games contained curious-looking screens with moving text and logos, such as TRIAD, but we skipped them as quickly as possible, because we just wanted to play. What is more, some cassettes contained similar screens without any game at all – how useless was that? It took five more years to realise that I had been viewing early crack intros and demos without even knowing what to call them.

The terms *demo* and *scene* have various meanings even when dealing with digital culture alone, so it is necessary to define them before proceeding any further. For some, a "demo" brings to mind preview versions of games or other software, whereas for others a demo might be something aspiring musicians send to record companies (Tasajärvi 2004, 16; Nitsche 2016). Here a demo refers to demonstrations, audiovisual computer programs, which, in general, tend to be non-interactive and showcase their creators' skills. Among their closest relatives are so-called *dealer demos*, used for improving computer sales at stores (Wasiak 2013), software pirates' *crack screens* (Publication 5), *display hacks* (Raymond 2003) and game *attract modes*, which lure players at arcade halls (cf. Reunanen 2010, 58).

The essence of scenes will receive further attention in Chapter 4, but to define the demoscene briefly here, it could be described as the international community of enthusi-

asts whose activities, such as creative endeavours, parties, and online discussions, revolve around computer demos. For sceners themselves, it is obvious what community is in question, so they tend to use the to-the-point form *the scene*. A comprehensive glossary of demoscene slang can be found in my licentiate thesis (Reunanen 2010, vii–x).

Demoscene-related studies have slowly started leaving their initial stages, which were characterised by descriptive introductions to the community and its artefacts. Such overviews have not completely disappeared yet, but there is already a notable trend towards increasingly in-depth analyses representing different fields of study, ranging from art history to software science (see Chapter 3). The big picture is far from complete: several aspects of the scene have gone unnoticed so far. To name a few blind spots, multiple kinds of artefacts, links to other communities, and the actual process of creating demos remain largely unstudied.

The motivation behind my thesis project is to fill some of those gaps, providing a new critical perspective to a still relatively little-known branch of digital culture. When considering the current plurality of what is out there, the demoscene offers a rare if not completely unique possibility to observe the development of a community over the course of multiple decades. Instead of providing a snapshot of an emerging phenomenon, we have the luxury of putting things into a historical context, exploring the dead ends and discovering the important turning points.

1.1 Research Questions and Scope

The core theme present throughout the study is change: What kind of changes has the demoscene gone through from the mid-1980s to the 2010s? It is not realistic to try and address every possible aspect of the topic, so I have narrowed the discussion down to the following three subquestions:

- 1. How did the demoscene come to be? (Publication 3)
- 2. How do different types of productions emerge and evolve? (Publications 2 and 5)
- 3. How has technological change affected the scene? (Publications 1 and 4 in particular)

Some further framing needs to be done, as the history of the scene spans three decades, tens of countries and multiple platforms. The focus here tends to be on the main-stream: the community that emerged and bloomed in Western and Northern Europe on the most common computers, such as the Commodore 64, Amiga and IBM PC compatibles. In addition to the mainstream, there are multiple other subscenes, often confined to a certain location or hardware/software platform (see Section 6.2). So far, such local histories have been rare, even though they could be worthy contributions, highlighting the peculiarities of digital culture that emerged in particular contexts (cf. Swalwell and de Vries 2013). Going to the essentials, it is necessary to question whether there exists a monolithic "scene" at all, as we are discussing a colourful set of communities grouped under the same umbrella term.

The changes are by no means over by now – quite the contrary. We are not studying a thing of the past, a frozen entity that can be sliced and inspected as if in an autopsy. The demoscene is still an active community that produces a steady flow of various artefacts, reacts to new hardware and software platforms and whose practices keep evolving. This thesis is, therefore, mostly a historical look back at what has taken place so far, knowing that forthcoming developments will again take the scene into a new, yet unknown direction.

1.2 My Position

The starting points of this study are, first and foremost, personal. My own involvement with the demoscene dates back to 1991, when I founded my first group with likeminded schoolmates. Since then, I have participated in tens of productions, mostly in the role of a coder (programmer) and a graphic artist, created demo-related websites, visited a number of demo parties, and more. Such a foundation cannot be without consequence when trying to study the same topics from an academic perspective, so it is necessary to consider the benefits and disadvantages of a researcher's personal involvement with his/her subject.

On the positive side, these 25 years have let me in on the practices and discourse of the community. A complete "outsider" would need to spend time to understand what demos, groups and parties mean to the community: selecting and viewing a representative sample of demos and related artefacts alone is a considerable task. Likewise, building connections inside a meritocratic, at times even exclusive, community might be challenging (see Huuskonen 2004; Reunanen 2010, 34–36; Publication 3). Without a doubt, an "insider" status has been beneficial in multiple respects.

However, personal participation is not a research method in itself, unless it is done with the same rigour as any scientific work should; merely hanging around is not ethnography. It would probably be easier for an outsider to take a fresh perspective on matters, without the load that has been accumulating over time. In my case, I have experienced what has taken place since 1991, especially in the PC scene, but there is plenty that happened before that and on other platforms. Thus, at times it has been hard to assess the magnitude and importance of phenomena objectively, or to step back to reveal my own blind spots. A Finnish perspective is not likely to be completely off when dealing with other Nordic countries, but moving further than that it becomes increasingly important to understand the economic, social, political and technological conditions that have affected the local scenes.

Another challenge that follows from personal involvement is of the emotional kind: getting to know your peers leads to liking or disliking them on a personal level, producing, again, distorted views. Likewise, the appreciation or dislike of certain productions can be detrimental when analysing them. It is probably impossible to completely drop these attitudes, but constant reflection and distancing – or completely removing – oneself from the research process alleviate the bias.

Similar settings have been described in the field of subcultural studies, when a researcher has been a current or former member of the community in question (Hodkinson 2005). Rhoda MacRae defines three kinds of researcher–subculture relationships: outsider-in, outsider-out and insider-in. The *outsider-in* approach refers to a classic form of ethnography, where an outsider participates in and observes a social group. In contrast, the *outsider-out* approach involves little first-hand contact with the subject, and is based on a theoretically-grounded reading of subcultural texts instead. Finally, in the *insider-in* case, the researcher actually is or becomes a member of the community, although such assimilation may ultimately be hindered by factors such as age, gender, and ethnicity. (MacRae 2007.)

Even though my own position, following MacRae's model, has been distinctly insiderin, that "insider" status was challenged when working with Publication 3. When trying to find respondents and get honest answers from the 1980s software pirates, I found myself as an outsider, someone suspicious who "had not been there". The situation was further complicated by the legally questionable status of cracking and piracy; some things might be better left untold in public. As Paul Hodkinson (2005) notes, the concept of an insider is neither binary nor self-evident.

According to MacRae (2007), the challenges arising from a close proximity to the subject are by no means insurmountable:

What seems to be essential in realizing the benefits of the researchers' initial positioning, is their ability to reflect critically on the process of knowledge augmentation. [...] I suggest that quality of understanding is more related to the researchers' ability for critical reflexivity rather than their positioning to the group under study.

Hodkinson (2005) describes how he, during his study on the British goth subculture, transformed from an insider to an *insider researcher*. In this case, his personal engagement with the subculture was, indeed, an asset. However, he also warns against "trying too hard", which might cause an equally negative response as being a complete outsider. All in all, Hodkinson views the insider position as advantageous: for example, when a researcher tries to validate his/her findings, there already exists a useful comparison point in the form of own experiences, instead of having to rely on others' accounts alone. In addition, it can be easier to build a trusted relationship with the respondents, and choose a research framework that fits the purpose. Like MacRae, Hodkinson also stresses the importance of continuous reflection. (ibid.)

1.3 Theoretical Context

The theoretical framing of the thesis is decidedly multifaceted, as I have wanted to observe the development of the demoscene from a number of perspectives in order to provide a holistic view of its different properties. Sociologist Norman K. Denzin (1978, 297–301) calls such an approach *theoretical triangulation*, stating that the use of alternative theories on the same data improves the reliability of the findings by avoiding potentially narrow theory-specific explanations. In hindsight, it could have been easier and more straightforward to pick only one, but then again, no single theory or paradigm would have captured all the relevant angles. A tighter scope would also have enabled me to participate in one particular discourse in more depth, as opposed to the current breadth that follows from striving for completeness.

The three main chapters dealing with the three perspectives each come with their own theoretical framework. In other words, the discussion is spread throughout the thesis in the relevant contexts instead of a separate "theory" part – the rationale behind this decision is to make each chapter a self-contained piece of text that can be read and

understood on its own. Table 1.1 is an overview of the most relevant fields of study present in the discussion, coupled with examples of the most notable works and the questions that I sought to study through each lens, presented as a *triangulation matrix* (see Suominen 2010).

Field of study	Questions	Thesis	Examples
		chap-	
		ters	
Youth and	How do communities work and	4	Hebdige ([1979] 2010),
subcultural studies	come to be? What are the		Muggleton (2004),
	relationships between a subculture,		Thornton (2005)
	society and the market?		
Game studies	What similarities, differences and	4, 5	Newman (2012),
	links exist between game cultures		Sandqvist (2012),
	and the demoscene?		Jørgensen, Sandqvist
			and Sotamaa (2015)
Software and	What is a platform? What does it	5, 6	Fuller (2008), Bogost
platform studies	imply that demos are software?		and Montfort (2009)
History of	When, how and why did	6	Ceruzzi (2003),
computing	microcomputers emerge?		O'Regan (2008)
Local histories of	How were computers used, marketed	6	Saarikoski (2004),
computing	and distributed in national contexts?		Wasiak (2010; 2014b),
			Stachniak (2015)
Domestication and	How do people adopt new	6	Silverstone, Hirsch and
diffusion studies	technology? Why do innovations		Morley (1992),
	succeed or fail?		Rogers (2003), Berker
			et al. (2006)

Table 1.1: Relevant fields of study, questions I sought to answer, and notable representatives.

The categories are partially overlapping; for example, local histories *are* computing histories, and platform/software studies, likewise, tend to include historical discussion. Instead of trying to define fields of study and draw illusory borders between them, the table rather documents the approach present in this thesis. The study of digital cultures, as observed by Jaakko Suominen (2013), tends to be multidisciplinary by nature: each researcher has their own background, be it anthropology or computer science, providing for a number of possible perspectives (cf. Gere 2008, 11–20). Therefore, this thesis, too, is a typical representative of the discipline – not only because of its topic, but also its approach.

1.4 Thesis Structure

The manuscript is divided into seven chapters, out of which the first three are of an introductory nature. Chapter 1 sets the stage, presents the research questions and my personal position in relation to the subject. Next follows a description of the research material used in the study, accompanied by a discussion on the methods that were applied to it (Chapter 2). To conclude the introductory part, Chapter 3 is an overview of existing demoscene-related studies divided by topic and the field of study they represent. This background study is the oldest part of the thesis and, in certain respects, its origin, as the work towards it started already in 2004 with the creation of the Demoscene Research online bibliography (see Chapter 3 for further discussion).

The three main chapters (4–6) correspond to the perspectives presented in Section 1.1 above: the community, its artefacts and its relationship towards technological change. Each chapter is based on its respective research article(s), with additional sources to support the argumentation. As the oldest article dates back as far as 2009, it was evident that some of the discussion needed to be re-evaluated in the light of recent or recently discovered research. The narrative of Chapters 4–6 is built so that first a description of the demoscene (in relation to other similar communities) lays the foundation for understanding the latter topics. As the scene is so fundamentally connected to, represented and even defined by its cultural artefacts, next follows a description of them.

In Chapter 6, the two topics converge, as the scene, its machines and artworks are subjected to an ever-changing technological landscape that forces the community to react in a variety of ways, but react nevertheless. The theme of *change* is most notable in this chapter, even though it is present in one form or another in all the others as well. Finally, Chapter 7, the conclusion, presents the reader with the most important findings distilled out of the previous chapters, my personal reflection on the merits and shortcomings of the study and possible directions for future research.

1.5 Included Articles

The main body of research comprises five published papers from 2009–2015. This section is a description of the topics covered by each article and their relevance to the study at hand, coupled with details on my own contribution in the case of co-authored works. The actual papers are enclosed at the end of the thesis.

The first and oldest publication (1) originates from the History of Nordic Computing 2 conference, held in Turku in 2007. *Demoscene Platforms: A Case Study on the Adoption of Home Computers*, finally published in 2009, was written with Antti Silvast. The same research material, diskmags and early online discussions, were also used in my later licentiate thesis (Reunanen 2010). The main point of *Demoscene Platforms* was to study the transitions between hardware and software platforms in the demoscene. The theoretical frameworks we chose, *domestication* and *diffusion of innovations*, proved fruitful and can be found in later publications, too. Furthermore, the lamer–elite binary was already present in this early writing. My main contribution was collecting the research material, and the analysis and theoretical discussion related to the diffusion of innovations as outlined by Everett M. Rogers (2003).

The second publication (2), *Four Kilobyte Art*, was first published in Finnish as *Neljän kilotavun taide* in 2013, and later translated and republished in English to serve the international audience. The article is, in essence, historically-oriented: I describe the roots and development of the so-called 4k intros – executable files no larger than 4,096 bytes – in relation to related phenomena, such as digital art and history of computing. In comparison to the other articles, there is a strong personal and practical aspect, as I was concretely involved in creating such intros in 2003–2005 as a programmer and designer.

The third publication (3) could be best described as the critical re-evaluation of existing histories. *How Those Crackers Became Us Demosceners* from 2014 takes a new look at the process where the demoscene supposedly drifted apart from its origins, the cracker culture. Starting from the canonical stories told by demoscene historians, I move towards contemporary discussions and interviews to reveal some of the complex reasons behind the separation. In addition to widening perspectives on the rift, I also question how total it actually was. David Muggleton's (2004) work on subcultures was a new addition to the toolbox, inspiring the discussion on the constant change and fluidity of scenes.

Publication 4, *Multiple Users, Diverse Users: Appropriation of the Personal Computer by Demoscene Hackers* (2014) is, in many respects, an evolutionary step from Publication 1. Together with Antti Silvast, I explore similar questions as before, but in more depth and with a more seasoned approach. The concept of a *technological script* (Akrich 1992) was first utilised in this book chapter, owing to my co-author's background in sociology (see Section 6.1). My contribution was again in collecting the research material, applying the diffusion of innovations theory and discussing the machine—user relationship.

Lastly, *Crack Intros: Piracy, Creativity, and Communication* (Publication 5) from 2015 explores another type of artefacts: crack intros, which decorate pirated games and serve multiple purposes in the cracker scene. Together with Patryk Wasiak and Daniel Botz we consider such intros from three perspectives: as cultural artefacts embedded in the practices of the cracker scene, as works of art, and as a communication channel. In addition to tackling a previously little studied topic, there is novelty in utilising three different perspectives in the same study. Considering the whole of this thesis, *Crack Intros* provides a historical foundation predating the demoscene and supports Publications 2 and 3. My main role was in outlining the content and conducting a textual content analysis of Apple II crack screens plus Commodore 64 crack intros.

Chapter 2

Research Material and Methods

To meet the needs of a multifaceted approach to the scene, the research material had to be compiled from a variety of sources. Following the setting described in Section 1.1 – formation of the scene, its artefacts, and relationship with technology – I chose materials that represent each category: texts and interviews for the history, demos and other productions for studying the artefacts, and again contemporary texts for the third perspective. With such content, the analytical toolkit also ended up equally diverse. Following Denzin's (1978, 295–306) terminology, the study involves both *data* and *methodological triangulation*, which, in an optimal case, enable comparisons and let the researcher benefit from the strengths of each method.

Online demo databases and other scene websites were a natural starting point for discovering material owing to their easy accessibility and high amount of available content. Artefacts, in particular, are extensively documented by the community. Large databases, such as *Pouet.net* and *CSDb.dk*, already feature tens of thousands of productions coupled with relevant metadata, such as publication dates, authors, platforms, events and competition rankings (see Reunanen 2010, 12–15). On the two mentioned sites, there are also comments on each release and, following the traits of today's social media, the possibility to "like" or rank them, providing hints on what is popular and why. These days, conversations take place mostly online, which makes finding and analysing them easier compared to old textual sources that are typically buried in demo scrolltexts, disk magazines or long-lost Bulletin Board System (BBS) discussion threads.

There is no strict border between the research material presented in my licentiate thesis (Reunanen 2010) and this study, as the work on the earliest articles included

here started in parallel with the earlier thesis. What sets the two apart is that, initially, I aimed to provide a general big picture of all things scene, whereas later on the framing has been tighter. As an example, disk magazines (see below) were first considered as a mass of text that lent itself to content analysis, but later the analysis has focused on individual topics found on a more limited selection of articles.

2.1 Online Databases

In addition to serving as the most important interface for discovering other sources, online databases were used for charting overarching historical trends. Party competition results, available at *Pouet.net*, provided data for the diagram that depicts the popularity of hardware and software platforms at major events between 1992 and 2002 (Publication 1). Similar figures, based on *Pouet.net* production counts, were later compiled into diagrams by myself (Reunanen 2011), and Bent Stamnes (2015) in his ongoing project to visualise demoscene trends. In this case, the visualisations served not only as illustrations, but also as a research method that made history visible, provoking qualitative questions on the reasons for each development.

Pouet.net, originally founded by the Mandarine demogroup in 2000, is among the most influential demo-related sites currently and, therefore, an important source for this study. The site caters to all demo platforms and features a large collection of metadata plus a discussion forum – actual files are hosted elsewhere. One notable characteristic is the focus on executable files, as opposed to other sites that feature a wider selection of media, such as competition pictures and music. My other main source, CSDb, represents the all-encompassing approach allowing, for instance, competition votesheets, paper magazines, and hardware extensions in its database. CSDb was founded in 2001 by a group consisting mostly of Danish Commodore 64 sceners.

Even though such repositories are a valuable (and practically the only) source of quantitative information on yearly production counts, the relative popularity of platforms and similar topics, they also have their shortcomings that need to be considered when assessing the reliability of the findings. Production lists are solely based on user-entered data, which may favour popular platforms, events and countries. Demos have been lost, some of them were never widely distributed or formally released, and so on. Non-digital items are generally not part of the archives, which tend to focus on digital artefacts only (see Section 5.2). Therefore, a database can never be fully complete, but only an imperfect approximation of what actually took place.

One more use for databases was to build an understanding on how sceners themselves categorise their cultural artefacts. Taxonomies dividing productions into demos, intros and more are present on most websites, but at times there are revealing differences between them. Furthermore, labelling and classification only represent the contemporary views, and are not necessarily uniform across time. More discussion on categorisation follows in Section 5.2.

2.2 Texts

Disk magazines – *diskmags*, *maggies* or *mags* for short – were the main source for contemporary discussions predating the Internet age. Publications 1, 3, and 4, in particular, draw on articles found on diskmags. Much like their paper counterparts, diskmags are edited collections of texts ranging from news to letters to the editor, and articles dealing with readers' topics of interest (Figure 2.1; see also Reunanen 2010, 71–78). In contrast to paper-based magazines, they are interactive software, which lets the user choose articles and read them by scrolling across the pages. As the name suggests, diskmags were initially swapped on physical floppy disks; the name stuck even if later on the Internet became the main distribution channel.



Figure 2.1: Table of contents, Imphobia #6 (1993), running on MS-DOS.

The first demoscene mags appeared in the late 1980s, but the concept is older than that: companies published similar pamphlets with news and software (ibid.). Another

related concept is the *cover disks* that were a common sight on the computer magazines of the 1990s. The diskmag format was, however, particularly prominent and developed in the demoscene, which retained it in active use until the late 1990s. More direct predecessors to demoscene mags were crackers' paper-based magazines serving similar purposes; a few of issues of *Illegal* were used in this study, too. For a researcher, diskmags offer a wealth of content, as there were hundreds of mags with multiple issues. As of June 2016, the Pouet.net database contains 4,450 issues of diskmag, each consisting of a number of articles.

Choosing from this pool was not a self-evident task, but eventually the aim became to cover as long a timespan as realistically possible with the focus on the dominant demo platform of each decade. The selected diskmags ended up being *Sex'n'Crime* (Commodore 64), *Zine* (Amiga), *R.A.W.* (Amiga), the esoteric *Maggy* (Amiga), *Imphobia* (MS-DOS), and *Hugi* (MS-DOS and Windows), spanning 20 years. A general overview of the themes discussed on the issues can be found in my licentiate thesis (ibid.). Several notable diskmags had to be left out owing to the sheer amount of available content. Instead of trying to do similar generalisations this time, articles were selected based on their topics: the scene's self-definition, historical accounts and opinions on technology (Publications 1, 3 and 4). Even with such framing, the amount of material was still considerable. For instance, 200 articles were analysed for Publication 4.

Parallel, somewhat newer discussions were found on Usenet discussion groups *comp. sys.ibm.pc.demos* and the less active *alt.sys.amiga.demos*. Together with diskmag articles the newsgroup messages were subjected to close reading, which led to a typology of the contents (see Kain 1998). Another analytical tool, particularly well-suited for dealing with conflicts arising from platform migrations, was to search for binary opposites that manifested themselves in the discourse (see Section 6.4).

2.3 Artefacts

Instead of trying to incorporate all the possible artefacts, I focus on two kinds in this thesis: crack intros (*cracktros*) and 4k intros. Crack intros, apart from being interesting as audio-visual works, also represent the first generation of scene productions and provide a view to the practices of the early software pirates. My main responsibility in the study presented in Publication 5 was to analyse the textual content of intros in order to assess what messages they conveyed, and how.

The material consisted of 50 screens found on *Apple II Crack Screens* collection by Jason Scott (2003) and the texts of 100 Commodore 64 crack intros automatically extracted by Pex Tufvesson (2013). Manually extracting or real-time reading the *scrolltexts* of a hundred intros would have been a tiresome task, and having them readily available saved considerable effort. Both sets were chosen randomly to represent the source material as evenly as possible, after which the texts were subjected to content analysis, as outlined by Krippendorff (2003). Instead of straightforward word counting, the analysis was a somewhat higher level interpretative term counting where duplicates, such as "greetings" and "greets", were combined. The results started converging surprisingly soon, after only ten screens and intros, which goes on to show how uniform their content was. The quantitative findings laid the foundation for the qualitative analysis, where individual expressions were lifted from the texts for closer scrutiny.

The treatment of 4k intros represents a different, personal angle. In addition to viewing productions, namely party winners and less successful contestants from 1990–2003, there is a strong notion of authorship, based on the co-creation of three intros during 2003–2005 with Antti Silvast (Publication 2). While three items does not constitute a significant sample in itself, digging deep into the strategies and tools involved in the process built understanding, which would be hard to obtain otherwise (cf. Burger, Paulovic and Hasan 2002; Brodersen Hansen, Toft Nørgård and Halskov 2014). Presenting the findings shortly afterwards back to the community was the first step of reflecting on the efforts (Reunanen 2006). The approach is close to art-based research, even though there was little focus on the experiential side of the work (see McNiff 2007).

2.4 Interviews

The need for interviews stemmed from the interest to learn more about the earliest days of the cracker scene for Publication 3. The oldest textual sources, such as disk magazines, cover a period starting roughly from the late 1980s, whereas crack intro texts tend to deal with only a very limited set of topics (see Publication 5). Second-hand sources provided some understanding of the practices of the early sceners (e.g. Polgar 2005, 42–55; Wasiak 2012; 2014a), but too many questions remained unanswered. Therefore, it was a natural step to try and find early participants and ask them.

The interviewees, six of them altogether, were found through personal contacts and the *C-64 Scene Database*. Personal contacts were the easy case, but to recruit interna-

tional respondents was trickier due to the continuing secrecy around the topic (see also Section 1.2). In the end, there were six semi-structured online interviews of former swappers – users who distribute software to their network of contacts – representing four countries: Finland, Sweden, Germany and the US.

A typology of the responses revealed recurring patterns, such as opinions and manners of speech. Some notable differences became evident, too: the European accounts were largely similar to each other, whereas the American interviewee came from a different background and did not share the European views on, for example, the role of the demoscene. As the respondents had to rely on their memories on events that took place as long as 30 years ago, contemporary diskmag articles on swappers plus existing studies were used as comparison points. For further discussion, see Publication 3.

2.5 Notes on Material Collection and Use

The fragmented and even colourful constitution of the research material required the use of different methods, which was somewhat of a burden in itself, and made it challenging to compare the observations obtained from different sources. At the same time, using multiple sources, some contemporary and others posthumous, lends credibility to the findings. Old texts, such as diskmag articles, retain unfiltered views from decades ago, whereas an interview on the same topic will inevitably be affected by later reflection, possibly even nostalgia.

The amount of interviews is relatively low. Had I been dealing with a completely new topic, there would have been a much higher need for consulting participants in order to understand their mindset, but in this case my personal involvement made up for at least some of it: factors such as the slang, demomaking practices, highly regarded "classic" works and platforms were already familiar to me, which allowed to largely omit the initiation phase, and focus on the less known aspects. Obviously, such personal experience cannot automatically be considered as valid knowledge, but there is a constant need for questioning one's assumptions, as discussed in Section 1.2.

The Internet has made the work of a demo scholar increasingly easy over time. Collecting similar material twenty years ago would have required considerably more effort, as there were no easily accessible, comprehensive databases available back then. Discovering, downloading and viewing demos is easier than ever; video captures and capable emulators alleviate the need to purchase and maintain a large hardware collection. Online forums archive and make available discussions on topics of interest,

and provide means for finding otherwise hard-to-reach interviewees. Such repositories allow for not only qualitative, but also quantitative, largely automated approaches as proposed by Lev Manovich (2009). The only thing missing from these valuable digital means is the experience of standing the first time in a dark party hall filled with fellow sceners and monitor glow.

Chapter 3

Related Work

Existing demo-related studies represent various academic disciplines, ranging from cultural studies to art history. Research interest towards the scene spans at least to the early 1990s (Bader 1990; Eckert et al. 1991), but the vast majority of works has been written only lately, during the 2000s. It has taken considerable time – roughly speaking, twenty years – for the academic community to take notice of the demoscene. In this chapter, I categorise the existing works, and assess their historical relevance with the purpose of providing an overview of the different approaches that scholars have taken.

The discussion here is based on the *Demoscene Research* website, which I co-founded with Antti Silvast in 2004 and have been maintaining ever since, recently together with Gleb J. Albert. The site is an online bibliography focused on aggregating all the scholarly works that deal with the demo and cracker scenes, with some additional material on related topics, such as chip music and software piracy. Owing to the help of several individuals' contributions, *Demoscene Research* has grown to be the largest catalogue of its kind with tens of publications coupled with reviews. (Reunanen, Silvast and Albert 2004.)

Who are typical demo scholars, then? Judging by the corpus of existing texts, demos are mostly studied in the same countries where they have been created: Germany and the Nordic countries. Even though English is the dominant language, significant bodies of work have also been written in Finnish and German. The researchers who have contributed to our knowledge on the scene typically have some close connection to the topic, for example in the form of active participation in demomaking. (ibid.) In

other words, the community has started documenting itself not just on its own but also academic forums. One of the most notable developments over time is the shift from short introductory texts (which still do appear at times) towards increasingly rigorous studies that draw from various theoretical frameworks and address in-depth research questions.

The demoscene overlaps and borders with several other forms of digital culture. Thus, there is a need to consider other closely related studies that provide both comparison points and analysis of topics that have not yet received attention from demo scholars (Section 3.4 below). Similar comparisons will continue in the following chapter, where I focus on the communal aspects of the scene. It is also time to critically revisit my own licentiate thesis (Reunanen 2010), which can be thought of as a prequel and foundation to this, more experienced academic endeavour.

3.1 Overviews

A major part of demoscene-related publications, both popular and academic, are general introductions to the culture and its artefacts. In popular contexts they, arguably, still serve a purpose, as there are always new people to reach. As to the academic world, however, it can be questioned whether there is any longer a need to repeat the same basics if there is no novel, revisionist take on them. In Publication 3, I have aspired to do exactly that: revisit the often repeated birth story where shady software pirates turn into creative demosceners. Next follows an overview of the overviews, which illustrates how demos and the scene have been described and positioned so far.

Sam Inkinen and Markku Salmi's book chapter *Media aseena ja työkaluna – hakkereita, teknohippejä ja koneromantiikkaa uuden median verkoissa* (Media as a Weapon and a Tool – Hackers, Techno Hippies and Machine Romance in New Media Networks) from 1996 is among the earliest general introductions to the demoscene in an academic context. In this case, the scene is presented as an example of technologically-oriented subcultures. Hackers and "techno hippies" connect the scene to other phenomena that had already become iconic in popular culture. (Inkinen and Salmi 1996.) Likewise, Linus Wallej's controversial *Copyright finns inte* (Copyright Doesn't Exist) from 1998 attempts to link demos, crackers and software piracy to the 1990s contemporary discussions (even hype) on themes such as cyberpunk and hacking.

Anders Carlsson's *The Forgotten Pioneers of Creative Hacking and Social Networking – Introducing the Demoscene* is a compact introduction published in a media art

context. In just five pages, Carlsson manages to go through the fundamental concepts of the scene: its history, practices and main artefacts. Rather exceptionally, he emphasises the pioneering aspects of the demoscene and its networking, which was already international before the commonplace availability of the Internet. (Carlsson 2009.)

In contrast to the examples presented so far, non-Nordic authors have also written these overviews. For example, Zelazny's (2004), and Hitzler and Niederbacher's (2010) similar papers were aimed at the German-speaking audience. The former paper represents digital art, whereas the latter portrays the scene as a youth culture among many others. As a curious example of a non-European overview there is Ferreira and Duarte's (2014) conference paper from Brazil, written in Portuguese.

The first ever popular book on the demoscene, *Demoscene: The Art of Real-Time* (Tasajärvi 2004) can, likewise, be considered an overview of demos and the scene. The book is not an academic one, but for example the threefold model of scene history, consisting of old-, middle- and newschool, is already analytical rather than merely descriptive (for further analysis of the model, see Reunanen 2010, 23–24). The other well-known popular book, *Freax: The Brief History of the Demoscene* by Tamas Polgar (2005), is considerably larger and only deals with the Commodore 64 and Amiga scenes. The book represents the scene's own history-writing – a considerable amount of prior knowledge is required to fully understand the text. The future of the following volume, which was to deal with the IBM PC scene, remains unknown.

My own licentiate thesis, *Computer Demos – What Makes Them Tick?* (Reunanen 2010), mostly falls into the "overviews" category, as it deals with a number of scene-related phenomena on a relatively basic level. In hindsight, the aim to encompass each and every topic was too much for a publication of 134 pages, so the outcome ended up scratching several surfaces without the possibility to offer in-depth views. The six years that have passed after the thesis have, obviously, broadened my views on both the subject itself and the possible theoretical approaches that could have been taken.

On the other hand, there is no need to overly criticise the earlier attempt, either. The thesis serves well as a foundation for this one with its comprehensive glossary and compact introductions that help especially an uninitiated reader. The theoretical framework that I chose for the analysis of the adoption of technology, diffusion of innovations by Rogers (2003), still appears fitting when augmented by more recent models (Section 6.3). Judging by the citations the thesis has received during the last few years (e.g. Botz 2011; Hastik and Steinmetz 2012; Tyni and Sotamaa 2014;

Wasiak 2014b), it seems to have found its way to the tiny canon of demo-related scholarly works.

Owing to the different backgrounds of their authors, these demoscene histories represent both insider (from scene to scene, or demoscener turned into a researcher) and outsider (non-participating researcher) perspectives. Jaakko Suominen (2016) has analysed similar histories dealing with digital games and divides them into four different kinds:

- 1. Enthusiast histories: chronicles written by insiders, often non-academic.
- 2. *Emancipations:* alternative accounts providing unorthodox views on history.
- 3. Genealogies: tracing the origins and family trees of games.
- 4. *Pathologies:* in-depth archaeological analyses of games (not limited to the temporal dimension alone).

Plenty, if not most, of demoscene histories represent the first approach; coming from an enthusiast background, I run certain risk of writing one myself. Suominen (2016) mentions the pitfall of *monumentalising* history into a stream of influential events and authors, in effect writing the history of the winners (cf. Therrien 2012). In this study, I have consciously tried to steer clear from such heroic milestones in order to say something about the scene as a whole, not only its celebrities. There are already traces of canonising certain productions: for example, *Megademo* (aka. *Red Sector Megademo*) from 1989 has received considerable attention by multiple authors (e.g. Polgar 2005, 106–7; Botz 2011, 145–53; Maher 2012, 184–88). The other three approaches are significantly rarer, even though traces of them can be found on certain publications: gender studies (see Sections 3.2 and 4.4) is an unorthodox – emancipatory – framework for demoscene research, whereas Botz's (2011) thesis could be called genealogical. "Deep excavations" of artefacts, such as Publications 2 and 5 here, fall into the last category, pathologies.

3.2 The Scene as Culture

Moving away from the general overviews, the next "track" of demoscene research is the studies with a cultural approach: the scene as hobbyist, youth or subculture (see also Section 4.1). Some of the publications discussed here do include short introductions to the scene in general, as it cannot be considered common knowledge, so the

line between them and the overviews presented above appears thin at times. Even so, what does set them apart is the focus on the participants and their social interaction. All in all, it seems that even if the demoscene is frequently defined as, say, a *subculture* and several paper titles mention some kind of "culture", actual cultural studies are still relatively scarce.

Patryk Wasiak is one of the most active authors who have discussed the demoscene in terms of (sub)culture. His 'Illegal Guys': A History of Digital Subcultures in Europe during the 1980s is one of the few scholarly works dealing with the early years of cracking and demos in Western Europe (Wasiak 2012). Another historically significant article by him, "Amis and Euros." Software Import and Contacts Between European and American Cracking Scenes, discusses the little documented interchange of "warez" – mostly pirate games – between American and European pirates (Wasiak 2014a). In his other writings, Wasiak frequently offers an Eastern European or, specifically, Polish perspective to the adoption of technology by hobbyists (Wasiak 2010; 2014b), in line with the local histories approach.

Petri Saarikoski has charted the scene in a number of publications ranging from articles to academic dissertations in the early 2000s as part of his research on digital culture (Saarikoski 2001a; 2001b; 2004). His writings are, first and foremost, historically oriented: the scene is put into perspective and positioned as a form of hobbyist culture. His point of view is mainly Finnish with international comparisons. One of the most notable insights is how the demoscene has, by its members, been considered as a serious hobby instead of a stepping stone towards something else (Saarikoski 2004, 205; cf. Tyni and Sotamaa 2014).

Doreen Hartmann's Zerstört Offenheit den Wettstreit? Über die subkulturellen Werte von Crackern, Hackern und Demoszenern (Does Openness Destroy Competition? On the Subcultural Values of Crackers, Hackers and Gamers) again connects crackers and demosceners to the hacker context, but offers novel takes as well by considering topics such as motivation and fame. (Hartmann 2012.) The demoscene–hacker comparison will receive further attention in Section 4.2. Hartmann continues to unravel the values and attitudes of the scene in her later article Animation in the Demoscene: From Obfuscation to Category (Hartmann 2014), which also relates to the artefact perspective discussed in Chapter 5 of this thesis.

The dominantly male nature of the community has received some specific attention from demo scholars. Sociologist Hege Nordli, whose main research focus has been

female computer hobbyists, analyses gender issues at the largest demo event in Norway in her article *The Gathering – Computer Parties as Means for Gender Inclusion*, also included in her doctoral thesis *The Net is not Enough: Searching for the Female Hacker* (Nordli 2003a; 2003b). Roininen's (1998) MA thesis offers similar perspectives to the Finnish situation in the late 1990s, even though gender is not her only topic of interest.

This section concludes with two more critical takes, which have often been lacking in demo-related texts that have at times even glorified their subject. Heikki Tyni and Olli Sotamaa discuss Assembly, Finland's largest demo (and recently also LAN) party in their 2014 article. Their most notable finding is how the role of the event has changed throughout the years. Business has been a part of Assembly almost from the beginning, for example, in the form of company headhunters scouting for recruits. In addition, they discuss the relationship between the demoscene, game hobbyists and the game industry. (Tyni and Sotamaa 2014.) The complicated gamer–scener relationship will receive further attention in Section 4.3. Another critical point of view is offered by Huuskonen (2004), who mentions how communities such as the demoscene are often self-sufficient and closed off from outsiders.

3.3 Demos as Art and Artefacts

Studies that approach the scene through its main artefacts, demos, constitute another major part of all demoscene research. Some of them represent an artistic angle – demos as media art –, whereas some focus on the technical implementation. Full-size demos tend to be the main object of interest, even though they only constitute a part of the spectrum of demoscene productions (see Reunanen 2010, 45–78 and Section 5.2).

Daniel Botz's doctoral thesis, *Kunst, Code und Maschine – Die Ästhetik der Computer-Demoszene* (Art, Code and Machine – The Aesthetic of the Computer Demoscene), is by far the largest study on demos as an art form. In the dissertation, Botz walks through the aesthetic development of demos from their very roots in the 1980s to the 2000s, revealing the development of different styles, demo formats and effects. (Botz 2011.) Unfortunately, in this thesis Botz's many contributions are somewhat underrepresented due to the language barrier, as there is no English translation of the book yet.

An interesting new take on the visual analysis of demos was presented by Canan Hastik in her recent article *Demo Age: New Views*, where she applies cultural analytics methods to demos. Her work is based on the tools and approach developed by

media scholar Lev Manovich, known for his long-standing research on various forms of new media (see Manovich 2009). Hastik presents various different time-lapse images that summarise and highlight the visual appearance and rhythm of very different demos running on various platforms. An example of such can be seen in Figure 3.1. (Hastik 2014.) In her other work, discussed in Section 5.3, Hastik and her colleagues have developed ontologies for the analysis and preservation of demos from an artefact perspective.

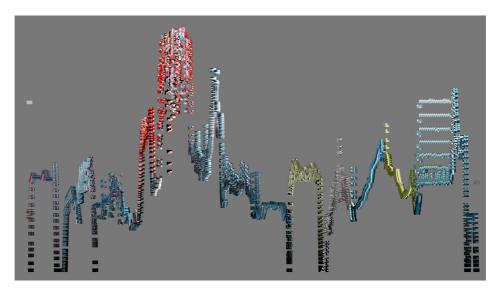


Figure 3.1: A time-lapse view of *Human Traffic* (2011) by Ghostown and Loonies. Time on the x axis, brightness on the y axis. Image by Hastik (2014), used with permission.

Studies on demo music often overlap with chip music research (see Section 3.4 below). However, there are a handful of clearly demo-related musicological articles and theses, in addition to which various overviews mention music among other topics. Hanna Lönnblad's two works, an MA thesis and a research article on tracker music focus on the role of music in demos through a comparative analysis of two demos, *Second Reality* by The Future Crew and *Caero* by Electromotive Force (Lönnblad 1997; 1998). Brendan Ratliff's (2007) MA thesis is a more recent account on demo music, in particular the iconic tracker music, its history and development (cf. Reunanen 2010, 66–70).

A handful of authors have published papers on the technical implementation of demos. While such topics are commonplace in scene-internal discussions, scholarly attention has been limited; one likely explanation to this is that most scholars simply

have not possessed enough technical knowledge to address such an in-depth topic. Burger, Paulovic and Hasan (2002) reflect on their first-hand experiences on the creation of three demos, *Dream, Expiration* and *Symbolic Expression*, in their article *Realtime Visualization Methods in the Demoscene*. Curiously, the title also makes a rare connection to yet another field of study, namely visualisation. Brodersen Hansen, Toft Nørgård and Halskov (2014) provide a rare glimpse to the working methods of a demo author with a focus on digital craftsmanship. Publication 2 of this study belongs to the same group, as it is largely based on personal observations as a programmer (see also Scholtz 2007a; 2007b; Peeters 2013).

3.4 Closely Related Fields of Study

Some important contributions originate from other contexts, where the scene may be used just as a case example instead of the main topic of interest. For example, chip music and software piracy are topics that often overlap with demoscene studies due to technical or historical reasons and, therefore, offer useful extra perspective to demo scholars. Two more relevant topics, digital games and their relation to the scene, as well as the question whether sceners can be considered as hackers, are discussed in their respective sections (4.2 and 4.3) in the next chapter.

Chip music or a chiptune refers to music created on old hardware, such as the Commodore 64 or Nintendo Game Boy or, alternatively, music that only sounds like it. For further elaboration on the problematic distinction between the two categories, coupled with questions of authenticity, see the study by Marilou Polymeropoulou (2014). As there are still active scenes on old hardware platforms, there is a clear overlap with demo research – plenty of demo music *is* chip music by definition. One of the most active writers on chip music has been Anders Carlsson, whose MA thesis and other texts shed light on the essence of chiptunes, also in the case of the demoscene (Carlsson 2008; 2010;cf. Driscoll and Diaz 2009; Hakkarainen 2011).

The studies mentioned above highlight how chip music is, on the one hand, about sound and technology, and, on the other hand, cultural activity. Walter Karila's (2013) MA thesis focuses on community building and meaning making on the Internet, where chip musicians actively distribute their works and chat about their hobby. Sebastian Tomczak's (2011) doctoral thesis represents the technical end of the spectrum, with a number of low-level case studies on old sound chips, their interfaces and sonic properties.

Tracker music or mods, created with trackers, is another paradigm highly characteristic to demos even today, although it has been recently contested by mainstream music production tools (see Reunanen 2010, 66–70). In addition to the aforementioned studies by Lönnblad (1997; 1998) and Ratliff (2007), which deal directly with the demoscene, trackers have been studied by Jimmy Maher for his *Platform Studies* book on the Commodore Amiga, *The Future Was Here* (Maher 2012, 191–99). There is significant overlap between chip and tracker music in the composition paradigm as well as the style (small chiptunes are a long-standing subgenre of MOD music), which is why the two are frequently mentioned in the same publications.

Historical studies on software piracy shed light on the early stages of the demoscene due to its roots. Even though the concept of "illegal" pops up frequently when discussing software piracy, it is necessary to bear in mind that, depending on the country, there were not necessarily laws in place against copying software in the 1980s or early 1990s and, thus, pirates' activities were not illegal per se (cf. Wasiak 2012; Publication 3). To curb piracy, game companies relied on increasingly complex copy protection schemes, turning cracking into a kind of sport (see Wasiak 2012). Jukka Vuorinen's (2007) comparative study on the software distribution models and ethics of crackers, hackers and the proprietary world provides an important theoretical foundation that can be easily applied to the demoscene as well. Most notably, Vuorinen observes how interlinked the cracker and proprietary modes are, as opposed to the hacker model that originated in a completely different context (further discussion in Section 4.2 and Publication 5).

In addition to Vuorinen, the practices of the warez scene have been studied by Alf Rehn (2004), who discusses the warez scene in terms of an *honour economy* that is based on competition, in many respects similar to the demoscene. Both Vuorinen and Rehn maintain a neutral position to software piracy, which is often not the case in public debates surrounding hacking and piracy (e.g. Thomas 2002; Yar 2008; Lindgren 2013). Likewise, I aim for neutrality in this thesis: observing instead of condemning or glorifying the activities of "warez dudes" and "illegal guys".

Chapter 4

A Scene Among Others

Calling the demoscene a *subculture* has been among the most common ways to describe it (e.g. Karaiste 2008; Wasiak 2012; Hastik 2013). While such a definition anchors the scene to a well-established field of study and helps the uninitiated reader to understand the exclusive nature of the community, it also suggests other parameters that do not necessarily fit. Most notably, a subculture requires a *parent culture* – a relationship which has received next to no attention. Would the parent culture be game culture, Western European computer culture or society at large? In his critique of the use of the term David Chaney (2004) goes as far as to say it has already become redundant, as any late-modern culture entails the same characteristics. Other authors, representing different backgrounds, have utilised other frames of reference that, likewise, come with their own assumptions and implications.

Already when reading Dick Hebdige's well-known *Subculture: The Meaning of Style* ([1979] 2010), I noticed that subcultures, as described by him, do not quite appear like the demoscene. Among the factors that seemed out of place were dresscodes, shared musical tastes and the locality of subcultural activities. To simplify a little, you cannot recognise a demoscener by looking at his clothing or music collection, let alone meet them at a certain bar at the weekend. The often-criticised Marxist interpretation of subcultures as a form of class struggle did not ring a bell, either, as the scene does not seem to share any single political agenda, or to noticeably rebel against a parent culture (Reunanen 2010, 48–49; cf. Muggleton 2004).

Other proposed candidates for a classification have been a *hobby* (Saarikoski 2004, 190–206), *youth culture* (Roininen 1998, 80–87) and *community of practice or interest* (Marisca 2013). Aune (1998) calls Amiga groups *clubs* in her *The computer in*

everyday life: Patterns of domestication of a new technology. Out of these options, the term hobby is descriptive, but at the same time it does have a potentially belittling tone, as in "just a hobby", which does not capture the dedication involved. Youth culture, in turn, might have suited the purpose better in the 1980s and 1990s but, as already Roininen (1998, 82) noted, a large portion of sceners were so old that they hardly represented the youth. Skimming through the party photo site *Slengpung.com* further suggests that today's active sceners tend to be closer to 40 than 20 years of age, so we are talking about a *former* youth culture at best.

In my own work, I have tended to use the word *community*, a group of connected people, in its everyday meaning. The term does, however, come with its own connotations, as in the context of sociology it refers to the community–society (Gemeinschaft–Gesellschaft) dichotomy coined by Ferdinand Tönnies (1887). Steven Brint (2001) provides an overview of the historical use of the concept, including the controversies concerning its multiple latter definitions, with the aim of rejuvenating its use and updating it to fit contemporary discourse. He, in turn, defines communities as:

[...] aggregates of people who share common activities and/or beliefs and who are bound together principally by relations of affect, loyalty, common values, and/or personal concern (i.e., interest in the personalities and life events of one another).

Shared common activities, in particular, suit the discussion on the demoscene, as so much is defined by doing. Common beliefs are much less characteristic, at least in the case of politics or religion (Chapter 5), but if we consider values, such as views on technology and authorship, the definition does indeed strike a chord (Section 4.4). In his hierarchical tree-shaped typology, Brint divides communities into two types, geographic and choice, based on their primary context, followed by further divisions based on the reasons and kinds of interaction involved (ibid.). According to his typology, the demoscene could be labelled as a *dispersed friendship network*: a geographically scattered choice-based community with shared activities and some face-to-face interaction, yet, keeping in mind the theme of change, the classification might not have been as accurate in the pre-Internet times.

The related term *community of practice* originates from the field of learning studies, where it refers to a group that has formed around a shared profession or goal (Lave and Wenger 1991). Henri and Pudelko (2003) place it on a continuum starting from an

informal *community of interest*, and ending at a professional and cohesive community of practice. On the one hand, the process of moving from a novice to an expert in a community fits well the initiation phase taking place in the demoscene, while on the other hand, the sharing aspect that Henri and Pudelko emphasise is not as evident at all: concurrently competing with others can lead into a completely opposite outcome (see Section 4.2). As part of their activities, sceners do acquire new skills, but as of now, the learning aspect has not been considered in the existing publications. Lave and Wenger's (1991) tripartite model consisting of domain, community, and practice would provide an easily applicable starting point for such studies.

The concept of a "scene" is by no means limited to demo enthusiasts. There are various popular music scenes, intertwined with clubbing scenes and the zine scene, and the goth scene, to name just a few (Straw 1991; Brill 2007; Gelder 2007, 47–65; Duncombe 2008). In fact, scene has been proposed as an alternative theoretical construct that would better capture the fluid nature of today's communities. Michaela Pfadenhauer (2005) provides the following general definition for a scene in *Ethnography of Scenes* (see also Publications 3 and 4):

Thus we refer to a thematically focussed cultural network of people who share certain material and/or mental forms of collective self-stylisation and who stabilise and develop these similarities at typical locations at typical times as a scene.

The self-stylisation and locality included in the definition initially stand in contrast to the externally invisible and internationally connected demoscene. However, if we consider only the psychological side of self-stylisation, the definition becomes better applicable. The self-stylisation present in demos and other artefacts, the slang, and the ways of using computers are, indeed, collective and largely stable. If we think of location as something that can also be virtual in addition to physical, the demoscene can be considered a scene by Pfadenhauer's terminology, too (cf. Brint 2001). Local subscenes are an even easier case, as they involve a concrete physical location.

4.1 Sub- and Youth Cultural Perspectives

Regardless of whether the demoscene is a subculture or youth culture by definition, the comprehensive body of research dealing with them offers us readily applicable theoretical and methodological starting points. Instead of repeating the history of

subcultural studies from the Chicago School to Birmingham Centre for Contemporary Cultural Studies (CCCS), I refer the reader to existing histories (e.g. Gelder 1997, 1–15; Hodkinson 2007) and focus on the most important concepts that I adopted myself, and their implications for this study.

Dick Hebdige, perhaps the best-known representative of Birmingham culturalists, was an early source of inspiration when I started getting acquainted with subcultural studies. Even when taking into account the considerable later criticism of his and the CCCS approach in general (e.g. Bennett and Kahn-Harris 2004; Muggleton 2004, 19–25), there are certain findings that have stood the test of time. *Subculture: The Meaning of Style* dedicates plenty of pages to clothing and music, but especially the concept of *incorporation* offers a valuable point of view to the interplay between commerce, parent culture and subculture (see Hebdige [1979] 2010, 92–99).

Incorporation, as defined by Hebdige, refers to the mechanisms that the parent culture employs in order to render the complexity and perceived deviance of a subculture into an understandable and manageable form. The first of the two main mechanisms is *commodification*, where style is frozen into a product, which brings the subculture back to the mainstream, or at least forces it to reinvent itself. The second one is the *ideological form*, where media, in particular, trivialises or sensationalises subcultural activities. The two mechanisms are not separate, but work in parallel, supporting each other. (ibid.) Gary Clarke warns against understanding incorporation too trivially, as the connection between subcultures and the market is not a one-way street. Moreover, the purported authenticity and creativity of the initial members can easily be overemphasised. (Clarke 1981.)

As the demoscene is hardly deviant, unless in its relationship to technology, it has not been the target of similar incorporation attempts as, for instance, network hacker culture, which has an inherent element of threat in it (see Taylor 1999; Thomas 2002, 177–219; Alper 2014). The scene does not constitute a notable market, either, so its artefacts have not been productised – even if the skills acquired in scene activities have been put into commercial use, as noted in Section 4.3 and in Publication 3. Traces of ideological incorporation can be observed in mainstream newspapers and websites, where parties have occasionally been portrayed in a somewhat condescending manner in the lines of "thousands of nerds gathered to play games" (some Finnish examples: MTV 2007; 2009; Digitoday 2013).

David Muggleton's (2004) *Inside Subculture: The Postmodern Meaning of Style* was the natural next stop. Compared to Hebdige, Muggleton paints quite a different pic-

ture: instead of well-defined subcultures with their authentic members, we meet people who identify with more than just one group, mix styles and, at times, grow out of a certain style. Muggleton's work represents a new wave of research that has been called *post-subcultural*. Post-subcultural studies typically criticise the CCCS approach, emphasising fluidity and diversity instead (e.g. Clarke 1981; Muggleton 2004, 22–24).

What could a demoscene researcher take home from post-subcultural studies? At least the fundamental thesis that demo-related activities are not the only thing sceners are involved in or identify with: as one example, my previous study shows how graffiti, techno and other types of popular culture have found their way to demos, becoming part of a shared aesthetic (Reunanen 2010, 60–62; cf. Botz 2011, 289–386). A scener's life is no more static than anyone else's: they, too, grow older, move on the socioeconomic ladder, and operate under "real life" pressures, all of which inevitably affect the relationship to the community.

Taking after Muggleton (2004), I wish to bring up the rarely asked question "Who belongs to the scene?". In most studies it seems evident that there are sceners, who subscribe to its values and practices, and then the outsiders. The border between the insider and outsider is necessarily fuzzy, as members join and leave the scene and, at times, come back. What about hangarounds who do not create anything but just visit parties? Does belonging result from a mere personal decision, or does the individual need to be accepted by others first?

One more lens offered by subcultural theorists is the Bourdieu-inspired concept of subcultural capital, which helps to understand how status – in the case of the demoscene, practically equal to fame – is acquired. According to Sarah Thornton (1995):

Subcultural capital confers the status of its owner in the eyes of the relevant beholder. [...] Just as cultural capital is personified in 'good' manners and urbane conversation, so subcultural capital is embodied in the form of 'in the know', using (but not over-using) current slang and looking as if you were born to perform the latest dance styles. Both cultural and subcultural capital put a premium on the 'second nature' of their knowledges. Nothing depletes capital more than the sight of someone trying too hard.

This short definition alone contains multiple relevant perspectives. First of all, subcultural capital is valuable only in its relevant context: learning to program or getting the latest computer will earn you capital among your peers, but not necessarily anywhere else. Even if "capital" is not part of the scene vocabulary, similar value accumulation can be observed, for instance, in the lame/elite dichotomy and ranking lists (see Section 4.4 and Publication 4).

In his critique of Thornton's work, Sune Qvotrup Jensen (2006) emphasises that social hierarchies need to be taken into account when considering participants' relationship with a subculture. In other words, subcultures cannot be regarded as separate realities where factors, such as one's economic means, gender, and ethnicity, could be omitted. The role of gender in the demoscene has received at least some attention by scholars, whereas other socioeconomic factors less so (see Section 4.4).

Judging by my fieldwork experiences with the Commodore 64 scene, as discussed in Section 1.2, even inside the demoscene there are multiple zones with their own subcultural capitals. The skills and knowledge that I had accumulated, mostly on the IBM PC during the 1990s and early 2000s, did not account for much when dealing with the pioneers who had experienced the formative years of the scene in the 1980s. This example suggests two factors, platform and age, as two axes in the formation of the "zones". Location is likely to be one more, especially in the case of national subscenes that may have been little connected to the outside. Thornton (1995) mentions gender as another parameter, but even if the demoscene is a heavily gendered community (Section 4.4), the exact effects of gender are not well known yet: women are not necessarily taken seriously, while at the same they may receive disproportionate attention simply for being female (Roininen 1998, 67–71; Nordli 2003a; Reunanen 2010, 26).

Thornton argues that subcultural capital can be converted into economic capital. She mentions DJs, club organisers, clothes designers, journalists and record industry professionals as examples of occupations where hipness turns into income. (Thornton 1995.) While there are rare examples of commercial demos (Wasiak 2013) and demo competitions can sport first prizes of thousands of euros – not necessarily much considering the required effort –, a more relevant case of capitalisation is the connection with the ICT industry, where underground skills are put into commercial use (see Publication 3). One of the best known links, sceners as game authors, receives further attention in Section 4.3.

4.2 Hackers or Not Hackers

Demoscene activities have frequently been portrayed as and connected to *hacking*, and its members labeled *hackers* (e.g. Saarikoski 2004, 190; Carlsson 2009; Publication 4). However, can such juxtapositions actually be justified, or do they rather rise from a need to explain the scene to the public or connect it to an easier recognisable phenomenon? As a starting point, we can look at a selection of definitions for a "hacker", taken from *The Jargon File* 4.4.7, collected by Eric S. Raymond (2003):

- 1. One who programs enthusiastically (even obsessively) or who enjoys programming rather than just theorizing about programming.
- 2. One who enjoys the intellectual challenge of creatively overcoming or circumventing limitations.
- 3. [deprecated] A malicious meddler who tries to discover sensitive information by poking around. Hence password hacker, network hacker. The correct term for this sense is *cracker*.

The bipolar and elusive nature of the word is evident in these three definitions alone. The programmer-centric one hardly fits the demoscene as a whole, since many participate in other ways than programming. The second one matches the scene ethic of "doing the impossible" rather well: minuscule 1k and 4k intros (Section 5.2) or pushing the limits of an obsolete computer definitely fit this description – like a myriad of other activities ranging from miniature painting to building ships in a bottle would. The third definition refers to the way hacking is commonly depicted in public discourse: harmful and illegal (cf. Taylor 1999, xi–xvi; Thomas 2002; Alper 2014). Notably, crackers are labelled as network intruders here, whereas in the demoscene discourse the use of the term tends to be confined to copy protection removal alone.

Quite obviously, there cannot be a definite answer to whether demosceners are hackers; by one definition yes, by another no. A more fruitful line of thought emerges if we focus on the relationship between the demoscene and the hacker community. No discussion of hacking culture would be complete without Steven Levy's *Hackers – Heroes of the Computer Revolution* ([1984] 2001), which draws a line from the 1950s "true hackers" to the free software movement. It is questionable whether Levy's "game hackers" actually fit the continuum, but that sidetrack will be omitted here.

I analysed *Hacker Ethic*, as outlined by Levy ([1984] 2001, 39–46) already in my licentiate thesis (Reunanen 2010, 27–28) and concluded that some of the principles seem alien from a demoscene perspective. Most notably, free information sharing in the form of demo source code is rare; a magician never reveals his secrets to the audience (cf. Krysa and Sedek 2008). On the other hand, artistic computing, meritocracy and positive change do ring a bell. It is also important to remember that we are dealing with Levy's interpretation: there was no such "Hacker Ethic" taped on the wall at Stanford or MIT for the original hackers' reference.

In contrast, the roots of modern-day open and free software movements can be easier traced to the first hackers (e.g. Levy [1984] 2001; Raymond 1992). Even if the demoscene has been discussed in relation to open source (Ratliff 2007; Carlsson 2008), there is a certain disparity between the practices and values of the two communities. In addition to source code sharing, there is a clear difference in the relationship towards commercial software: while the free/open software movement champions the use of Linux and similar free alternatives, the demoscene has mostly followed the mainstream of computing, sticking to the most common platforms (Reunanen 2010, 100–1; see also Chapter 6).

Jukka Vuorinen's (2007) article Ethical Codes in the Digital World: Comparisons of the Proprietary, the Open/Free and the Cracker System offers an insightful point of view to the ambiguous relationship between open source and the scene. Even though Vuorinen deals with crackers, not the demoscene, the model is still largely applicable because of the shared roots of the two. He notes how crackers, in turn, adopted practices from the software industry instead of the hacker tradition, which flourished in a different context (cf. Publications 3 and 5). The commercial side of demomaking and cracking would warrant further study – how do economic principles manifest themselves in hobbyist scenes?

4.3 Gamers: a Complicated Relationship

Sharing the digital domain with other hobbyists has not always been easy for the demoscene, which can especially be seen in its complicated relationship with computer games and game players. In public discourse and academic studies, the scene has often been discussed in the context of digital games – yet another example of a simplified narrative that relates to a topic most people recognise –, while sceners themselves might, at times, have been downright hostile towards gamers. Attitudes

towards games have also varied significantly during the last thirty years, so there is not one single truth on the issue.

As stated in Publication 3, cracker culture is inherently linked to commercial software production: without a constant influx of your fundamental artefact, games to crack, there would be little to keep the community going. Games were not an alien topic in early diskmags either, which featured reviews along the same lines as computer magazines (Reunanen 2010, 121). Based on diskmag discussions, the need to draw the line between the scene and gamers increased together with the growing self-consciousness of the community (ibid., 29–30). The need to distance demoscene activities from game piracy was affected by legal factors as well (Publication 3).

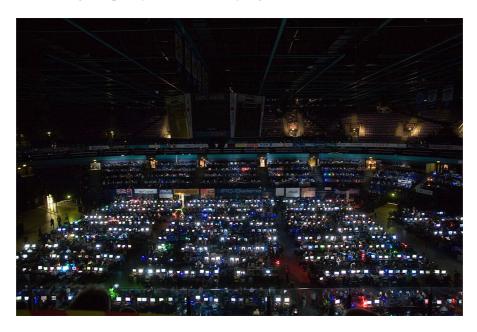


Figure 4.1: The party hall of Assembly 2006 held in Helsinki, Finland. Image courtesy of Nasu Viljanmaa.

Demo parties, with their roots in so-called *copy parties* where early hobbyists swapped software with each other (Wasiak 2012), are among the most long-standing and fundamental forms of demoscene culture (see Nordli 2003; Reunanen 2010, 37–39; Tyni and Sotamaa 2014). Figure 4.1 is an example of how a party place looks like on the inside. Game enthusiasts, in turn, gather to *LAN parties*, which focus on playing networked games, first-person shooters, in particular (Jansz and Martens 2005). Some events that started as purely demo-related have drifted towards LAN parties, which has then led to a kind of power struggle and at least verbal conflicts between the two

groups (Roininen 1998, 126–7; Nordli 2003, 71–91; Reunanen 2010, 37–39; Tyni and Sotamaa 2014). The following quote illustrates the rift as perceived by one scener:

I'm talking about our beloved species of gamers. Well, the hardcoregamers, those people we usually call more exactly lamers. (Styx/HcR in Hugi #23, 2001)

The use of the derogatory term *lamer* dates back to the 1980s. It has been used to denote multiple inappropriate characteristics, ranging from people with little skill to wannabes and game players. Traditionally the binary opposite of a lamer has been an *elite*. One apparent sign of change is the nowadays relaxed and even opposite use of the two words, which used to have deep and serious connotations back in the day. (Publication 4.) Levy ([1984] 2001, 115–8) mentions a similar division into *winners* and *losers* among the early hackers.

One more well-known connection between the scene and games comes from the game industry. There is plenty of evidence concerning the demoscene roots of a number of notable game companies, such as Remedy, Housemarque and DICE (Saarikoski and Suominen 2009; Reunanen, Heinonen and Pärssinen 2013; Sandqvist 2012; Jørgensen, Sandqvist and Sotamaa 2015), so the link surely exists. Along the same lines, popular discussions repeatedly mention sceners' successful careers in the industry (for some examples, see Kauppinen 2005; Lappalainen 2015, p.11). Even the influential *Pouet.net* and *CSDb.dk* websites, which do not otherwise focus on games, feature categories for games created in the context of the demoscene. Furthermore, parties have served as recruitment opportunities for ICT companies (Tyni and Sotamaa 2014).

While some demoscene members, indeed, joined the game industry and founded their own studios, many others did not. One of my main points in Publication 3 is that the narrative leading from the unknown digital underground to a respectable career is a trivialisation, which reduces demoscene activities to something that they are not by nature. The question "What became of demosceners?" might not even be relevant here, as it is based on the assumption that the years spent on scene activities were merely a passing phase. Demos have meaning and value to their creators and audience on their own, without any need to present them as a preschool for the industry (cf. Saarikoski 2004, 205). Such easily digested explanations can be considered as a form of incorporation, as discussed in Section 4.1 above.

4.4 Defining Features

There are certain defining, interrelated features that have coloured most demoscene activities throughout the three decades. I provide here an overview of some of the most central ones in order to provide a foundation for later topics. One characteristic trait is high regard for skill (Publications 1 and 4). The most obvious skill is programming, fundamental for demos' existence in the first place, but also "softer" abilities, such as graphic design and music composing are valued and necessary. There seems to be a certain tendency to favour and emphasise these three skills, which all represent authorship; according to the laconic comments by equally hard-working swappers, their competence has been less appreciated (Publication 3).

If there were a "Scene Ethic", in the lines of the Hacker Ethic as described by Levy ([1984] 2001, 39–46), it would certainly encompass hardware pushing and doing the impossible; such themes pop up in all of the articles that constitute this work. In particular, Publication 2, dealing with four kilobyte intros, shows how much effort has been put into the tools and techniques needed for creating those minuscule artworks. Hardware pushing is much less of an issue on today's powerful computers, but it still continues on the old school platforms, such as the Commodore 64, Amiga and ZX Spectrum, and alternative devices, such as game consoles and embedded computers (see Section 6.2).

Proving oneself requires a do-it-yourself attitude and display of mastery. Using Sherry Turkle's (1984, 104–10) model, control-obsessed *hard mastery* seems to be better aligned with the demoscene's views than the more subjective *soft mastery*. Cutting corners by using others' code and content with and especially without permission – *ripping* – has traditionally been condemned (Publications 1 and 4), which is also another example of how sharing in the demoscene should not be lightly equated to the free/open software ideology. On the other hand, the focus on activity, concrete doing, is not unlike hacking with its obsessed programmers and hardware hacks, more recently branded also as *DIY* culture (Levy [1984] 2001; Schäfer 2011).

It is hardly exaggeration to call the demoscene a *meritocracy*. Competition, hierarchy and fame can be observed in diskmags' ranking lists, party competition results, and demos' greetings lists alike. (Reunanen 2010, 33–36.) Competition does not take place only under the hood, but it is made explicitly visible and commonplace. Similar attitudes have been observed in other forms of male-dominated digital culture, such as hackers and gamers (Levy [1984] 2001, 43–45; Thompson 1984; Turkle 1984,

210; Håpnes 1996, 136; Jansz and Martens 2005). Turkle (1984, 201–2) and Roininen (1998, 65–66) propose obsession and competition as two factors that sway women away from such social circles.

As shown in previous studies, the scene has traditionally been a male domain (e.g. Roininen 1998, 65–70; Saarikoski 2001a), like computer hobbyism, in general (Haddon 1990; Thomas 1991, p.xvi–xvii; Saarikoski 2004, 167–86). Such imbalance has unavoidably affected its values and practices in a number of ways. As mentioned above, competition is one factor that is frequently present in male computer use – at the same time keeping in mind that there is no evidence that women, too, would not compete in their respective hobbies. Other depictive examples can be seen, for example, in the imagery produced by the scene; *Freax: The Art Album*, a collection of visual artworks, illustrates how masculine male and seductive female figures keep repeating throughout the years (Vigh and Polgar 2006). At the same time, the representations mirror contemporary popular culture, which is already gendered and eroticised in itself (e.g. Nikunen, Paasonen and Saarenmaa 2005).

It is challenging to count the number of people who have been involved in the scene; there is not enough information to begin with, and the very definition of who is or was a participant is a complex issue on its own. In spite of the problems involved, it is still valuable to at least try to estimate the magnitude of the phenomenon. Again referring to online databases, *CSDb* features (as of July 2016) 26,879 sceners and 8,289 groups, whereas *Pouet.net*'s figures are 21,456 and 11,922. The Amiga-centred *ExoticA* has 1579 groups in its collection. There is, obviously, heavy overlap between the three, but based on these numbers it seems reasonable to say that we are talking about tens of thousands of people at minimum.

When considering other relevant demographic factors, nationality comes next. United States is the home of a significant number of computer and game console models, and also the cradle of several forms of digital culture. Because of that, it is tempting to emphasise the American perspective to historical developments. To counter an unbalanced Americentric view, local histories focus on other, less studied geographical regions (e.g. Wasiak 2010; Alberts and Oldenziel 2014; Stachniak 2015). The danger in demoscene research is rather the opposite: as we are dealing with a mostly European phenomenon (see Reunanen 2010, 24–25), it could be easy to fall for Eurocentrism and overlook the importance of external influences that have left their mark here. As an example, Wasiak (2014a) has shown that there were active connections between at least the US and Europe during the formative years of game piracy.

International networking was part of demoscene practices even in the pre-Internet days and even more so nowadays. To facilitate communication, English became the lingua franca of the scene, as can be observed on its websites, disk magazines, party advertisements, and usenet discussions (Reunanen 2010, 42–43). Having said that, contents produced in local languages, such as German, Russian or Finnish, are not rare either, especially if the intended target audience is local. The roots of the internationalism are not hard to track: cracker culture ran on swapping, and games needed to move across borders – even the Iron Curtain (Jakić 2014; Wasiak 2014b; Stachniak 2015). As the practices and channels were already there, the demoscene inherited them as it started becoming increasingly independent (Publication 3).

Chapter 5

Artefact Point of View

Studying the demoscene without looking at demos could be compared to studying impressionism without looking at paintings; even if artefacts are not the main focus of this thesis, omitting them would be unthinkable. The very name of the community, the *demo*scene, suggests an intimate connection between the community and its artefacts. It is also important to understand the plurality of demoscene productions: in addition to demos there are intros of various sizes, music, short films, graphics, disk magazines and games, just to name a few. From a research point of view all of them can be thought of as small repositories where internal meaning-making manifests itself. These "lesser" works have received little attention from scholars so far, in spite of their continuous popularity. Publications 2 and 5 aim at closing this gap by describing two kinds of artefacts in depth.

Susan M. Pearce defines artefacts as "objects made by man through the application of a technological process" in her book *Interpreting Objects and Collections*. She adds that in practice the term is reserved for movable pieces and inorganic or dead materials. (Pearce 1994, 125–32.) The definition represents a museological angle and is tied to physical objects, which software, consisting of intangible bits controlling a computer is not (cf. Schäfer 2011, 64–66). Traditional storage media, such as cassettes or floppy disks, do have a physical dimension to themselves, but even in that case we are interested in their content rather than the construction of the medium itself – with the exception of disk cover art (for examples, see Vigh and Polgar 2006, 17–34).

As noted already in one of the first academic papers on the scene, George Borzyskowski's (1996) *The Hacker Demo Scene and Its Cultural Artifacts*, demos are cultural

artefacts, which reflect the changing values and practices of the community. Even though his perspective of the demoscene as a form of cyberculture mainly echoes the 1990s contemporary discourse, Borzyskowski rightly brings up the communicative role of demos. Likewise, crack intros, as discussed in Publication 5, are cultural artefacts that serve almost identical purposes, with the extra dimension of software piracy.

Demos are not created in a vacuum; in addition to reflecting the particularities of the community, they are also heavily affected by the technology and popular culture of their time. Out of the two external factors, it is somewhat easier to observe technical changes: the capabilities of contemporary machines and authoring tools, augmented by creative misuse, can be traced in the audio-visual works produced by the scene (see Reunanen 2010, 79–96; Botz 2011, 45–288). As one concrete example, circumventing the colour limitations (often called "colour clash") of the Sinclair ZX Spectrum is characteristic for demos and still images on that particular platform. For some instances of such artworks, see *Freax: The Art Album* (Vigh and Polgar 2006, 173–84) or the *Demotopia* site (Westcott 2001).

Analysing the effect of pop culture trends on demos is not quite as straightforward, even if on the surface we can easily observe heavy metal and graffiti inspired logos, references to movies or games, and the appearance of various musical genres, in particular electronic music. Compared to a handful of different computing platforms with their technical properties, popular culture is a vast phenomenon, whose indirect, synthesised and subconscious traces in demos cannot possibly be revealed in their entirety. In addition to Botz's (2011) extensive thesis, there are a handful of other attempts at revealing the aesthetic origins of the scene (Carlsson 2009; Menotti 2009; Reunanen 2010, 57–62; Peeters 2013; Hartmann 2014).

A road even less travelled is studying the effect of social and political factors on demoscene artefacts – or the community itself, for that matter. Again, as rather exceptional cases we can find demos with a "message" (Figure 5.1), but in general the scene has been notably apolitical. At this point, I can only offer initial thoughts as to why: youth cultures generally tend to distance themselves from their parent culture, where politics also belong, and, in the case of the demoscene, political arguments could also be detrimental to its international nature. Even in the presence of recognisable, charged symbols it is not necessarily evident whether they represent authors' actual opinions or just stylistic play (Reunanen 2010, 48). The most common politically-coloured theme addressed in related research has been the interaction between West



Figure 5.1: Political messages in demos. On the left *Red Storm* (1992) by Triad criticising the Swedish prime minister. On the right retelling Estonian history in *Fairytale* (1994) by On the Oath of Styx.

European and Eastern Bloc countries during the Cold War, in the form of software piracy and, to a lesser extent, the demoscene (see Section 6.2).

5.1 Demos Are Software

We know by now that demos are computer software that runs real-time. Breaking down and moving beyond this simplistic definition reveals new dimensions in them and opens new possible directions for research. What does it imply that demos are "real-time"? How are they created, and what are their building blocks?

When trying to explain the essence of demos, the real-time aspect is often mentioned as a defining trait. Demos have at times been compared to music videos (Scheib et al. 2002; Saarikoski 2004, 190), and the two formats do, indeed, share certain properties: both are typically non-interactive audio-visual presentations that last for a few minutes. For an outsider, some demos might well pass for music videos, as they share the same aesthetic as their MTV counterparts. The real difference is on the inside: videos are edited and rendered offline and played back as a sequence of still images, whereas demos display their audio-visual content on the run, as the execution of the program proceeds. This difference alone sets the two formats far apart in both technical and conceptual terms.

That said, the distinction between offline animation and real-time graphics is not always trivial and, as Doreen Hartmann (2014) has shown, it is also subject to constant renegotiation. The demoscene ethic manifests itself in this dichotomy; offline rendering does not provide for a similar display of wizardry as accomplishing the same

visual effects in real-time on limited hardware or in limited size. In practice, most size-constrained productions categories make it downright impossible to incorporate pre-rendered images or music, let alone video (Publication 2).

Digital programs stored on a floppy or other medium only come to life when they are run: the files themselves are a "demo" only in a narrow sense, as the actual experience springs from executing them on a suitable hardware and software platform. Even seemingly minor changes, such as a different version of the operating system, might stop the production from working (Publication 2). This sort of fragility, inherent in developing technologies, is by no means unique to demos: similar challenges have been met in business software and games alike (e.g. Newman 2012). Possible solutions to these problems receive further attention in Section 5.3 below, where I discuss demo preservation efforts and strategies.

The distributable form is only a part of the lifecycle of a demo. In almost all studies so far, the focus has been on the "final" outcome as seen by the audience, and the development process has been omitted (for some opposite examples, see Brodersen Hansen, Toft Nørgård and Halskov 2014; Kemppainen 2014; Publication 2). That a demo first exists in a human-readable source code format, before being compiled to an executable file, provides unexplored angles to their analysis (cf. Krysa and Sedek 2008). In effect, such an approach would fall under the emerging paradigms of software and critical code studies, as proposed by Manovich (2001, 48; 2013, 10–20), Marino (2006) and Fuller (2008). According to Manovich's (2001, 48) definition:

To understand the logic of new media we need to turn to computer science. It is there that we may expect to find the new terms, categories and operations that characterize media that became programmable. From media studies, we move to something which can be called software studies; from media theory – to software theory.

In his later account, Manovich (2013,10) steps back from pure computer science and adds the effects of cultural, social and economic factors to the scope of software studies. Likewise, *Software Studies: A Lexicon*, a collection of critical essays from 2008 shows how different perspectives are possible when discussing software (Fuller 2008). Schäfer (2011, 65–66) goes even further in his *Bastard Culture!*, stating that it is nearly impossible to separate technology and culture when dealing with software, as they are both so fundamentally connected to users' activities.

In addition to code, there is a need for music, still images, 3D graphics and other media objects, also known as *assets* in other contexts of content production. The tools and processes involved in their creation are as little documented as programmers' efforts so far. I took a glimpse at the tool aspect in my licentiate thesis (Reunanen 2010, 97–99), but the sample represents only one moment in time – for instance, software used in the 1980s was completely different. In spite of technological change, the long-standing tripod of demo making, code–graphics–music, is embedded in the scene's practices in various ways: credits for a demo chiefly refer to these duties, and competitions at parties let sceners compete in these particular skills. Other roles do exist, but they are hardly as definitive and stable (ibid., 32; Publication 3). How you identify yourself is, first and foremost, defined by what you *do*.

5.2 Dual Nature of Categories

There is a clear and somewhat understandable tendency to focus on demos when discussing the scene and its artefacts, but at the same time such simplification occludes the actual variety of works. "Demos" alone can be divided into subcategories, in addition to which there are images, music, animations, group t-shirts, party flyers and many other artefacts produced by the enthusiasts; some digital, some physical. In this section I look into the taxonomies created by the scene, their origins and effects, and other possible ways of classifying the works, in particular the ontologies developed by Canan Hastik and her colleagues.

Let us start with a concrete case, the taxonomy of productions as seen in the active *Pouet.net* website, which I have divided into subcategories (in bold) for better readability:

- BBStro
- Collections
 - artpack, demopack, diskmag (disk magazine), musicdisk, slideshow
- Cracktro (crack intro)
- Demos
 - demo, dentro (demo-intro), fastdemo

Demotool

Fixed-size intros

- intro, 256k, 128k, 100k, 96k, 80k, 64k, 40k, 32k, 16k, 8k, 4k, 1k, 512B, 256B, 128B, 64B, 32B
- Game
- Liveact

• Party-related

- invitation, report, votedisk
- Procedural graphics
- Wild

Pouet.net only accepts executable productions, with the exception of videos, so music, images or other non-executable works are excluded. The categories are not mutually exclusive; for instance, an *invitation* can also be a *demo* or an *intro* at the same time. At least the following three factors can be observed in the taxonomy: size, content and function. For those entries that do not fit any other category, there is a "miscellaneous" slot, *wild*, featuring mostly videos, but also hardware hacks and other hard-to-classify experiments. Another relevant detail is how *Pouet.net*, too, recognises the cracker-demoscene connection by including crack intros as one production type.

Other sites follow their own criteria, and at *CSDb* we can find several other categories and subcategories not seen in *Pouet.net*: paper magazines, game cracks, still images, and even BBS software. The differences partially reflect the personal choices of the website maintainers, but more notably the practices of the Commodore 64 scene. The presence of piracy-related content is evident both in their production taxonomy and the possible roles the users can choose for their profile. Crackers, importers, original suppliers and NTSC-fixers who modified American games to run on European machines are all rooted in the reality of the 1980s international software piracy (see Wasiak 2014).

How are these taxonomies formed? First of all, it is necessary to keep in mind that they are never stable or final. The community negotiates and renegotiates the definitions when the technological landscape changes, and new types of artefacts emerge

and establish themselves. Some of the categories presented above are posthumously defined, as the original authors did not necessarily think of their work in the same terms. I present one case of such labelling in Publication 2, which deals with 4k intros. The first "4k intros", as categorised by *Pouet.net* users, were neither 4,096 bytes nor created with such a title in mind. A great number of crack intros would technically satisfy the requirements of a 4k intro, but due to their different cultural context and purpose, they go with a different label.

In contrast to posthumous definition many, if not most, productions are created to specifically meet the criteria of an existing category. I call this the *dual nature* of demo categorisation: an emerging activity is canonised, after which the definition takes a life of its own and starts dictating the activity. Demo parties have played an important and active role in these definitions, as they publish beforehand their competition rules stating the allowed file sizes, platforms and, on a general level, the content (e.g. racism or pornography may be forbidden). Referring again to Publication 2, competition rules are also subject to change: initially, 4k intros were silent, but later music became an integral part of the intros when the rules started allowing sound. Likewise, the maximum acceptable size for a demo has been on the rise throughout the history of the scene (Reunanen 2010, 46). Later on, taxonomies have been defined and refined by online archives to facilitate structured browsing.

Demo researchers have, by and large, taken the existing taxonomies at face value, which is also justifiable if the interest lies only in how the participants themselves view the artefacts. The most notable exception comes from Hastik, Steinmetz and Thull (2013), who propose an ontology for real-time audio-visual art, demos in particular. Their starting point is the standardised *CIDOC Conceptual Reference Model* (CRM), defined in ISO 21127:2006 and further revised in ISO 21127:2014. Their ontology consists of similar entities as stored at, for instance, *Pouet.net* (production name, platform, authors, group etc.), but their relationships are also clearly defined: something that might appear evident for an "insider", but needs to be done for systematic archival. When trying to address all the properties of a demo, the shortcomings of the *CIDOC CRM* become evident, as it cannot encompass the required hardware platforms or the real-time aspects of computer software. (Hastik, Steinmetz and Thull 2013.)

5.3 Demo Preservation

30 years in the digital domain is a little eternity – it is hard to comprehend the difference in the computational power, communication networks and storage media that

were available to consumers now and then. Quickly evolving technology has rendered old platforms and their software mostly useless for everyday purposes, but at the same time it has also enabled us to better preserve the old in the form of archives, emulators and reliable long-term storage. From this perspective, demos are no different to any other software. Digital games are a close relative as they, too, are audio-visual software running on the same hardware. Therefore, the tools, methods and discourse dealing with game preservation offer a valuable comparison point. Another closely related topic is the preservation of media art, even though demos mostly run on standard platforms, as opposed to physical installations that cannot be archived by simply duplicating their bits.

The scene, being a self-conscious community, has actively preserved its own digital cultural heritage for quite a while already. Such efforts are crucial for the researcher, since otherwise there would be little hope of accessing the artefacts, but they also reveal how the community values its own history and tries to ensure its continuity. These days the archives are, naturally, online and accessible to anyone who is interested and knows where to look. Some repositories host both information and files, while some are pure file archives or demo databases by nature. Another difference is that some sites are platform-specific, while others aim at covering all the platforms. The following, non-exhaustive list describes some of the most notable preservation sites I have come across during this research (some of them are already inactive):

- Amp.dascene.net Amiga Music Preservation, a database of Amiga music and musicians.
- Csdb.dk A Commodore 64 specific site with productions, information, discussion and scener profiles.
- Demozoo.org A demo database which, unlike Pouet.net, also includes music and graphics.
- *Exotica.org.uk* The host for multiple retro computing related subprojects, including Amiga groups and demos, and Commodore 64 groups.
- Files.scene.org/ftp.scene.org A large file archive hosting demos and related artefacts for multiple platforms.
- *Intros.c64.org* A site dedicated to Commodore 64 crack intros, coupled with files and discussion.

- *Pouet.net* An active multiplatform demoscene site with discussions and a large demo database.
- Zxdemo.org Aka. Demotopia. A Sinclair ZX Spectrum scene specific database.

Even if all of the above sites in effect contribute to demo preservation, they are not necessarily history-oriented per se. Distributing and discussing contemporary productions might be their primary purpose, and the preservation more of a by-product. The physical, non-digital heritage of the scene has not been conserved even nearly as extensively, but the recent *Got Papers?* initiative by Gleb J. Albert (2015) is specifically focused on that.

In addition to Hastik and her colleagues' work, there is little academic research on systematic demo preservation. In my licentiate thesis (Reunanen 2010, 102–3), I briefly address the topic, based on the views of Bruce Wands (2006), Mark Tribe (as quoted in Paul 2007), and the UNESCO-published *Charter on the Preservation of the Digital Heritage* (2003). Borrowing from Wands and Tribe, who both represent the field of media art, I consider the following four approaches to demo preservation:

- 1. Migration to new platforms
- 2. Emulation
- 3. Documentation
- 4. Recreation

Kam Woods and Geoffrey Brown's *Virtualization for Preservation of Executable Art* charts the possibilities of emulation in the case of executable art, demos in particular. At the same time, their work also represents a rare American perspective on the scene and its artefacts. Based on the evaluation of 250 demos created for various legacy hardware (and software) platforms each, they highlight the importance and high quality of open-source emulators. Already in 2008 most tested productions ran fine on C-64, Amiga, and Atari ST(E) emulators, while the results for the IBM PC compatibles were less impressive. They also discuss the challenges involved in automatic metadata extraction, as demos are not distributed in uniform file formats and the information stored with them is not necessarily machine readable. (Woods and Brown 2008.)

Another common practice in place today is rendering demos into standard video files, which facilitates their viewing on modern-day devices without the actual hardware or software. As can be seen on *Pouet.net*, *YouTube* is currently the most popular channel for distributing the videos. Not only productions running on exotic or retro hardware receive such treatment, but new demos, too, are frequently captured for non-real-time viewing. While this approach is practical and preservation oriented, it goes against the long-standing notion of demos as real-time art. Furthermore, watching a 30 fps (frames per second) video capture on today's 60 Hz flat screen is far from an authentic experience if the original work was created for a 50 Hz CRT-based video monitor (cf. Lowood 2013).

There has hardly been a need for *recreating* old productions on new platforms, due to aforementioned high-quality emulators and video captures (cf. Woods and Brown 2008). The most common old demo platforms were sold in millions and, thus, have not yet disappeared in spite of their ageing (see Section 6.2). There are, however, some curious examples of remaking demos for other, less capable machines in the name of homage and showing off, which, instead of recreation, we could label *retrocreation*. The purpose of such remakes is clearly not preservation, as the target platforms themselves are technically outdated from today's perspective and, therefore, do not make the content any more future-proof than the original production. Figure 5.2 is an example of how *Second Reality*, an iconic PC demo, was remade for the Commodore 64 and Atari ST. In addition to the remakes, there are also parodies of the demo, such as *Sqrt(2) Reality* (1996), created by the pseudonym "Future Screw".



Figure 5.2: Second Reality (1993) by the Future Crew running on IBM PC compatibles, Second Reality 64 (1997) by Smash Designs and The Obsessed Maniacs for the C-64, and Second Reality 2013 by Checkpoint for the Atari ST.

In the current absence of conclusive demo-focused takes, it is necessary to look into related contexts for theoretical discussion. James Newman's (2012) *Best Before*, dealing with digital game preservation, serves as a good foundation because of its comprehensive approach. Computer and video games are in many respects similar to demos,

even though they also contain unique factors that do not concern us: elaborate packaging, instructions and interactivity are usually of little concern when dealing with the latter. With the exception of so-called *dynamic demos*, scene productions generally display the same content each time, whereas a game experience only comes to be through interaction and is not identical to each user. A walkthrough video of a game is, therefore, a considerably poorer representation than a similar capture of a demo.

The most evident challenges, deteriorating storage media ("bit rot") and dying hardware, are only one part of the picture, and not equally relevant for productions of different ages. These days, as demos reside in mirrored online archives, such as *Scene.org*, the possibility of completely losing an artefact is extremely low compared to a pile of floppy disks that have matured 30 years in a garage. Compared to games, demos do not suffer from disappearing online content because they tend to be self-contained, whereas games face the risk of becoming obsolete when a company decides to take unprofitable servers offline (see Newman 2012, 22–26). Another notable difference springs from the commercial and proprietary nature of video games: to curb piracy, game companies introduce various Digital Rights Management (DRM) measures, which are further supported by stringent copyright legislation that makes it legally impossible to create archival copies (Anderson 2011; Newman 2012, 137–9).

Current game preservation efforts have largely been undertaken by hobbyists. On the one hand, Newman recognises the crucial importance of fan efforts, but on the other hand, he is also critical of them, as the activities are chiefly personal motivation driven, which is a potential risk for their longevity. (Newman 2012, 26–31.) I have observed similar traits when compiling the *Videogames.fi* database on commercial Finnish games: hobbyists collect and preserve what they find interesting to themselves (Reunanen, Heinonen and Pärssinen 2013). In the case of the demoscene even more so, since there is little commercial gain involved, coupled with equally little recognition from memory institutions so far.

Chapter 6

Facing Technological Change

Over its three decades, the demoscene has undergone considerable technological transitions: starting from the 1980s home computers with 64 kilobytes of memory, processors of a few megahertz, and BASIC interpreters, we have seen a move to gigabytes, gigahertzes, 3D accelerators, and sophisticated graphical user interfaces. The development is far from over, so today's computers, too, will eventually face obsolescence and appear as hopelessly underpowered compared to the platforms to be. At the same time, the same "obsolete" hardware obtains an aura of nostalgia, coloured by personal memories and history that new machines do not yet possess (see Suominen 2008).

Already at the beginning of my research, I came to think of the demoscene as an example of the adoption of microcomputers (also known as *appropriation*, *diffusion*, or *domestication* depending on the context). The already a notable body of research on how people adopt technology and innovations in general provided a fitting frame of reference for analysing similar processes in the case of the demoscene and its machinery; the original hardware engineers could not possibly have anticipated all the uses their designs were put into. The computers were also not built with a thirty-year lifespan in mind. As many of the original manufacturers are long gone, and the platforms in question have not been commercially viable in quite a while, it is only due to the efforts of dedicated hobbyists that a machine survives to this day.

By a strictly technical definition, a computer is a piece of programmable hardware that is capable of executing its dedicated software. At the same time, it is much more than that: a cultural artefact laden with history, practices, meanings, memories, users, and their communities. Before a computational device became all that, it had to go

through a series of transformations that concurrently shaped both the machines and their users. Studying the demoscene and its relationship towards its computers, we can build one more perspective on this co-construction in a specific context coloured by competition, creativity and constant technological change.

6.1 Becoming a Home Computer

The general history of computers and video game consoles has already been discussed by a number of authors (e.g. Ceruzzi 2003; Forster 2005; Gere 2008; O'Regan 2008). In the historical perspective the demoscene is clearly a child of the home computer boom, which started in the late 1970s in the form of the Apple II, Commodore PET, and TRS-80, all introduced in 1977 (see Ceruzzi 2003, 264–6). A necessary prerequisite for the advent of personal computers was the invention of the integrated circuit by Jack Kilby in 1958, which later on led to the first commercially available general-purpose microprocessor, the 4-bit Intel 4004, in 1971 (ibid., 183, 220).

In a matter of just a few years, the home computer market became populated by a colourful selection of mutually incompatible offerings from different manufacturers, most of which would disappear equally fast. Computers had already found their important uses in a variety of technical and commercial tasks, but it was less evident what an ordinary household could do with one. According to Saarikoski (2004, 88–90), early ads emphasised that learning to use a computer would be an essential skill in the future. Such rationalisation was obviously aimed at conscious parents in order to legitimise the purchase, although, in reality, games were a common use for the machines (Haddon 1988; Saarikoski 2004, 211; Lean 2014).

Leslie Haddon's *The Home Computer: The Making of a Consumer Electronic* from 1988 is among the earliest critical takes on the history of home computers. Starting from a technical history that led to the creation of microcomputers, Haddon moves on to the roles of enthusiasts, retailers, the press and advertising in shaping what would eventually become the home computer. In the transformation, the manually assembled "black box" of early technically capable hobbyists was turned into a purportedly user-friendly, affordable commodity for the masses, and sold with prepackaged software. (Haddon 1988.) The juxtaposition between productivity vs. "useless" entertainment bears striking resemblance to the demoscene's discourse on different platforms, and has most likely influenced the latter at least indirectly (Section 4.3, Publications 1 and 4).

Along the same lines, Christina Lindsay emphasises the role of the user community in preserving and expanding the Radio Shack TRS-80, one of the earliest commercially produced home computers. The TRS-80 was introduced in 1977 and discontinued in 1984. From early on, enthusiasts participated in the construction of the potential uses and group identity using the Apple II, another popular contemporary, as their reference. After the commercial obsolescence of the TRS-80, only a small portion of the early users stayed in the community – but they did. (Lindsay 2003.) Even if the TRS-80 never was a popular demo platform, Lindsay's findings resonate with my observations on the demoscene and its machines, as discussed in the following sections.

When considering the imaginary, potential and actual uses for a computer, the concept of a *technological script*, originating from the field of semiotics, offers a suitable theoretical lens that brings together artefacts, designers, users, and the context of use – owing to Latour's actor–network theory, technological objects are considered as participating actors among others in a network. As defined by Madeleine Akrich in *The De-Scription of Technical Objects* (1992): "[...] technical objects define a framework of action together with the actors and the space in which they are supposed to act." Designers make assumptions on users' needs and behaviour, which is why the outcome of the design, the product, contains a "script" that purports a certain kind of use (ibid.).

Users are not confined only to the possibilities that have been scripted into an object, but they, too, actively participate in shaping technology – if it were not so, we could observe curiously uniform patterns of use with next to no innovation from the user side (see also Section 6.3 for discussion on reinvention). To casually expand on the concept, marketers and educators, likewise, "re-script" products following their own agenda, as is evident on Haddon's (1988) account on the introduction of the home computer. Finally, the end users and their communities construct their own scripts in ways that the original designers had no way of anticipating, like in the case of text processors, learning tools and games machines that were turned into platforms for demos.

6.2 Demo Platforms: What, Where and Why

The software piracy that emerged on the Apple II in the US during the early 1980s already featured a number of familiar traits that can be observed later in the European cracker and demoscenes: instead of their real names pirates used handles, they formed

groups, and modified game title screens for their own purposes (Figure 6.1). There is some evidence that the later American Commodore 64 pirates were aware of their predecessors, but the link from Apple II piracy to the European circles has proved hard to establish (Publication 5). Based on the memoirs of Kevin Savetz (2012), a formerly active game swapper, game copying was equally common on the Atari 8-bit computers, such as the Atari 800.

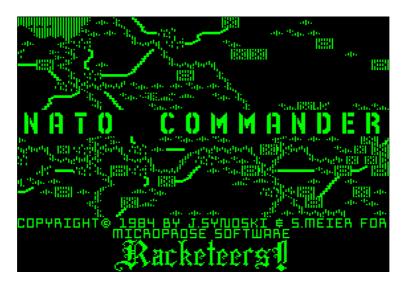


Figure 6.1: A defaced game title screen from the *Apple II Crack Screens* archive (Scott 2003). The "Racketeers" logo has been added to the bottom of the screen.

In spite of the popularity of Apple, Atari and Sinclair computers, when it comes to the early demoscene, there is one company above all others: Commodore International. Founded in 1954 as a typewriter manufacturer, Commodore moved on to calculators and eventually into the computer business, producing the PET line of personal computers, the VIC-20, C-64, and finally the Amiga series (Bagnall 2005). The iconic C-64 was widely popular both in the US and Europe, and by and large the cradle of organised cracking and the demoscene. The Amiga was a natural upgrade to Commodore fans, in particular when the affordable A500 model was introduced in 1987 and followed the C-64 as the most active demo platform until the early 1990s (Reunanen 2011; cf. Maher 2012, 171–205).

The growing pressure from the IBM PC compatibles (at times labelled "PC clones"), coupled with internal struggles led to the bankruptcy of Commodore in 1994 (Bagnall 2005, 536–48). The bankruptcy was a clear turning point for the demoscene, let alone the worldwide Amiga community. Even if the scene did not immediately aban-

don the Amiga, the writing was on the wall: either stay with your aging computer or move to the new dominant platform. Almost coincidentally the old competitor, Atari, ceased its computer business in order to focus on the failed Jaguar game console (1994), which ended up being its last attempt in the hardware business (Forster 2005, 150–51) – the home computer age had come to an end.

Demos and crack intros on the PC compatibles date back to the 1980s, but they gained popularity as demo machines only towards the mid-1990s. It is problematic to even talk about "the PC" as a single entity, since its original hardware from 1981 is so vastly different to today's. A similar gap exists on the software side: the rudimentary command line of MS-DOS has been replaced by a WIMP-based graphical user interface with direct manipulation (see Shneiderman 1996) and several layers of abstraction sitting between the user and the underlying hardware. The gap also is reflected on *Pouet.net*: MS-DOS and Windows productions are placed in separate categories, even if the hardware was exactly the same for multiple years when the two overlapped in the market.

Ian Bogost and Nick Montfort, the editors of the *Platform Studies* series, approach the problematic of defining a "platform" through a layered model consisting of platform, code, form/function, interface, and reception/operation, all of which reside in a cultural, social, economic and historical context. They acknowledge the dual nature of the term: both hardware and software can be considered a platform, "the abstraction level beneath code". (Montfort and Bogost 2009, 145–50.) Another definition, found on their *Platform Studies: Frequently Questioned Answers*, is simply "[an] underlying computer system" – again reflecting the same layered way of thinking about platforms (Bogost and Montfort 2009).

As of June 2016, *Pouet.net* features productions for as many as 90 named platforms. Among the most commonly known machines and operating systems there is also a number of exotic ones with a handful of productions. To name a few, demos have been created for the Soviet-built BK-0010 computer, the NeoGeo Pocket and Nintendo Pokémon Mini handheld consoles, and even the built-in script language of the *mIRC* chat software. Furthermore, the "Wild" category contains various unique hardware hacks or marginal gadgets with perhaps just one production, so the actual number of demo platforms is likely noticeably larger than 90. While the majority of demos are made for mainstream computers and operating systems, there is also clear push to conquer more marginal ones, although such efforts tend to remain isolated curiosities.

Even if they are not part of the focus of this study, there is no denying that commercial and political factors have played an important role in, first of all, where the demoscene was born: Commodore strongholds largely overlap with especially the early cracking activities, but much more can be said on the locality of scenes. For example, The Netherlands, where MSX compatible computers had a high market share, fostered a local scene with its own particular practices (Reunanen 2010, 41). A much more notable watershed was, however, the Cold War with its Iron Curtain that hindered, yet did not completely stop, the exchange between Western and Eastern enthusiasts until the early 1990s.

The Coordinating Committee for Multilateral Export Controls (CoCom or COCOM), founded shortly after the Second World War, was the Western Bloc's instrument for controlling the export of high technology to the Soviet Union and its allies. Computers were among the CoCom regulated goods, which severely limited the sales of high-performance devices, including Japanese products, to the East. (Cain 2005.) The restrictions were not, however, static, and sufficiently old technology could be exported, which created curious pockets around computer brands and models that had either failed in or already faded from the Western market. Some examples of those, as seen on *Pouet.net*, are the Hungarian Enterprise and Commodore Plus/4 scenes, and the Polish Atari 8-bit scene.

In addition to state-run shops, many Eastern hobbyists got their computers through technically illegal channels, for example from flea markets and "bazaars" where you could purchase machines and software that were unofficially imported from the West (e.g. Jakić 2014; Wasiak 2014b). Another way of coping with the low availability of personal computers was to build one on your own: makeshift companies, clubs and capable individuals designed and built both hardware expansions and complete kits, again giving rise to curious local scenes, some of which still exist. Western home computer designs were often used as a starting point, such as in the case of the Russian Sinclair ZX Spectrum clones (Lean 2014; Stachniak 2015).

Much remains unknown about the East–West interchange of games, demos and hardware during the Cold War. In the big picture such connections are part of a larger phenomenon of unofficial distribution channels, black markets and Western media consumption in Eastern Bloc countries (e.g. Kern and Hainmueller 2009; Loveless 2009). It is only recently that scholars have started to unearth and analyse the digital underground, as exemplified by the *Hacking Europe* compilation consisting of various studies on the topic (Alberts and Oldenziel 2014). From a demoscene point

of view the emergence of the Eastern European scene, with its similarities and differences to the Western one, highlights the international nature of the community and its strict – but not altruistic – focus on its own activities instead of world politics.

It is worthwhile to consider a demo platform a *process* rather than a piece of hardware or software with its technical characteristics. The complex mechanics of the market make a platform available in a certain context, where a community evaluates the product's compatibility with its needs, values and practices, and, eventually adopts or discards it. The narrative that started emerging from the study of the demoscene seemed by no means unique to it, so the next logical step was to look into theories of how people adopt technology in general.

6.3 Models of Adoption

The diffusion of innovations theory, proposed by Everett M. Rogers (2003), is the framework that has most shaped the analysis of technology adoption in this study. First published in 1962 and revised multiple times after that, the diffusion theory offers a number of models that holistically deal with the factors involved in an adoption process, including the properties of an innovation, different stages of adoption, the role of change agents, and interpersonal networks where the innovations spread. Even though an innovation may refer to a concrete commercial product, as is typically the case when the theory is applied, it can equally well be of an immaterial nature, such as a new farming method. According to Rogers' definition (ibid., 5):

Diffusion is the process in which an innovation is communicated through certain channels over time among the members of a social system. It is a special type of communication, in that the messages are concerned with new ideas.

Probably the best-known models developed by Rogers are the bell and s-curves of adoption (ibid., 273, 281), which depict the phases and rates of diffusion, and the kinds of adopters that hop in at different times. A small group of *innovators* experiments with the innovation, followed by *early adopters* that influence the deliberate *early* and sceptical *late majority*. *Laggards* are the last, relatively small group of adopters. It should be noted that even though "laggard" may sound pejorative, it should not be considered as a negative term: laggards preserve the old ways of doing

things, which may prove fruitful to the community if an innovation fails. Furthermore, the reasons why some need a long time to adopt, or never do, provide valuable feedback that can be used for improving the innovation in question. (ibid., 282–85; cf. Wyatt 2003.) As shown in Publications 1 and 4 dealing with platform adoption, demosceners do not represent only one of these categories, but all of them.

Variables Determining the Rate of Adoption of Innovation serves as a useful starting point and checklist when considering the various reasons as to why an innovation is adopted faster or slower. Quite evidently, the properties of the product or idea count, but several social factors are involved in the process as well. Decisions are not always made by individuals, as the adopting unit might be an organisation or as large as a nation. The social system in question has its own norms that affect the perceived acceptability of the innovation. Communication channels ranging from interpersonal to mass media are the necessary prerequisite for the distribution of new ideas and products. The last variable is the efforts of the change agents trying to further their own agenda, be it commercial, educational or governmental. (Rogers 2003, 222–59.)

The concept of *reinvention* is highly relevant when considering the demoscene and its use of computers. As defined by Rogers (2003, 181) it refers to "[...] the degree to which an innovation is changed or modified by a user in the process of its adoption and implementation." As we are dealing with a commercially marginal sector of consumers, it is unlikely that their needs would be considered when designing new computers for the mass market. Demo viewing and creation are by no means common uses for digital devices, yet that is exactly what the enthusiasts do, thereby reinventing the purpose of the product. Eglash (1997) breaks reinvention (although calling it appropriation) into three categories: reinterpretation, adaptation and reinvention, which reside at different points on the consumption–production axis.

Like any theory, diffusion too has received its share or critique, some of which is addressed in the later editions of *Diffusion of Innovations* itself. One recognised shortcoming in diffusion studies has been the tendency to side with change agents, positivistically focusing on successful adoption and omitting the imperfections of the process (Rogers 2003, 106–26). The theory of diffusion has also been criticised for being linear and overtly rationalistic, which was one of the reasons for the emergence of the largely European *domestication* discourse that tries to address the shortcomings (Berker et al. 2006). For a more in-depth discussion on the origins and development of the concept, see Silverstone (2006).

Without the need to pick sides I, on the one hand, recognise the reasons why Rogers' theories can be labelled as rationalistic: presenting overarching models of how adoption takes place runs the risk of simplifying the endless complexity of human behaviour, while on the other hand, the models offer an exceptionally holistic view to the topic and make the process clearly understandable. Domestication studies, which are typically of qualitative nature, come with their own models – plenty of them – but there is no underlying grand theory that would be shared by the authors representing the paradigm. As the name suggests, domestication research is more focused on personal use and the domestic scope, whereas diffusion aspires to address adoption by organisations and other large social systems as well.

Starting from the late 1980s and early 1990s, multiple domestication researchers have looked into how digital technology is received and appropriated by its users. Margrethe Aune's *The Computer in Everyday Life: Patterns of Domestication* (1996) describes how information technology arrived in Norwegian homes. She divides the interviewees into categories, such as "extenders", "explorers" and "game-freaks", based on their activities and style of work. Even if not called that, Amiga sceners and crackers are mentioned as part of the "game-freaks" category. A notable gap between male and female users is evident in her study: enthusiasts were mostly men in the early 1990s. (ibid.)

Another representative of Norwegian domestication studies is Tove Håpnes' *Not in Their Machines: How Hackers Transform Computers into Subcultural Artefacts* (1996). Keeping in mind that hackers are not quite the same as demosceners (Section 4.2), Håpnes' paper offers a relevant point of comparison. She recognises how the meanings that users assign to computers are not inherent or given, but created through a *negotiation process*. Many other findings sound familiar as well: for instance, the users that she calls "real hackers" considered themselves as a unique group that operated outside the mainstream of computing. The creative aspect, embraced by the demoscene, was present in her hackers, too. (ibid.)

Not unlike diffusion, domestication studies emphasise how cultural adoption is, above all, a process (e.g. Aune 1996; Håpnes 1996; Lehtonen 2003). Silverstone, Hirsch and Morley's (1992) influential four-phase model of domestication is a foundation several later works have built on:

- 1. Appropriation: the artefact is acquired by an individual or a household.
- 2. Objectification: the artefact becomes part of the physical environment it is in.

- 3. *Incorporation:* the artefact is integrated into the routines of the household.
- 4. *Conversion:* the artefact is reflected outside the boundaries of the home.

When applying the framework to demos and the demoscene, we immediately face the question of what is the artefact in the first place – a demo or the computer it is running on? In Chapter 5 demos were the object of interest, but in this context it must rather be the computer, even if it would be conceptually interesting to try to consider an essentially immaterial object, a piece of software as the artefact that is being domesticated. The vast importance of software today provides added motivation for such a take.

6.4 Times of Change

Publications 1 and 4 discuss the ways demosceners have backed, opposed and, eventually, adopted new software and hardware platforms. Some of the most visible turning points have been the Amiga–PC clash of the mid-1990s and the MS-DOS–Windows transition of the late 1990s, which affected not only the scene, but computer hobbyists in general. Similar, equally fiery cases have been observed among gamers, who have fought so-called *machine wars* between different computer models and games consoles (Saarikoski and Reunanen 2014).

The emotional tone of the discussions reveals how, for a technologically-oriented hobbyist, a platform is not just a piece of hardware or software, but notably more than that: a part of their identity, as observed early on by Turkle (1984). Binary juxtapositions of, for instance, powerful—too easy, sceners—gamers, and insider—mainstream polarise the discussions and call the participants to choose their sides, as if there could be only two (Publications 1 and 4). Harsh language, downright aggression, conservatism and predictions on the death of the scene are all ultimately mechanisms that the community puts into use when its safe status quo is shaken by an external change that is too significant to be ignored. Using Rogers' (2003) terminology, it is a process of evaluating the attributes (relative advantage, compatibility, complexity, trialability, and observability) of an innovation (cf. Håpnes 1996; Lehtonen 2003).

A number of non-technical factors are in play when a new platform is being evaluated by the scene: in addition to the personal relationship to a machine, possibly coloured by nostalgia, there is a community of other users that has grown around it (cf. Lindsay 2003). The effort invested in learning the finest details of one computer

or building a software collection may be next to worthless when the rules change. To put it in other words, the subcultural capital acquired on one platform might not readily transfer to another, a loss which sparks understandable hesitance (Publication 3).

After enough negotiation and external pressure, the majority – if there is such a thing – does eventually adapt to the new situation. The statistics gathered from *Pouet.net* serve as one indicator of how the most popular (home) computer or operating system has systematically also become the dominant demo platform (Reunanen 2011; Stamnes 2015). Nowadays Amiga or Commodore 64 hobbyism may represent an alternative niche, but 25 years ago the same machines were at the very core of mainstream computing. Rogers' (2003) model of different stage adopters seems to fit the demoscene well: initially, a new platform is tried out by innovators, after whom influential opinion leaders, such as famous groups, pull the majority in. Some "laggards" choose to never adopt, preferring the past alternatives for the above reasons (Publication 1).

The adoption process is not necessarily one-way, as can be observed in the continuing and even increasing popularity of retro computers (e.g. Suominen 2008; Suominen, Reunanen and Remes 2015). 30-year-old machines have diverged so far from today's offerings, that comparing them feature-wise is hardly meaningful; their worth lay elsewhere than practical everyday use. In her study on modern-day TRS-80 users, Lindsay (2003) reveals some factors that resonate well with retro (also known as *old-school*) demos: simplicity, control, challenge, mastery, elite community and nostalgia (see Section 4.4; Turkle 1984, 207–13).

Not all retro is equal: in his presentation at Kultura Gier Komputerovych in 2015, Pawel Grabarzyck introduced the concept of *born retro* demos, referring to the difference between productions created at the heyday of a platform and later endeavours. For example, an intro from 2016 might look audiovisually identical to its 1986 counterpart, but was created in a completely different context, which is why the two cannot be evaluated on equal terms. On the one hand, the available tools and knowledge have improved during the 30 years, and on the other hand, the meaning of the artefact to the community is also different. Another factor is that for quite some platforms there has not ever existed an "indigenous" scene, but all the productions are actually made several years after the computer disappeared from the market.

As seen above, adoption is not necessarily ever complete and total, for active users extend the lifespan of a past computing platform far beyond its practical viability. Even the most outdated and marginal machinery survives in local contexts thanks to

the community that formed around it. In spite of the presence of a dominant platform, there is never a standstill when everyone fitting under the wide umbrella of "the scene" would use the exact same tools and computers – quite the contrary, as old gadgets refuse to die and new ones are added to the ever-growing list of target platforms.

Chapter 7

Conclusion

Apart from learning about the demoscene, looking into its history has been a cross-section of contemporary technology and media, with traces of politics, other enthusi-ast communities, and social change. When I first set out to study demos in 2006, I had rather few assumptions on the direction the work would take, but now, after more than ten years, it is evident how I have been exploring a rich case of the cultural adoption of technology all along. Constantly affected by its surroundings, yet at the same time independent and exclusive, the scene has repurposed a computational device and the associated production tools to fit its own agenda, the creation of digital works of art that adhere to its own particular standards.

Technological change, in particular, can be easily observed on the timeline, as new platforms appear and, if successful, also become the dominant player; a seemingly simple process on the surface, but much more complex on the inside. While it is easy to criticise technological determinism, the line of thought does not appear quite as alien when talking about the micro level instead of the society at large. An individual or a relatively small group of people, such as the demoscene, with negligible market potential or political impact, cannot in general affect the technological landscape, but rather only react to it. In contrast, the relationship between the cracker scene and the game industry has been much more bidirectional from the start. The alleged economic impact of warez distribution quickly led to extensive countermeasures from the industry side, not unlike graffiti artists or punks, whose deviance has been curbed in various ways by society.

New computing platforms are an external force that sparks discussion and even fighting with their mere presence. External pressures, such as the bankruptcy of Commodore in 1994 or the tightening copyright legislation of the early 1990s, act as triggers. The panic caused by police raids and the – realistic or not – prospect of being stuck with a useless computer are like a rock thrown into a quiet pond: the frogs wake up and create more splashes on their wake. To put it in other words, it is not the outsiders who directly cause sceners to change, but rather the shared reaction of the participants themselves.

Demosceners are undoubtedly a group of active and technically capable computer users, which might, on first thought, suggest that they are among the first adopters of new gadgets. Publications 1 and 4 disprove any such notions: rather than naively adopting the latest computers that would, in absolute terms, best facilitate artistic creation, there is often a considerable lag, critical evaluation and opposition before any large-scale migration takes place; technical competence can both inhibit or speed up adoption. In addition to the know-how that lets capable users make informed decisions, increased processing power goes against the long-standing principle of proving yourself and is, at least initially, incompatible with the values of the community.

Instead of appearing from somewhere, a scene rather *becomes* one after passing various phases. The most imminent example, present throughout this thesis, is the interplay between crackers and the demoscene: an initially uniform community eventually took two different directions due to both internal and external forces. At the same time, shared history, practices and distribution channels kept the two together for a number of years, and in recent years we may even observe a kind of nostalgic convergence, as cracking and crack intros have been incorporated back into the demoscene discourse. The interest is mostly of a safe historical kind, since today's online piracy does not affect the scene in any observable way; in all likelihood some connections still exist, but they are not reflected on the public discourse.

The early 1990s saw a rapid rise in the self-consciousness of the community, a significant turn in of the process of becoming. Emphasising creativity, loss of interest in cracking, coining the first scene histories and parties growing to international events of thousands of visitors were among the most notable indicators of this change. In addition to cementing its practices, many of which still remain today, the scene was building its own narratives that became a shared way of understanding the digital domain: the incapable gamer and the creative scener, lamers and elites, raunchy party reports, and heroic achievements all part of them. Based on the latest observations, it seems that at this point the community has already passed its serious and even aggressive self-definition. The current phase is rather characterised by an increasingly

relaxed atmosphere and sarcastic, self-referential takes on old clichés, suggesting the following preliminary lifecycle model:

- 1. Gravitation: individuals find like-minded others.
- 2. *Self-definition*: cementing the main practices, defining the borders.
- 3. Settling down: an active plateau.
- 4. Distancing: self-referentialism and sarcasm instead of personal involvement.
- 5. Stagnation: loss of interest, turning into a relic.

The two first phases were quick and finished by the early 1990s, after which followed a stable stream of productions, which started to fade in the early 2000s. The death of the demoscene has been predicted several times early on, and by now the narrative has already turned into a humoristic cliché itself. Back in the 1990s, the tone was not, however, as humorous: technological shifts and generation gaps were the most common reasons for stating that the end was nigh (or already there). Realistically speaking, the scene is certainly not going to disappear anytime soon, but it remains to be seen how attractive it stays in the tough competition of increasingly colourful digital culture.

In spite of the low public visibility of the scene, outsiders have also built their own narratives. The slightly funny nerds who gather for a weekend to play games and drink Coca-Cola are the actors in a storyline often seen on newspaper articles describing local parties, that renders the unknown harmless and understandable – in particularly deep contrast to the drinking, smoking and generally reckless behaviour that constitutes a major part of the scene's own accounts on the same events. The influx of American nerd imagery, no matter how alien it might be in a European context, has provided stereotypical representations that are used as an anchor here. The other common narrative, the enthusiast turned into a successful game programmer, is partially grounded on reality, but still equally incorporative, and even more positivist, as the underground years lead to a desirable outcome: joining the adult cadres as a respectable moneymaker.

7.1 Looking back

The academic contribution of the thesis can be divided into three parts as per the research questions. Firstly, questioning the simplified narrative of how the demoscene

came to be revealed a network of contributing forces that led to the divergence of cracking and demo-related activities – and how the rift was not as complete as often claimed. Such tracing of the lineage goes on to show how enthusiast communities do not simply emerge out of nowhere, but how they reinterpret their predecessors. Secondly, the cultural history of two previously little-studied artefacts, 4k and crack intros, received analytical treatment, as opposed to a merely descriptive take. Lastly, observing demosceners as consumers and adopters of technology is a new perspective that sheds light on how the unwritten ethics and attitudes of a technically sophisticated community can affect the domestication process in both negative and positive ways.

The five-stage lifecycle model presented above is my first take on the topic. It is founded on the observations made during these ten years of research, so it is likely not far detached from reality. At a minimum, the model serves as a conversation piece and a starting point for a more refined one. As the demoscene is still an ongoing phenomenon, the last stage cannot be observed; verification would be easier done by applying the schema to already disappeared communities.

The research material of the study mostly originates from mainstream Western European and Nordic sources, which is inevitably reflected on the findings as well. Other, marginal or geographically distant subscenes do not share all the same traits, and, to be on the safe side, it is also correct to question whether the Western main branch has actually been a monoculture. As for the generalizability to other similar communities – digital subcultures if you may – I am even more cautious, as they do not share similar origins and history. There is certainly some universality in the underlying human (male) behaviour, but at the same time it is easy to point out fundamental differences that undermine one-to-one comparisons. For instance, the deviance and public visibility associated with network hackers are factors of low importance when discussing the demoscene, whereas gamer communities revolving around commercial titles are, in comparison, more intimately linked to consumption.

Game studies turned out to be an unexpectedly big influence, which is hardly surprising in hindsight, since games are digital artefacts rather closely related to demos and have given rise to enthusiast communities, such as dedicated fans or modders, which could be labelled as scenes of their own. A notable portion of existing demo studies have been published in a game studies context, which is one more indicator of certain thematic overlap. The amount of research conducted on games must be at least two orders of magnitude larger than on scene-related matters, and, thus, there is a sizeable pool of studies that readily offers useful perspectives to demo scholars.

7.2 Looking ahead

Trying to fill the gaps of existing research had the effect of discovering many more relevant angles that have not been covered yet. Any analytical in-depth studies are still most welcome, as the corpus of demo-related studies is not large, but certain topics have received either little or no attention at all. Next follows some reflection on the possible research questions and approaches for future studies, which I wish to undertake later on.

In the lines of recent subcultural studies, there would be a need to consider the scene as a fuzzy rather than clearly defined community. While we can easily recognise phenomena that clearly fall inside the scene or outside of it, there are still grey areas where binaries do not apply. For instance, who *is* a scener? Apart from dedicated enthusiasts (insiders) and people who have never even heard of demos (outsiders), there are others, who are not quite either: a hangaround who visits parties but never made anything him/herself, an old cracker who has not been involved in the last 30 years, or, perhaps, a chip musician who only uses tools developed by the demoscene. As another example: when does a game become a scene game? Is it because of the venue where it was released or are its authors the deciding factor?

Apart from a few personal accounts, the process of demomaking remains largely unstudied; demo creators themselves know what is involved, but the tools, practices and attitudes are hardly ever externalised so that outsiders, too, could grasp them. In addition to standard media production tools and workflows, the scene develops its own to suit its particular needs: assemblers, paint programs, musical applications, executable compressors, and converters for a myriad of file formats are among the most common examples of in-scene tools (see the *Pouet.net* collection of "demotools"). Various productions ranging from diskmags to 256 byte intros are little known outside the scene, owing to most publications' heavy focus on full-size demos only. Studying demos as software would come with the added benefit of linking them to the *software studies* paradigm, which has recently been gaining momentum in the humanities.

The formative years of the cracking scene warrant further attention, as they are the least documented period of scene activity. The defining practices, such as international networking and copy protection removal, are known on a general level, but the details are still missing. One potential approach would be to follow the path of a game starting from the original creators to the hands of the cracker, network of swappers, and, eventually, to a non-knowledgeable "end user" enjoying the game in a living room somewhere. Some feasible perspectives would be to consider the meanings,

legal status and worth the item in question accumulates or loses on each leg of its journey.

A critical and even revisionist take could be achieved by observing the connections between the scene and business. Apart from the well-known and even overemphasised career path leading to the game or other ICT industry, there are other, less visible links: commercial demos created for companies, demo party economics, and the interplay between the music industry and the scene, just to name a few. In this thesis I have studied the effects of the ever-changing computer market, but it is only one of the multiple commercial actors that affect the demoscene at least indirectly, as the community does not exist in a vacuum.

After stressing multiple times how there are local, often platform-specific subscenes scattered around Europe, it appears natural that they receive specific attention as well. Such studies are, arguably, best conducted by local researchers, due to their understanding of the context and, as a very practical reason, the language. It is not easy to talk even about the Western and Northern European scenes as a uniform whole, and even less so when taking into account the other side of the Iron Curtain, where access to affordable computing was not given, and where media consumption was notably different at least until the 1990s. Examples of local scene histories have started emerging relatively recently, and there is certainly room for more, as they paint a completely different picture of the events and remind us to avoid unfounded generalisations about computer culture.

As a researcher, I recognise the value of unearthing facts, discovering patterns, and generally making the academic world more aware of demos and the demoscene, but as a participant I am still undecided: what good is research to the community itself? Describing an ongoing phenomenon runs the risk of freezing it in time and canonising something that is only one of many possible interpretations. As a positive prospect, a study like this can offer possibilities for self-reflection by placing one's own recollections into a wider historical frame. I expect – and invite – the scene to be a critical audience for this thesis, knowing others have experienced the events quite differently. *That's not how it went!*

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Enclosed Publications

The following five articles constitute the main body of this thesis. Their contents and my personal contributions are outlined in Section 1.5. Articles 1 and 4 reprinted with permission from Springer.

- Reunanen, Markku, and Antti Silvast. 2009. "Demoscene Platforms: A Case Study on the Adoption of Home Computers." In *History of Nordic Computing* edited by John Impagliazzo, Timo Järvi, and Petri Paju, 289–301. Berlin: Springer.
- 2. Reunanen, Markku. 2013. "Four Kilobyte Art." *WiderScreen* 2–3/2013. http://widerscreen.fi/numerot/2014-1-2/four-kilobyte-art/.
- Reunanen, Markku. 2014. "How Those Crackers Became Us Demosceners." WiderScreen 1–2/2014. http://widerscreen.fi/numerot/2014-1-2/crackers-became-us-demosceners/.
- 4. Silvast, Antti, and Markku Reunanen. 2014. "Multiple Users, Diverse Users: Appropriation of the Personal Computer by Demoscene Hackers." In *Hacking Europe: From Computer Cultures to Demoscenes*, edited by Gerard Alberts, and Ruth Oldenziel, 151–63. Berlin: Springer.
- 5. Reunanen, Markku, Patryk Wasiak, and Daniel Botz. 2015. "Crack Intros: Piracy, Creativity, and Communication." *International Journal of Communication* 9:798–817. http://ijoc.org/index.php/ijoc/article/view/3731/1345.

Demoscene Platforms: A Case Study on the Adoption of Home Computers

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Abstract. This paper discusses the adoption of new technology by a hobbyist community known as the demoscene. The demoscene is chiefly a European community that originates from the mid-1980s and continues to exist even today. During its twenty years of existence, the demoscene has had to react to several changes in the field of information technology, in particular new hardware and software platforms. Based on the contemporary communication found in disk magazines and Internet forums we present case examples of the transitions and analyze the adoption processes. At large, the observations made serve as examples of the rich and unexpected ways in which the home computers were domesticated since the early 1980s.

Keywords: Demoscene, Computer hobbyists, Diffusion of innovations, Multimedia.

1 Introduction

The demoscene is a community that creates digital art with home computers. It has its roots in the late 1970s home computer revolution and software piracy. The demoscene—or just *the scene*—has traditionally been a male-dominant hobby, popular in Europe and especially in the Nordic countries. The aim of this study is to provide the reader an overview of the community and its relationship with the ever-changing world of computing. Ultimately, the demoscene and its practices serve as examples of the rich and unexpected ways of living with computers, never anticipated by the original manufacturers.

Any new technology needs to fit into already existing relationships and practices. In the context of the demoscene, a typical example of this would be a new computer like a Commodore 64 or Amiga or PC appearing in the market. By studying how the demosceners react to new platforms, we aim to show that new computers do not get judged only by technical features or market price. Rather, the reaction to new computers has to do with inclusion: it is important for the sceners to estimate which material objects and persons can belong to the scene and which cannot.

The demoscenes' communication has not been studied from this perspective before. On a different level, our study aims to describe a self-reflective community of technology users. We claim that communities of computer users are actively debating about those social relationships, practices, and technologies that account for the community itself.

2 Starting Points for the Study

To understand the demoscene and its development it is necessary to place it in a historical context. The contemporary technology and its possibilities are fundamental for such a culture. However, they alone do not explain why an international community of demo groups would emerge in the late 1980s. In the following, we present the reader a historical overview of the era and position our work in the context of demo research conducted by other researchers.

2.1 Historical Frame

The home computer revolution of the late 1970s and the early 1980s was a necessary precondition for the birth of the demoscene. Affordable computers appeared in stores and for the first time in history were available to the masses. This commercial and technological development was not enough in itself—there had to be a need and interest to buy one. The early attitudes towards computers were often controversial: advertisements and governmental plans typically emphasized educational values, whereas in reality gaming was the most popular use from the very beginning [18]. The loose attitudes towards copyrights lead to an extensive software piracy, which in turn lead to the birth of the *pirate scene* with its *crack intros*, later evolving to computer demos [14, 17]. *Cracking* in this context refers to the removal of copy protections of commercial software.

The first popular home computers such as Sinclair Spectrum and Commodore VIC-20 did not yet feature extensive sound or graphics capabilities. The low amount of memory was also a limiting factor. The first demoscene computer was Commodore 64, introduced in 1982, featuring advanced graphics and sound for its time. Its popularity was not shadowed until the late 1980s. For example, in Finland C64 was advertised as "Tasavallan tietokone"—"The Computer of the Republic" [18]. The other 8-bit computers of the era such as MSX and Amstrad CPC sold well in certain countries but did not attract the early demosceners in great numbers, presumably due to their lesser popularity and a weaker pirate scene.

The following important model of Commodore computers was Amiga 1000 introduced in 1985, followed by Amiga 500 (1987), which was a more compact and affordable model suitable for home users [1]. From the home computer perspective, the major competitor was Atari ST, released in 1985, which was able to sustain a modest demoscene of its own. Commodore retained its position amongst the hobbyists with its Amiga line of computers until the early nineties. By that time, the border between home and business computers had mostly faded away. IBM PC compatibles started appearing at homes and after the Commodore bankruptcy in 1994 [1] there was little commercial competition left. We examine the effects of these changes on the demo hobbyists in further detail in Section 4.

2.2 Related Work and Criticism

As we have overviewed in our online demoscene research bibliography [15], media researchers, sociologists, and cultural historians have already shown some interest in the demoscene. For the purpose of this article, we separate these studies to two domains. The first way of researching the scene has been to view it as artistic activity,

which makes it the subject of art research. "Demoscene culture", in this use, is likened to other artforms, or it is even elevated to an artform of its own. This has meant looking at the demoscene as "art of the real-time" [20, 14], as a form of musical hobby [12] or as an emerging digital art form [19]. There is also a second way to measure the culture in the demoscene: as a particular way of life. This perspective relates to sociology, cultural studies, and cultural history. The researchers have discussed demoscene as youth culture or counter culture [17], multimedia hacker culture [6] or as a gendered community [9].

We admit that these studies have opened up demoscene for discussions in the mentioned research domains. In doing this, they have however taken a very abstract and often an outsider perspective to the scene. Another major pitfall of these studies has been the tendency to write "the history of the winners", often based on anecdotal evidence. Narrowing the research to famous groups and competition winners leads to a biased view of the phenomenon, since the majority of members and artifacts of the scene fall outside this winners' category. Overall, we feel that the real live action of being in the scene has been neglected thus far. In this article, we stress that the demoscene is always something active; as community, it is a collection of social relationships, practices and technologies [10], whose composition must be discussed by the members in order to keep it afloat.

3 Material and Methods

There is a wide variety of artifacts produced in the context of the demoscene. Examples of these are *demos*, *intros* (small demos), *disk magazines*, text files, pictures and tunes, which have already been studied [17, 20]. Additionally the communication between the scene members produces messages in modem-based bulletin board systems (BBS), newsgroups, disk magazines and message boards. The demoscene artifacts too convey meanings, but to understand the cultural values and reasons for phenomena it is reasonable to choose communication, because in it the active construction of common meanings is made more explicit. Various Internet archives such as demo sites proved to be a valuable source for the desired material—gathering the same information fifteen years ago would have required a great deal more time and an extensive network of contacts in the community.

The skipping of material on Atari ST, MSX, Sinclair Spectrum and other small scenes was a conscious choice. Firstly, the three most active platforms (Commodore 64, Amiga, and PC) and their changes are easier to study due to the good availability of source material. The material also represents a wider population. Secondly, since our focus is on transitions and reactions instead of the particular properties of the different scenes the actual selection of platforms is fairly insignificant.

3.1 Disk Magazines

Disk magazines—or *diskmags* for short—are interactive electronic magazines, which were originally distributed on diskettes in copy parties. The structure of a diskmag roughly mimics the structure of an ordinary magazine or a newspaper: there is an editorial, news, rumors, advertisements, interviews, and articles on topics that interest the readers. *Charts* are an important part of diskmags. In the charts, the most popular

groups, coders, swappers, musicians, graphics artists ("graphicans") and demos are ranked either by voting or according to the editor's personal preferences.

Several properties of diskmags make them a valuable source for researchers. Sceners write them to sceners, meaning the topics reflect the interests of the community. For the same reason the opinions stated are typically not tuned down to please the outsiders. The articles are also contemporary, providing a peek to the phenomena of the time not colored by nostalgia, which would be the case if we interviewed the writers today. The rumors and speculation in diskmags are especially useful for tracing contemporary understanding and debates. Those seeking for historical facts should however note that the mags' factual content is not very reliable, because it is characterized by differing interpretations and competition of groups and cliques.

For this study we chose four diskmags as the main sources of information. The large amount of diskmags made the selection a difficult one but based on the opinions of hobbyist sources, we picked Sex'n'Crime (Commodore 64), Zine (Amiga), R.A.W. (Amiga), and Imphobia (PC). The 45 issues analyzed cover the period from 1989 to 1996. In the 1980s there were earlier disk mags as well but the period covered by Sex'n'Crime (1989–1990) is of particular interest because of the Commodore 64–Amiga migration. At the other end of the span, mid-nineties, the diskmags started to lose their status as a communication channel because of the Internet.

3.2 Supporting Material

Since the mid-1990s, the scene has increasingly started to use the Internet for the exchange of thoughts. Already in 1993, there was an article about the net in the Imphobia diskmag. To support and contrast the observations made from the diskmags, we used the ample archives of Usenet newsgroups *alt.sys.amiga.demos* and *comp.sys.ibm.pc.demos* as supporting material. Especially the latter newsgroup was highly active up until 2002: according to Google Groups, there were over 10,000 messages yearly during the most active period [2]. Reading and analyzing all the messages would have been a colossal task so we chose to limit the scope to relevant topics dealing with the adoption of new technologies.

Two additional resources used were competition results from the four biggest yearly *parties* (scener meetings) and *pouet.net*, a popular demoscene website. In contrast to the qualitative data of diskmags and newsgroups, the data obtained from competition results was quantitative by nature. The parties chosen were Assembly (Finland), The Party (Denmark), The Gathering (Norway) and Mekka & Symposium (Germany), during the period 1992–2002. Before 1992 the parties were smaller in scale and organized more often, according to Polgar [14] and the reports found in the Sex'n'Crime diskmag. The sample obtained from the party results consisted of 2094 productions.

3.3 Methods

Our observation of the text articles and discussions was based on distinctions and associations. We observed the construction of oppositions: what kinds of practices belong to the scene and which outside the scene? What associates with "elite" sceners (*i.e.* valuable), what with "lame" uses and users of computers (*i.e.* not valuable)? What marks the boundaries of the scene use and other use of computers?

When dealing with the quantitative data of the party results and productions the goal was to facilitate visual interpretation. Five variables were chosen: amount of Commodore 64 demos, Amiga demos, Amiga intros, PC demos and PC intros each year. We obtained the totals by summing the quantities from each party. Unfortunately, the limitations of the data set reduce the accuracy of the result. Firstly, the competitions in some Assembly parties were limited to only 15 entries because of a preselection. Secondly, Mekka & Symposium party appeared only in 1996 so its contribution is not present in the earlier totals. The latter weakness is somewhat countered by the effect of Mekka & Symposium growing from a small party at the expense of The Gathering and The Party.

4 The Major Transitions

The notion of a *major transition* here refers to a significant development in the information technology industry and the reactions of the demoscene to it. This section is divided according to the dominant platform of the era. It should be noted that this division is merely a simplification of the actual events: the different eras are overlapping and greatly more complex and detailed than what the threefold model would suggest.

In his book on the diffusion of innovations Rogers presents five distinctive groups of adopters: innovators, early adopters, early majority, late majority, and laggards [16]. Our observations of the transitions of the demoscene revealed a similar pattern: innovators try out a new platform early on but the demos they make are mere curiosities at that time. Influential persons and groups—early adopters—migrating to the new platform eventually start dragging the early majority with them. The late majority adapts because of practical reasons and only the laggards remain opposed to the transition. The retro movement has its point of reference in the past. In the demoscene circles, the phenomenon is now called "oldschool" or "oldskool" (also used by Tasajärvi et al. [20] to refer to the first era of the scene).

4.1 Commodore 64

Our most important source, Sex'n'Crime, was a Commodore 64 diskmag published by the group Amok during 1989–1990. The first impression the reader gets from Sex'n'Crime is that the Commodore 64 cracker/demo scene of the late 1980s was a hostile environment. Numerous accusations, rumors, and news about wars between groups appear practically in every issue of the diskmag. The rhetorical style found in the articles is emotionally loaded (both positive and negative) and occasionally downright harsh. As an example of the style, in Sex'n'Crime #21 (1990) *OMG/Amok* responded to a letter to the editor like this:

"Dear Roy of Dynamics, let me say this from the bottom of my heart: you are lame!"

The ranking of individuals and groups in the charts was a controversial subject, sparking heated discussion in the following issues. In some letters and interviews, you can sense dissatisfaction with the ongoing wars and unfriendliness but overall these opinions did not constitute a significant part of the discourse. The distinction

between the legal and the illegal activities was vague: cracked games, police raids, pirate software swapping and legal demos still went hand in hand in 1990. Gruetz-macher provides a slightly different interpretation [4], claiming that the illegal and legal scene activities slowly drifted apart in the late 1980s.

The emergence of the Amiga line of computers in the mid-eighties naturally received attention from the Commodore 64 sceners. This was the first technological transition the young scene had to face. Surprisingly—in comparison to other changes documented in the following subsections—the reactions expressed in Sex'n'Crime were chiefly positive or neutral. Polgar, however, reports that there was opposition as well [14]. In the news section of Sex'n'Crime the gradual transition becomes apparent during 1989–1990 (news of people "going" to Amiga) but it was not portrayed negatively, while the style of the diskmag otherwise was controversial. An important factor was that while new, the Amiga was still a product of the same company as the familiar Commodore 64.

4.2 Commodore Amiga

Amiga 500 was the second major hardware platform of the demoscene, following the success of the Commodore 64. Similar to Commodore 64, Amiga started as a uniform platform where the software would run the same on all setups. However, later the newer models such as the Amiga 1200, released in 1992 with its new AGA (Advanced Graphics Architecture) chipset and faster processor fragmented the platform. Starting from 1992 both the R.A.W. diskmag and the *alt.sys.amiga.demos* newsgroup contain a multitude of messages about the incompatibility problems related to the new chipset—a new challenge that was there to stay. Another source of problems was the difference between the PAL and NTSC Amigas, which hindered the exchange of demos between Europe and the United States.

There are notable differences between the two diskmags analyzed: Zine, published from 1989 to 1991 was still extensively connected to the cracker tradition, whereas R.A.W. (1991–1996) was chiefly demoscene-oriented and more refined in its appearance. The historical connection between the two communities remained at least through swapper activities. As an example of this interplay, the contact section of R.A.W. #5 (1993) still featured numerous advertisements for illegal swapping.

The first major transition faced by the Amiga sceners was the AGA in 1992 and the following two years. Incompatibility of software was only one facet of the transition. The opinions found in R.A.W. and the newsgroup varied from excitement to extreme resistance. The positive arguments were based on the new possibilities offered by the new hardware, whereas the opposition claimed that there was no challenge in doing demos on such powerful computers. Another argument used was the high price of the new machines, which placed them out of reach of many users and even lead to a supposed split of the scene. *Rufferto/Covert Action Team* summed up the views of the opposition in R.A.W. #6 (1993):

"OK, you'll be able to do much better and faster routines, but everybody knows, that you're not one of the best coders then, you just have got one of the best Amigas!"

In hindsight the real threat to the Amiga was neither the AGA nor the accelerator boards but the IBM PC. First in 1993 and increasingly thereafter the community members expressed concern of the future of their platform—earlier the status of the Amiga scene had been so strong that people would look down upon any rivals. In the heated newsgroup posts and diskmag articles there were numerous arguments for and against PCs. Interestingly even in the Amiga forums you could find favourable mentions of the PC, while the consensus was against the transition. A platform war kept raging in diskmags and newsgroups (including *comp.sys.ibm.pc.demos*). Some of the most common, often contradictory, arguments for and against the new platform were:

- o Amiga demos are better designed and programmed.
- o PC hardware is not uniform.
- o Windows/MS-DOS sucks, Amiga has a better operating system.
- o PC owners are followers of big companies.
- Amiga has coprocessors for sound and graphics—either a positive or negative feature.
- o PC has more computing power / PC has too much computing power.
- o PC/Amiga owners just play games—used by both sides.
- o PC is more suitable for texture mapping.
- o PC has better graphics modes because of SVGA (Super VGA display cards).
- o Developers are leaving the Amiga, PC has more software.

Polgar [14] and Saarikoski [17] provided further discussion of the Amiga–PC clash. In addition, Saarikoski's remarks on the Finnish "machine wars" of the 1980s provide some means for understanding the juxtaposition [18].

4.3 IBM PC

The demoscene that formed on the IBM PC and compatible machines since the early 1990s cannot be treated as one single scene only. During its seventeen years, the PC demoscene has faced changes that can be compared to complete platform transitions.

Imphobia was an influential diskmag published in 1992–1996. The development of the magazine closely resembles the course of Zine and R.A.W. on Amiga: the early crude magazine evolved into a well-edited and impressive publication. In the early issues until 1993 references to software piracy could be found but after that the focus of the diskmag soon changed to the legal demoscene. The underdog status of the PC scene in comparison to Amiga was generally recognized and dealt with in varying manners: either by acknowledging the situation or by coming up with emotional or rational counterarguments. An interesting finding is that since Commodore 64 was not considered a threat any more, the writers considered it either outdated or— increasingly by time— held the coders in high regard for pushing the old computer beyond its limits.

A controversial theme occurring frequently in our source material was the increasing computational capacity of the PC. While some regarded it as an opportunity to make better demos there were opposing voices too, complaining that the 486 or Pentium did not require any skills from the programmer. These discussions started in Imphobia and *comp.sys.ibm.pc.demos* in 1993 and continued until at least 1995. Another, fiercer hardware-related disagreement concerning sound card support took

place in 1994–1996. This time the controversy was about demos that only supported Gravis Ultrasound, which had gained a strong following among the PC sceners.

A new kind of transition started in 1995 (first mentioned in the newsgroup already in 1994) with the introduction of Windows 95. Until then Windows had been running on top of MS-DOS, the predominant operating system of the PC scene. This shift was technically different to the previous ones since it was about software, not hardware. The future of MS-DOS looked uncertain, which called for a reaction from the community. The response was highly emotional and at first mostly negative. We must specifically mention one of the many arguments used in the discussions: the emergence of Windows 95 would mean an end to direct hardware access, which had been a principal technique used in demos from the earliest days in order to achieve the best possible performance. Losing this control over the machine did not suit the existing practices. During 1995–1998, the *status quo* did not yet change, with most demos still released for the accepted MS-DOS platform. Several options such as OS/2, Linux and even an own operating system "DemOS" were considered but eventually the PC scene followed the industry and mostly migrated to Windows towards the end of the 1990s.

4.4 Chronology of the Transitions

The qualitative results gained from diskmags and newsgroups presented in the subsections above illustrate the mechanisms and characteristics of transitions. The weakness of such analysis is that we cannot perceive the magnitude and speed of migrations. To illustrate the chronology of events we plotted the data collected from the party results of 1992–2002 in time/productions coordinate system for visual inspection (Figure 1).

Productions at major parties

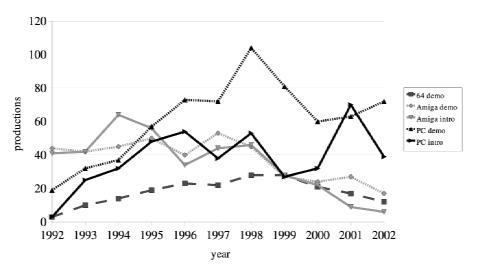


Fig. 1. Party productions by year

Certain properties clearly stand out from the diagram and support the previous observations: until 1995, the PC scene was less productive than the Amiga scene; after 1996 the positions changed permanently. The drop after the peak year 1998 coincides with the Windows migration, presumably indicating the challenges involved in such transition. The decay of Amiga productions starts in 1998 and the trend continues during the following four years. Perhaps the most surprising observation is the Commodore 64 renaissance of the late 1990s. We can explain this phenomenon by the increase of Commodore 64 sceners attending the big mainstream parties, the decay of illegal activities, and the introduction of suitable competition categories in the parties. Additionally, such activity on an almost 20-year old machine reveals the strength of the retro/oldschool attitudes among the demoscene.

5 Practices and Distinctions

The demoscene reacts to large transitions through its own practices and its interpersonal relationships. The mechanisms both limit and enable the adaptation of new platforms. The same limitations and strengths apply when demoscene has to confront larger issues than the scene itself. Similarly, Rogers notes that the structure of a community can facilitate or impede the diffusion of innovations in a system [16].

5.1 Skills

As Turo-Kimmo Lehtonen [10] points out, the existing attachments between users and their technologies always both limit and enable new technologies. In the demoscene, an important form of attachment are the skills of a scener. Similar appreciation of skills is apparent in other male-dominated hobbyist communities as well [21, 11, 5]. Technical features of a new platform do not automatically lead to success. Quite the contrary, too efficient a computer can undermine the skills needed to make demos. "I don't like lamers who require a hyper-fast PC to do little things like 24 faces glenz" (Imphobia #7, 1993), a commentator notes of the PC. "I think using AGA just shows that you are incompetent to do really innovative things on normal machines" (R.A.W. #6, 1993), another comments on the AGA technology on Amiga. However, this relation can also turn upside down: once the new computer starts to enable scene skills, it can be "a waste of talent" to stay with the old computer like the Amiga (*Tsunami/VD* in R.A.W. #9, 1995).

The same applies to using new "too easy" tools, even with existing computers. The use of so-called *demo-makers*, tools that require little or no programming skills, was routinely frowned upon according to our data. Also certain interpreters like AMOS, a form of the BASIC programming language, were seen as not belonging in the scene: "We'll see a whole bunch of AMOS coders, but they hardly fit in our scene, do they?" (R.A.W. #3, 1992). Nevertheless one could accept "easy" tools in the future, once they start to better enable scene skills. The role of the Flash scripting language for making demos is a topical debate on this.

Sceners often describe bad skills as something of a child's play. Since people frequently refer to demosceners as kids in the media [3], this distinction carries some irony. According to one diskmag, bad demos look like a drawing competition at a

kindergarten (R.A.W. #6, 1993). Another Amiga owner mentions that he would never buy a PC, "because this is indeed a computer for only playing, little children and for hardworking businessmen" (R.A.W. #3, 1992). Therefore, the demoscene skills are not child's play, but they are not hard business either.

The most severe sign of no skills is ripping other demos' source code, graphics or music. The following newsgroup posting by *Lancelot/Aggression* in 1993 notes:

"ANYONE WHO COPIES PICTURES IS A LAMER!!! As a gfx-artist I am very well aware of how difficult it is to make a good picture. The reason why paintings are copied is that IT IS SO MUCH EASIER."

This frowning upon ripping is not a question of artist's copyright—with the demoscene's extensive cracking past, that would not be very believable. Rather, ripping is not a scene practice because it is too easy. The writer positions himself inside the scene: he is an artist and knows how difficult it is to make something that requires skills.

5.2 Elites vs. Lamers

The discussions we observed show that sceners put great efforts to define what they are not. This is marked by the distinction between "elites" and "lamers". Comparably, the early MIT hackers of the 1960s divided users to "winners" and "losers" [11]. The dictionary definition of "elite" points to the ambivalence of the concept. In common use, elite is a group of people considered best in particular society. However, in its original use in the late 18th century, elite was a noun of process: it meant "selection" or "choice". Similarly, in our data, many argue that it should go without saying what describes elite and lame. Nevertheless, the sceners still constantly debate this description. There seems indeed to be an active selection and choice of whom and what deserves to be elite, and even on what counts as a satisfactory test for that (see also Kline & Pinch [8]).

The lamer has certain motivations, skills, and qualities. Firstly, the lamer is motivated by aims to be something that is not his essence. He would like to be famous or is trying to be better than he is. According to one account,

"The most typical lamer type is the guy in a group nobody knows because he has no contacts, moreover no coders, musicians, gfx... But this kind of lamers would like to be famous. But he isn't because he can't do anything." (Zine #02, 1989)

The same account already points to lamer's skills, which we also covered in subsection 5.1. The lamer "can't do anything (related to the scene)". Other accounts mention that the lamers are constantly asking for advice on coding routines. Even more severe forms of lame skills are the buying or ripping of content made by other groups. Finally, lame qualities include having, aside little contacts, little ideas and personality: "it (lameness) is your personality or better the missing of it" (Imphobia #3, 1992). With all these connotations, it was a powerful metaphor to call a new computer lame.

In our data, there is much more emphasis on defining lamers than on defining elites. There are many entire diskmag articles devoted to the motivations, skills and qualities of a lamer, none for the elites. This may reveal that the scene does not need

to observe in detail the normal conditions. Rather, it needs to keep an eye on everything around the scene: all those changes that appear abnormal and even threatening to the scene's existence. For this purpose, the elites need the category of "the others", the lamers. As *Domino/TRSI* puts it in R.A.W. #06 (1993), "What's the point in being elite if there are no lamers?"

5.3 Confronting a Changing World

We have underlined that demosceners have an active and self-reflective relation to new computers. They often consult other sceners and try to determine whether a new computer counts as viable for making demos. Similar patterns are apparent for example in studies by Lehtonen [10] and Rogers [16]. Most sceners are not enthusiastic early adopters of new technology, but want to use computers for certain ends instead. This means defining whether the computer in question is elite or lame and whether it enables scene skills to flourish. The sceners in our source material strived to create and maintain a critical distance to the new computers. The users were thus retaining a degree of control over technological change [10].

However, the degree of control over change was not high. The technological sphere still has an autonomy of its own. Similarly to the average consumers [10], the sceners were simply subjected to the arrival of Amigas and PCs—the scene could mediate the arrival, but not prevent it. Consequently, in our data, the sceners always eventually adopted the newest computers and technologies. In addition, while arguing about computers on more general level, the sceners often chose the same language as their environment: the language of the markets and companies. In a diskmag entry, "the death of Amiga" was said to result in "the stupid PCs and the videogames in charge of the computer and entertainment scene" (R.A.W. #3, 1992). One commentator even claimed that Microsoft was "The innovative engine of the entire software industry. Does Microsoft support the Amiga? Microsoft supports any machine worth supporting" (R.A.W. #8, 1995).

As we observed in subsection 5.1, the scene activities are sometimes contrasted to "hard business". However, the sceners can still use the arguments of markets for their own purposes. This inconsistent relationship with business describes the scene in relation to technological change. Internally, the scene can observe anything according to its own binary oppositions between *elite* and *lame* and *skillful* and *non-skillful*. Nevertheless, it cannot change the much larger spheres like the global markets of computers and the mass media. If the sceners want to discuss computer business, they can do nothing but communicate accordingly.

6 Conclusion

The transitions we have described illustrate the role of active communication in the domestication of home computers from the late 1980s to the late 1990s. People will reject a new platform at first if it does not fit the current community practices, no matter how technically advanced it is. One might expect that technically proficient and active people such as the demoscene members would be among the innovators or early adopters of new technology, but our study disproves such assumptions. The adaptation of community practices in the case of demoscene takes considerable time and largely follows the same pattern as any diffusion process.

What appears in the mass media as harmless adolescents making audiovisual presentations hides an elaborate system of interpersonal relationships and practices. Thus portraying this complex community as a mere monoculture of nerds or a preschool for IT business [7] is an oversimplification. The conflicts both inside the scene and with the outside world may rather rudely affect the persons involved, because they are so deeply involved with the system. The emotional tone of the discussions also reveals the intimacy of computer as an object.

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Four Kilobyte Art

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Abstract

The so-called 4k intros are real-time audiovisual presentations that fit in four kilobytes. They have mostly been created by the demoscene, a technically-oriented community that emerged in the mid-1980s. In this article I study the history and cultural importance of 4k

intros as a marginal form of digital art.

Keywords: 4k intros, algorithmic art, demoscene, programming

Introduction

Two to the power of twelve, 4096 bytes, is a tiny amount of data: approximately as much as a row of pixels on a computer screen or a page of text. These days, when applications and media files consume gigabytes of disk space, it might be hard to think that one could fit something

meaningful in just four kilobytes, or that there would even be a need for such compression.

4k intros, real-time audiovisual presentations created by the demoscene, a community formed in

the mid-1980s, could be called miniatures of the digital age. In this article I discuss them, on the

one hand, as cultural-historical artifacts that reflect the changes of the technological landscape

and the demo culture itself and, on the other hand, as creative works of art that have let their

authors exhibit their wizardry to others. In addition to a historical overview, I will focus on various tools and approaches that have been used to tackle the challenge of four kilobytes. Most

of the discussion will revolve around intros created for IBM PC compatible computers due to

their popularity, and because they illustrate the development of computing power and the graphical capabilities of mainstream computers starting from the early 1990s in the best way.

By definition, a 4k intro is an executable file that is at most 4096 bytes in length, including all the code, graphics and audio needed. In spite of their minuscule size, the best 4k intros are remarkably advanced, featuring several visual effects and music that sounds larger than its size, combined into a tightly synchronized audiovisual presentation (see Fig. 1). Two essential keywords that define the content are *generativity* and *compression*: both the graphics and sound are generated algorithmically and, in addition, the size of the code is optimized with special purpose-built tools.

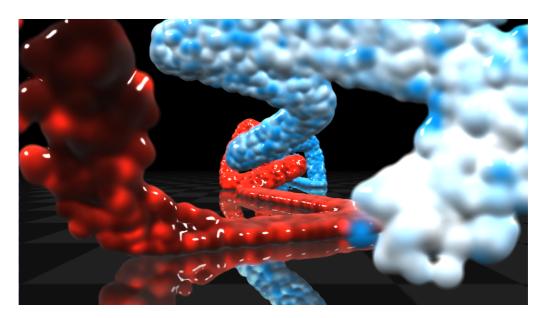


Figure 1. "Nucleophile" by Portal Process and TCB (2008).

Full-blown demos have grown in size year by year, whereas tiny intros have rather taken an opposite direction. Traditional 40k and 64k intros have been followed by 4k and even smaller categories, such as 1k intros, where all the content must fit in 1024 bytes. Even smaller powers of two are common: at *Pouet.net* (http://www.pouet.net/), a popular demoscene site, there are also categories for 512, 256, 128, 64, and finally 32 byte intros. These extremely small productions typically feature only one seemingly impossible visual effect that has been

painstakingly hand-optimized byte by byte. These clearly defined categories also highlight how important it is for the demoscene to classify its works. (Reunanen 2010, 52–57.)

All in all, computer demos are a marginal research topic and, judging by the existing publications, 4k intros are in the margin of the margin. As an example, the two largest demoscene books, *Freax* (Polgar 2005) and *Kunst, Code und Maschine* (Botz 2011) hardly mention the topic at all. In my own licentiate thesis (Reunanen 2010, 52–57) there are a few pages dedicated to size-limited intros, but in general there is little research on the intros. One of the most interesting texts published on the topic is the interview of Sebastian "Minas" Gerlach, published in the *SCEEN* magazine, where the author of several high-ranking 4k intros describes his working methods (SCEEN #2 2007, 72–75). In addition to *Pouet.net*, important source material was found in *IN4K* (http://in4k.northerndragons.ca/), a collection of tools and tips for 4k intro programmers.

My personal connection to 4k intro programming dates back to 2003–2005, when I created three intros with Antti Silvast. The first of them, *Yellow Rose of Texas* (2003), clearly required the most hours, whereas the following two, *Je Regrette* (2004) and *Make It 4k* (2005), were experiments built on the already existing foundation. All three were first released for Linux, after which they were ported to other hardware and software platforms. Some of the ports were made by other enthusiasts in the spirit of open source software. These projects provided me with plenty of hands-on experience on the numerous challenges that limited size poses to audiovisual programming and the tools used.

4k Intros Then and Now

Modest technical features, such as minimal processing power and memory, of the 1960s and 1970s computers severely limited the means available to early computer artists and, therefore, digital art of the time is marked by minimalism. In addition to technical reasons, such minimalism was also a conscious choice: according to new media theorist Lev Manovich, the roots of the esthetic can be traced back to the modernism of the late 19th and early 20th century, which steered all visual arts into a minimalist direction. The first overview of the emerging art form, *Computer Graphics – Computer Art*, was written by Herbert W. Franke (1971). The

pioneering works by artists such as Charles Csuri and John Whitney appear, in spite of their age, somehow familiar when compared to 4k intros; mathematically generated graphics and limited resources produced a similar esthetic 25 years later (cf. Saarikoski 2011).

For today's tiny intro programmer the size limit is a completely arbitrary rule set by the community, but similar constraints found in early video game consoles and home computers were due to their technical features. In their book *Racing the Beam* Nick Montfort and Ian Bogost mention familiar figures about the Atari VCS game console: the 6507 CPU could address only eight kilobytes of memory, many games fit in two kilobytes and the maximum size of a standard cartridge was four kilobytes (Montfort & Bogost 2009, 25–26). Just like with tiny intros, we are dealing with powers of two. In addition to their mathematical properties, such numbers are also a way of understanding the complex internal workings of the computer, which leads to repeating them even in contexts where there are few technical reasons for their use.

The demoscene was preceded by a few years by the cracker scene, which was first characterized by so-called crack screens, static images placed in pirated games. Later on, in the mid-1980s, the screens developed into flashy crack intros. An intro, shown before the actual game started, could be described as a business card of the group that had removed the copy protection and distributed the game. Crack intros served multiple social purposes, such as increasing the status of the group, as well as forming and maintaining the social networks of software pirates. (Polgar 2005, 40–70; Reunanen 2010, 22–23.) Limited storage and memory led, again, to a certain minimalism. In addition, cracked games were compressed in order to save precious disk space (Wasiak 2012). Another example of tiny executables is the so-called BBS intros, ads that were circulated in Bulletin Board Systems (Reunanen 2010, 52). Based on this, I argue that size optimization has been at the very core of the demoscene right from the beginning.

According to *Pouet.net*, the first actual 4k intros were created in the early 1990s. At STNICC, an Atari ST hobbyist meeting held in 1990, there was a 3.5 kilobyte programming competition with a nostalgic title "VIC Times Revisited" (A Commodore VIC-20 reports 3583 bytes of free memory after starting up). Some of the works were games and some intros, which reveals how the practices had not yet settled at that time. One of the participants was British Jeff Minter, better known for his unique llama and camel games. After the STNICC, the category was

practically forgotten for a few years before it became part of competitions (*compos*) held at demo parties.

4k intros turned from a casual curiosity into a relevant competition largely because of Assembly'94, one of the biggest demo parties of the time. Already at the Bush Party of the same year there had been a 4k compo, but Assembly brought intros to the limelight. As was typical of the era, the competitions were split by the platform and, therefore, the category was called "PC 4k". In the results (*Assembly 94 results*, pouet.net) there are only eleven intros, but there were other participants whose works did not make it past the jury. *Stoned* by the German group Dust came out as the winner. The intro features typical demo effects of the time, such as an image rotator, a tunnel and a Mandelbrot fractal, which was often seen in contemporary music videos, too (Fig. 2). The following year the rest of the big parties, The Gathering and The Party, included 4k intros among their competitions, and they became a permanent part of the demoscene canon.

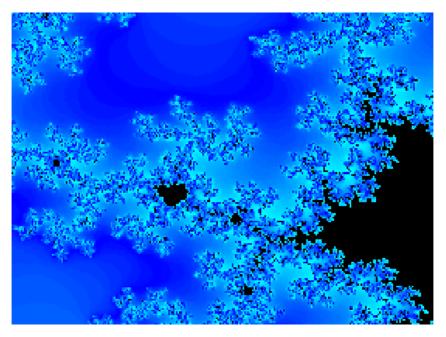


Figure 2. "Stoned" by Dust (1994).

The ever-changing computer market and technological development affect 4k intros, but with a certain delay, since the demoscene does not adopt new technology instantly without criticism.

Reunanen and Silvast (2009) discuss the topic in depth and mention a critical attitude toward mainstream computing and the purported ease brought by new computers as two reasons for the change resistance. Based on the competition results archived at *Pouet.net*, the gradual decay of the Amiga led to the dominance of MS-DOS based intros at big parties toward the end of the 1990s. Separate Amiga and PC competitions were combined into one. At the same time, 4k intros were adopted by retro computer scenes and started appearing for the Commodore 64 and the ZX Spectrum. There had been plenty of small intros for both even earlier, but not as a clearly-defined category.

One of the most fundamental paradigm shifts in the history of the demoscene is the transition from low-level "hardware banging" to system-friendly programming around the beginning of the millennium, fueled by the popularity of Microsoft Windows that did not allow for direct hardware access anymore. The shift was by no means painless and it required several years of accommodation. One important factor was the rise of affordable 3D accelerator cards, since their interesting features could only be used through the programming interfaces provided by new operating systems. (Reunanen 2010, 92–96.) Likewise, other services, such as audio APIs (Application Programming Interface), changed the essence of tiny intros dramatically, as there was no longer a need to program everything from scratch if a suitable component was already offered by the system.

As of this writing, in 2013, 4k intros are still relevant for the demoscene. According to the statistics gathered from *Pouet.net* by Bent Stamnes (2013), approximately a hundred new intros are released every year, and so it seems that they will not disappear anytime soon. The audiovisual quality of 4k intros has climbed so high – "4k is the new 64k" – that the focus seems to be shifting towards the next, even more challenging category, 1k intros, that have not yet been explored in the same depth. For example, at Assembly 2012 there were significantly more works in the 1k competition than in the 4k (*Assembly 2012 results*, pouet.net). In addition to the joy of discovery, it seems likely that the workload involved in the creation of a full-scale 4k intro has become discouraging for authors. Another recent competition category, "procedural graphics", where the aim is to generate an impressive static image in little space, can be seen as another example of the demoscene going back to its roots.

Tiny Effects

It is practically impossible to include media files, such as digital video, sound clips, pre-made 3D models or even static images, in four kilobytes, and so the typical working methods of the new media field do not suit this context. The most important means of creating impressive visual effects is to *generate* them instead: objects, patterns and movement can be created with the creative use of mathematical functions, random numbers and fractals. In the heart of this kind of process is the programmer, whose creativity and skill mostly dictate the quality of the outcome.

When creating the aforementioned 4k intros, we quickly discovered another strategy that was refined already when some of the effects were used for visualizing music at concerts and clubs a few years earlier. The strategy was *parametrization*. In the context of concert visuals parametrization refers to altering the same content progressively so that it is possible to prolong the performance without additional material. Likewise, in the case of 4k intros precious data and code can be reused in multiple ways to provide the viewer an illusion of multiple effects. Typical means for parametrization are, for example, changing the color palette, mirroring the graphics, modifying and copying 3D objects using mathematical formulas, changing the camera angle and filtering the output in various ways. In other words, the content is not hard coded, but its parameters are left open and modified during the execution of the program.

Computational generation of graphics produces a distinctive, recognizable esthetic that is marked by abstraction: organic figures, such as lifelike human models, are tedious to generate. Thus, it is not surprising that most 4k intros do not even aim at replicating real-world objects, but are rather based on abstract forms instead. As a counterexample we could consider the numerous 3D landscapes that may appear very convincing at their best. Other real-world objects and phenomena that lend themselves to algorithmic generation are, for example, regular plants (Prusinkiewicz & Lindenmayer 1990), waves, clouds, buildings and mechanical machines, which have all appeared in both tiny intros and procedural graphics.

In the history of computer graphics there are numerous examples of similar approaches to creating photorealistic images, especially since the 1980s (see Goodman 1987, 102–164; Foley

et al. 1996, color plates 12–41). Karl Sims' animations, such as *Particle Dreams* (1988) and *Panspermia* (1990) are based on algorithmically generated imagery, and their at least indirect effect on demos is easy to notice. Another well-known case of algorithmic art is the works by Laurent Mignonneau and Christa Sommerer, who have brought art and technology together since the early 1990s. The typical division of labor between a programmer and an artist is alien to Mignonneau, Sommerer and the demoscene: the role of code is not hidden, but it is considered as an experimental and creative tool on its own (cf. Mignonneau & Sommerer 2006).

Currently, the most popular 4k intro at *Pouet.net* is *Elevated*, released in 2009 by TBC and rgba. The intro serves as a good example of the algorithmic generation and parametrization of real-time visuals. A virtual camera pans in a believable snowy landscape shown from multiple angles (Fig. 3). There is water in the valleys, clouds in the sky, mist in the air and the sun reflects from the surfaces – all typical means of increasing realism in computer-generated imagery, but this time implemented in a minimal amount of bytes. Music plays in the background and supports the illusion with its echo and wind sounds. Iñigo "iq" Quiles, the other programmer of *Elevated*, discussed the technology and production process of the intro in his presentation at the Function demo event in 2009 (Quilez 2009).

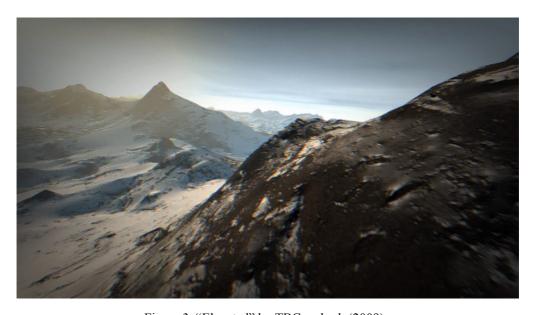


Figure 3. "Elevated" by TBC and rgb (2009).

The development of mainstream hardware and software has undeniably affected the amount and types of content that can be included in 4k intros. Traditional MS-DOS and Amiga intros had to be self-contained, whereas modern PC operating systems are bundled with multiple useful components, such as libraries, fonts and compression software, which take some load off the programmer. As an example, in the case of 3D graphics the difference is radical: back in the day, everything had to be created from scratch, whereas these days equal or better functionality is available through standard API calls. The use of external components has transformed 4k intros and, at times, led to bitter arguments between the traditional do-it-yourself ethic and pushing the genre's limits (*Some thoughts on 4k competition rules*, pouet.net).

Tiny Audio

Most 4k intros were silent until the end of the 1990s and, thus, rather ascetic compared to other demos; the tightly-knit interplay between visuals and audio is the main point of many productions. Still in the Assembly'98 competition rules (*Assembly'98 Official Invitation Text*, ftp.scene.org) the controversial situation was justified as follows:

NO MUSIC or other sound is allowed (this is because this a coders' competition, not musicians')

Behind this arbitrary constraint was apparently the idea that programmers, musicians and graphic artists should each have one dedicated individual competition, as full-blown demos are usually created by teams. After 2000 music finally started becoming an integral part of 4k intros, which increased the already high requirements of the category even further: in addition to visual effects you had to fit in a tune and a sound player routine.

Creating music in tight space heavily depends on the underlying software and hardware platform. Home computers of the early 1980s typically contained a sound chip with a few channels and different waveforms that would produce recognizable, characteristic sound. In the case of the Commodore Amiga and modern PC compatible computers, sound consists of digital samples, meaning that the waveforms have to be somehow generated first. Anders Carlsson (2010) deals with different sound chips from a composer point-of-view in his MA thesis. Here I will focus

especially on software sound synthesis, even though it is not the only option: some 4k intros have utilized the speech synthesizer or MIDI playback provided by the operating system which, however, often leads to space-efficient but easily recognizable and plain sound.

My own approach in 2003 was also software sound synthesis. *Syna*, a minimal synth written in assembly language, took 1.5 kilobytes with a tune after compression, which was borderline acceptable, since plenty of other content had to be fit in as well. At its core *Syna* features four typical waveforms (square, saw, sine and noise) that can be played back at different frequencies, which is enough for simple beeps. The timbre is augmented by using envelopes that mimic real instrument behavior and a low-pass filter that smoothens the sound (cf. Tolonen et al. 1998). The music produced using these means still appears somewhat flat, so the output is fed to a delay loop echo that creates an illusion of space.

From a musician's point of view, using *Syna* requires technical skill, patience and careful planning, since the composing is done by typing notes to a text file. Having said that, the modest feature set encourages creative problem-solving to overcome the limitations, as demonstrated by musicians that have created music with *Syna*. For example, adding distortion by increasing the volume or recycling the same melody with different instruments were not features that I had consciously implemented, but which emerged from real use and its needs instead.

As of now, the most popular tool used for 4k music creation is *4klang* that was developed by the demogroup Alcatraz. Compared to *Syna*, it features multiple technical improvements, such as waveforms that can be modified and filtered more freely. One of the fundamental principles of *4klang* is that simple building blocks, such as oscillators and filters, can be combined into complex instruments – a similar approach is used in a number of other so-called modular synthesizers. Instead of relying on a monolithic codebase that might contain unneeded features, *4klang* outputs a playback routine that is optimized for the tune at hand and can be directly used by a programmer in an intro. Musicians' workload has been reduced by creating a VSTi plug-in (Fig. 4) that can be used together with practically any common sequencer software. (Zine #14, 2010.)

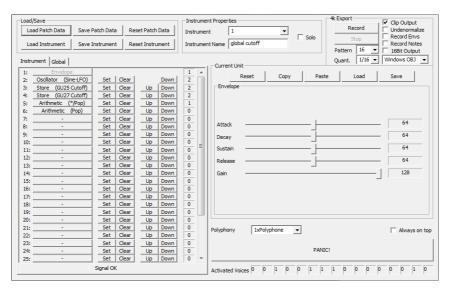


Figure 4. The graphical user interface of 4klang.

The gradual improvement of tools and increasing standards have led to a situation where the best 4k intro tunes sound – as they should – rather massive in spite of their minuscule size of one or two kilobytes. In addition, visual effects and music are tightly coupled in order to create a carefully crafted show for the viewers. The algorithmic generation of instruments and limited space together restrict the realistically possible music genres to different types of repetitive electronic music that tend to be popular in full-scale demos, too. At times there is no music at all, but an ambient soundscape that supports the spatial illusion created by visual means.

Space Optimization Tools

In addition to their audiovisual content, 4k intros have their purely technical side, which needs to be understood when dealing with limited space. The correct use of tools, such as compilers and compression software, saves precious bytes for the actual content and reduces the programmer's workload. Tools and approaches have improved gradually over time; the discoveries made by one programmer have been followed by others, and at the moment the workflow of creating 4k intros is already highly streamlined with its special methods and utilities. Ready-made examples help newcomers to get started by offering a platform on which own experiments can be built.

The executable files of the early 1980s home computers were simple; for example, a COM type

program used in MS-DOS contains pure code with no extra headers, which has ensured its continuous popularity in the smallest intro categories. The primitive COM format dates back to the 1970s, when it was used in the CP/M operating system (see Digital Research 1983). In contrast, modern-day executables are considerably more complex and include various headers that, from an intro programmer's point of view, can be considered as unnecessary overhead. One way of *bumming* bytes is, therefore, reducing the headers to a minimum. *A Whirlwind Tutorial on Creating Really Teensy ELF Executables for Linux* (http://www.muppetlabs.com/~breadbox/software/tiny/teensy.html) by Brian Raiter is an illustrative example of not just saving space, but also the effort that enthusiasts invest in their hobby.

My personal experience with system and code level optimization dates back to 2003, when Linux 4k intros were still in their infancy, much like their Windows counterparts. The beginning of the millennium was a transitional period, when intros had just started appearing on modern PC operating systems, as opposed to the traditional MS-DOS. A significant portion of the effort involved in the creation of *Yellow Rose of Texas* went to pure engineering, such as fine-tuning of compiler parameters, optimizing external library use, and finding suitable methods for code compression. With the two other intros the platform and workflow were already there, so we could mainly focus on the actual content production.

Perhaps the most mystic and hardest to control factor in byte bumming is dealing with compressed code. 4k and 1k intros typically consist of a small stub followed by compressed executable code that is decompressed and run by the stub. Thus, the original uncompressed program can be considerably larger than four kilobytes – for instance, in the case of *Yellow Rose*, 7632 bytes. Already the earliest intros created for the MS-DOS utilized *PKLITE* that can easily be recognized by looking at the beginning of the file. Because of its mathematical nature, the gains obtained by compression are hard to predict and the effect of small changes in the program code affect the size in an almost random manner: changing an individual number or even removing code lines, which would seem like a natural thing to do, may increase the size of the end result. In practice even small differences start to matter when approaching the hard limit of 4096 bytes.

The *IN4K* website (http://in4k.northerndragons.ca/) is a collection of tips and tools suitable for 4k intro programming. *Crinkler*, originally created in 2005 by Rune L.H. Stubbe and Aske Simon Christensen for Windows, serves here as an example of an advanced tool created for the needs of tiny intros. In addition to compression, *Crinkler* optimizes intros in multiple other ways, such as by loading the necessary libraries in a space-efficient manner. (*The Crinkler executable file compressor*, http://www.crinkler.net/.) The version history of the utility also reveals how system-dependent extreme size optimization is: new operating system versions and updates may render current methods useless, which results in unwelcome incompatibility when trying to view old productions.

Conclusion

The study of 4k intros brought up phenomena that are also relevant outside the demoscene. Tiny intros are an example of how early technical limitations have over time turned into a practice and tradition, which is only relevant to the community itself. There is no practical reason to limit executable files to four kilobytes on modern computers – the size counts because of the rules created and maintained by the community. The demo culture is strongly marked by the appreciation of technical skill and creativity, and to fit an impressive production in a few bytes requires both.

The demoscene creates tools, such as *Crinkler* or *4klang*, for its own purposes in the do-it-yourself spirit. Painstakingly crafted utilities are often released for free, so that other members of the community may benefit from them. At the same time, the creation of advanced tools is one more opportunity to show one's skills, and such development has taken the genre forward by allowing for more content in the same space. Another community-oriented trait is the publication of example programs that help others to get started. All in all, we may observe how the development at large has led to the automation of several trivial or tiresome steps, letting the programmer focus on what counts, namely the creative problem-solving tasks involved with audiovisual content production.

The two-decade history of 4k intros mirrors the evolution of computer hardware, software, and the practices of the community during the same period. In the historical perspective, new

operating systems and hardware platforms have been adopted relatively slowly, often with considerable criticism. Especially in the case of old iconic platforms, demosceners have tried to "push them to the limit" and, on the other hand, have not been willing to lose the social capital they have gained – skills and a familiar community. Large demo events, in particular the Finnish Assembly, have had an active role in the construction of practices through their competition rules: which computers and operating systems are allowed, what kind of content is allowed and how a 4k intro is defined in the first place.

In the big picture, tiny intro programming can be compared to other art forms, such as miniature paintings, haiku poems, limericks or ships in a bottle. Their strict rules, which may at first appear arbitrary, require similar problem-solving and focus on the essential – wizardry and creativity often spring from limitations, rather than from a complete freedom of expressive means.

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How Those Crackers Became Us Demosceners

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Abstract

Numerous authors ranging from hobbyists to researchers have tried to explain the roots of the demoscene in their texts. Most often such histories have been brief and almost identical to each other: first appeared crackers with their crack intros, which then evolved into the demoscene during the late 1980s. In this article, I shall reiterate the canonical story and offer new perspectives to the events that led to the purported separation of the two communities. I approach the topic by looking at it from three different angles: first by dissecting the canonical story, then through the recollections of early hobbyists, and finally by comparing the two to the discussions found in contemporary texts. Based on the findings, the divergence between the two scenes was the outcome of a number of parallel developments, and was neither as clear-cut nor rapid as often portrayed.

Keywords: demoscene, crackers, home computers, software piracy

Introduction

The history of the community known as the demoscene dates back to the mid-1980s when the first groups started to appear, and the first crack intros, shown at the beginning of a cracked game, were released. Here, "cracking" refers to the removal and circumvention of copy protection schemes that game companies tried to employ in order to stop users from duplicating the game media, such as tapes and floppies. The intros were preceded by simpler static screens that served the same purpose of telling the world who was behind the release. Later on, the early scene diverged, when some of the hobbyists became increasingly interested in just the intros, leaving software piracy and related activities aside.

Above, we have an example of a story that has been repeated and canonized numerous times in

various publications ranging from disk magazines to academic papers (for example Leonard 1994; Gruetzmacher 2003; Saarikoski 2004, 191–192; Tasajärvi et al. 2004, 12–15). Most of the authors who have written on the topic were not part of the original scene themselves, so they have had to rely on second-hand sources where conflicting details have already been left out. My aim in this paper is to trace the origins of the story and offer a new perspective to the various reasons that led to the gradual separation of the two scenes.

As a matter of fact, even the too evident assumption that there ever was such a split should be brought into question, as several groups started with cracking and retained legal and illegal activities side by side for quite a while (Kauppinen 1991; Polgar 2005, 99–101). As another counterexample, during the last few years the demoscene has started coming into terms with its roots, and crack intros made by legal demo groups have started appearing again – although they should be considered more as nostalgic or ironic references to the wild past rather than to the realities of contemporary software piracy (see *The Commodore 64 Scene Database (CSDb)* for recent examples). Nowadays, one of the most active all-platform demo websites, *Pouet.net*, also features crack intros as one of its numerous production categories.

The concept of a "scene" requires some attention before moving any further. In this article, I shall use the word *scene* as an umbrella term that encompasses all the related activity and refer to specialized communities as *the demoscene* and *the cracker scene* (also known as the warez or illegal scene, among other names) for the sake of clarity. Arguably, the distinction is somewhat artificial, as the members of both have simply considered themselves to be *in the scene*. In other contexts, many other communities have been referred to as scenes, such as the graffiti scene, clubbing scene, or punk scene (for example, Straw 1991; Hitzler & Niederbacher 2010). Sociologist Michaela Pfadenhauer provides the following general definition for a scene in her article *Ethnography of Scenes* (2005):

Thus we refer to a thematically focussed cultural network of people who share certain material and/or mental forms of collective self-stylisation and who stabilise and develop these similarities at typical locations at typical times as a scene.

When applied to the demo and cracker scenes, Pfadenhauer's definition raises some relevant

questions: for example, what are "self-stylization" and "typical locations" in the case of networks that are largely virtual by nature? There is hardly any demoscene attire that would instantly reveal the identity of its members to others, unlike in many other scenes that are outwardly more pronounced. Therefore, the self-stylization must be mostly mental – which it is. As to the typical locations, virtual spaces, such as online discussion forums, need to be considered in addition to physical spaces. The flip-side of *similarities* inside a scene is that there must also be *differences* to other scenes that ultimately set them apart.

The demoscene has, at times, been discussed in terms of a subculture (for example Roininen 1998, 69–79; Saarikoski 2001). Omitting the elusive definitions of parent, counter-, and subcultures here, it is still evident as to how subcultural studies are a valuable frame of reference when discussing scenes, since the two concepts (i.e. scene, subculture) are so clearly related and, at times, even used interchangeably (cf. Pfadenhauer 2005). As a well-known example, Dick Hebdige, in his book *Subculture: The Meaning of Style* (2010/1979), traces the genealogy of British subcultures ranging from teddy boys to punks, and shows how they have preceded and influenced each other. Even though British subcultures seem spectacular and deviant when compared to demo and cracker scenes, the idea of evolution and lineage are equally applicable – scenes, subcultures and communities do not appear out of nowhere.

David Muggleton (2004/2002) has criticized the work of Hebdige and his peers¹, stating that they fail at understanding the indigenous viewpoints of actual subculture members (3). Valuable points made by Muggleton are that a subculture should not be seen only as a response to economic and social changes, as many earlier studies tended to view them (9–10), and that the role of an individual in a subculture may be fluid and fragmented (107–128). Both Hebdige (2010/1979, 92–99) and Muggleton (2004/2002, 131–154) recognize the importance of *incorporation*, where deviant subcultures are defined, trivialized, and turned into commodities by the parent culture in order to render them harmless. In the case of the demo and cracker scenes, such trivialization has frequently occurred in, for instance, newspaper articles dealing with demo parties². However, Douglas Thomas (2002, 148–160) states that hacker culture has proven to

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¹ Hebdige represents the Birmingham Centre for Contemporary Cultural Studies (CCCS). According to Ken Gelder (2005/1997, 81–85), CCCS studies were founded on Marxist theories and tended to focus especially on working-class subcultures. See Clarke (2005/1981) for more discussion on their approach.

² Demo parties are typically described by the press, somewhat condescendingly, using expressions such as *WiderScreen 1–2/2014: Skenet – Scenes*

be largely resistant to incorporation due to its technical nature and existence in a highly fluid electronic medium. Neither Hebdige's nor Muggleton's case studies included digital subcultures, so they do not mention technological change as something that affects subcultures, but in this study its role, quite obviously, cannot be omitted.

When thinking of the motivation behind the scene activities, Sarah Thornton's Bourdieu-inspired concept of *subcultural capital* offers a useful theoretical frame of reference. According to her definition, subcultural capital defines an individual's status in the eyes of the other members and can be earned through different means, such as attire, ownership of valued artifacts, subcultural knowledge and "cool" behavior (Thornton 2005/1995). Similar traits have been observed in studies dealing with digital culture, for example in Alf Rehn's (2004) article, where he discusses the practices of the warez scene and refers to them as "honor economies". Meritocracy is also heavily present in the related cracker culture (Vuorinen 2007) and the demoscene (Reunanen 2010, 33–35).

In the following sections I will explore the shared history of the two scenes from three different angles. First, the focus is on the origins and forms of the canonical story, which highlights how the scene has seen itself, presented itself to outsiders, and how outsiders, in turn, have interpreted the history. The second set of source material, consisting of interviews of first-generation sceners, brings forth rich details that have been lost in the standard story. Lastly, I will look at contemporary texts of the late 1980s and the early 1990s in order to illustrate how people experienced the ongoing developments, in contrast to later recollections that can easily be colored by nostalgia or belittling³.

Reading the Story

The scene started to document its roots early on, when the first histories and personal recollections were published on diskmags (disk magazines) in the early 1990s, and a few years later on the World Wide Web. One of the best-known descriptions can be found in the *PC Demoscene FAQ*, originally written by Thomas "Tomaes" Gruetzmacher in 2003. Section 2.3 "Where does the demoscene come from?" starts with crack intros and software piracy, after

[&]quot;the nerd heaven". For some examples, see Yle.fi 2012; Taloussanomat Digitoday 2013.

³ In my own fieldwork, I have frequently noted that former sceners are not always willing to discuss their past, which they may consider embarrassing or something that is best kept secret.

which follows a description of the divergence:

In the late 1980s the legal part of the cracking and warez scene slowly drifted away from the illegal part. Intros became more advanced, (mega-)demos (several advanced intros linked together) appeared. The demoscene was born... sort of. A few individuals are still active in both, demoscene and warez/cracking scene.

The cracker scene is seen as the predecessor of the modern demoscene and, somewhat exceptionally, even the remaining link between the two is mentioned. There is no clear explanation as to why the two communities started drifting apart exactly, but the illegality of the warez scene is mentioned twice, which hints at one possible reason. According to the description, the demoscene "was born" and took the trade forward, which creates a distinction between old and new: crackers are portrayed as aging forefathers who are still alive but, at the same time, passé. Another similar account was provided by a long-standing demoscene activist, Jim "Trixter" Leonard, in *PC Demos Explained* (1994), where he wrote as follows:

Around this time, a gradual shift occurred, from people cracking games to writing graphic/sound demonstrations that showed off the computer they had just learned to program. Sure, cracking games was still popular, but some people decided that learning about the machine and using it as a tool for creativity was "cooler" than cracking one dime-store game after another.

In this case, the legality of the hobby is not seen as an important factor. Instead, Leonard emphasizes the creative nature of demo programming as opposed to the repetitive cracking of low-quality games. Compared to the *PC Demoscene FAQ*, Leonard's text is significantly earlier – the first version appeared already in 1994 and was updated until 1998. In the early 1990s the self-awareness of the demoscene was on the rise, which could be observed, among other things, in its attitudes towards computer games (Reunanen 2010, 29–30, 77). Early on, games were a natural part of scene activities, but became a taboo when the community started defining its borders and aggressively distancing itself from other communities occupying the same computer hobbyist domain (ibid.). In this light, the older description of the events resonates well with other

sentiments of the time, whereas in 2003 there was already less need to emphasize the uniqueness of a firmly established community.

Several authors of demoscene-related articles and books have included a variant of the canonical story in their texts, which has further strengthened its status. When comparing the versions provided in four different publications (Roininen 1998, 30–31; Burger, Paulovic & Hasan 2002; Saarikoski 2004, 191–192; Tasajärvi et al. 2004, 12–15) it becomes evident how similarly the roots of the demoscene are described: first there were crackers with their intros that later – somehow, and we are never told exactly how – evolved into demos. The authors have not invented the histories; instead, they are based on first- or second-hand accounts provided by demoscene members themselves, which goes on to illustrate how deeply the community itself has adopted the standard story. Between the lines one can also sense nostalgia that colors the recollections⁴

There are two notable works that describe the early days of cracking and software swapping in detail. The first description can be found in *Freax: The Brief History of the Demoscene* by Tamas Polgar (2005, 40–62). Even if Polgar's approach is rather informal, it provides relevant insight into the practices of the early hobbyists, such as copyparties, international swapping, and cracker magazines. According to an interview with Grendel⁵, the separation of the demo and cracker scenes started as early as 1988–1989 and became stronger during the following two years (ibid., 57). The other notable peek into the history was written by Patryk Wasiak, whose *Illegal Guys* (2012) documents the rise and fall of what he called "the illegal scene". Wasiak links the increased interest in legal demos directly to the West German police raids of the late 1980s, where illegal software collections got confiscated⁶.

Owing to their common origin, early crackers and demosceners shared many traits, such as groups, handles, tools, parties, and communication channels. Therefore, it is easier to look at the differences between the two rather than the similarities. One deciding factor, indeed, is the

⁴ For examples of early scene nostalgia, see Maggy #10, #11 and R.A.W. #1.

⁵ Jukka O. Kauppinen, also known for his work in the Finnish computer press, especially the *MikroBitti* magazine.

⁶ In Finland, similar procedures started in the 1990s and were targeted mostly at pirate BBSs (Saarikoski 2004, 330–335).

relationship to law enforcement that started interfering with software piracy in the early 1990s, when copyright legislation started catching up with digital products (Saarikoski 2004, 319–337; Wasiak 2012). Such negative publicity and the fear of sanctions (Zine #2 and #3) can be seen as two probable reasons as to why the demoscene has emphasized its creative aspect and, at the same time, distanced itself from software piracy.

According to Vuorinen (2007), the cracker system can be seen as an offspring and a mirror image of the commercial model, clearly different to the open source movement that has its roots in the original hackers of the 1950s and 1960s (cf. Levy 1984). The cracker economy, in its purest form, is inherently linked to the commercial world, since it needs a constant influx of commercial software in order to function, whereas the demoscene is more self-sustained by nature because it produces its own artifacts: demos. Even though the modern warez scene, as described by Rehn (2004), differs from the pirates of the 1980s, the two can still be considered as parts of the same continuum.

First-Hand Accounts

As the second part of the study, I conducted six interviews with long-standing scene members who had started their career in the 1980s on the Commodore 64. It turned out somewhat difficult to recruit interviewees, as many of the pioneers are hard to locate after almost thirty years, and because there still seems to exist a certain veil of secrecy that makes it hard for an outsider to ask around. My own role as a demoscener and researcher – reflected on the title of the article, too – created a setting where I was regarded as an outsider by some representatives of the early cracker circles. The insider—outsider issue has been further elaborated by Rhoda MacRae (2007), who divides researchers' approaches into three basic categories: outsider-in, outsider-out, and insider-in (see also Hodkinson 2005). Hebdige (2010/1979, 139), too, noted how subculture members were often opposed to any attempts to formally define them.

The interviews took place online, some by email and some on Internet Relay Chat (IRC). The respondents represented four different nationalities: two Finns⁷, two Swedes, one German, and one U.S. scener who could provide a rare view to the otherwise chiefly Eurocentric scene. The personal recollections of O'Hara (2006) and Savetz (2012) shed some further light on the

 $^{^{7}}$ The interviews with Finns were conducted in Finnish. Translation of the quotes by MR.

American BBS and pirate scenes, while most other authors appear to have focused on the hacker culture (cf. Levy 1984; Taylor 1999; Thomas 2002).

When compiling a typology of the answers, it soon became evident that the Eurosceners' answers were mostly similar to each other, whereas Jon, the American interviewee, had rather different views on the events altogether. One notable difference was how software piracy went online in the U.S. earlier than in Europe, where mail-based swapping of floppies was still relevant in the early 1990s (cf. O'Hara 2006; Savetz 2012). Jon's low interest in demos is in line with the common notion of the demoscene being a mostly European phenomenon. As another example of national differences, the small size and geographical fragmentation of the Finnish Commodore 64 scene was emphasized by both Finns, Grue and Micron. The search function of *CSDb* finds 188 Finnish groups which, indeed, looks like a modest figure in comparison to Sweden (571) and Germany (1,493).

Jon's recollections go back as far as 1984, when the Commodore 64 scene was only starting to take shape. As a curious detail, he mentioned how his first group, Apple Commodore Connection (ACC), was modeled after some earlier Apple II crews. Apple II crack screens (see Figure 1 for an example), which could be described as messages and defaced title screens attached to pirated games, started appearing around 1981, and can be regarded as predecessors of later flashy crack intros. A large collection of the first screens can be viewed online at Jason Scott's collection *Apple II Crack Screens*.

The interviewees described the 1980s scene as active, colorful, competitive and elitist. According to Grue, after the turn of the next decade, the community started becoming more organized, and small meetings grew into large parties. There was a constant influx of new people, and at the same time some first generation sceners already started to retire due to work, studies, family, and loss of interest – some even left after getting busted. As an external factor, the Commodore 64 was starting to disappear from the market towards the end of the 1980s and was getting replaced by the Commodore Amiga and IBM PC Compatibles, which affected the scene, too: all of the respondents recalled people migrating to another platform, mostly to the Amiga (cf. Saarikoski 2004, 134–140, 389; Polgar 2005, 99–111; Botz 2011, 107–114). Comparable migrations (Amiga–PC, MS-DOS–Windows) have repeatedly taken place ever since. What

might appear as a simple case of purchasing a new computer is in reality a complex negotiation process that affects individuals and the community at large in multiple ways. Even though new hardware is "better" in absolute terms, it needs to be appropriated before it can be accepted. (Reunanen & Silvast 2009.)



Figure 1. The crack screen of *Destiny* (1985), an Apple II adventure game.

Based on the interviews, there were no sharp borders between different activities before the 1990s: cracking, swapping, intro coding and demos coexisted side by side. While some programmers were involved with all of the above, it was also common to specialize in, for instance, cracking only. Thus, intros could be created by another specialist, not the cracker himself, which provides an interesting comparison point to the canonical story: sceners did not somehow "become" interested in pure audiovisual programming, as there were such people right from the beginning. The early 1990s saw the rise of legal demo-oriented groups and sections, but there had been such groups and individuals even earlier (cf. Polgar 2005, 57). Of my interviewees, Bacchus mentioned two groups, Horizon and Ian & Mic, as examples that were not involved in cracking, whereas Bitbreaker stated that he was not interested in the illegal side, and Grue told that his group at the time (Beyond Force) started focusing solely on demos towards the end of the 1980s.

Swapping was an integral part of the early scene and all of the respondents had, at least initially,

been involved in it. So far, scene histories have mostly focused on the three main roles involved in demo creation: coders, graphic artists ("graphicians") and musicians. The often overlooked role of active swappers in the success of a group was much more pronounced in these interviews:

There were a lot of us, and I would argue that we were the grease in the scene. (Jon)

The swappers role was really important back then (alltho it felt they didnt get the thanks they deserved). (Pantaloon)

The impression conveyed by these responses is that swapping, too, was a highly competitive trade where speed, quality, and the number of connections were essential if one wanted to gain recognition. Grue, who, according to his statement, did not even have a significant number of connections still stated that he had to spend "a terrible amount of time" to keep up-to-date. Likewise, Micron recollected sending a copy of the same floppy to around a hundred other swappers, and how some BBS traders eventually burned out and quit the scene altogether. Sceners involved in more creative activities did not necessarily regard swapping highly, as illustrated in the quote above and a statement by Micron, where he claimed that among artists swappers were "of course not appreciated". The same schism still popped up in 1993 in *R.A.W.* #5, where Vastor lamented the situation in his article *Are swappers lame?* The reason for this disparity is most likely that a successful swapper could only demonstrate social instead of technical skills.

Police raids were already mentioned in the previous section, but the police was not the only institution that cast its shadow on swappers. As mentioned by Bitbreaker and Micron, it was a common practice for mail traders to "fake" (reuse) stamps for saving on postage, which could lead to trouble from the postal service. The busting of high-profile or close connections would send a shockwave throughout the community, as in the following cases:

These are sort of stupid to think about now, but there was always rumors of guys getting

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⁸ Technical skill was highly appreciated already by the early hackers (Levy 1984). Another point of comparison is the concept of "hard mastery", which, according to Sherry Turkle (1984, 101–115) is more typical for male than female programmers.

busted, phreakers ratting out other phreakers, or software houses demanding user lists from BBSes and all sorts of nonsense that a 14 or 15 year old would easily believe. So I would put my codebooks and warez collection up in my ceiling tiles "just in case." (Jon)

But I happened to be a user at the JRC, so when it got busted I got the creeps. I hid all my floppies for a couple of months. (Micron)

The wealth of detail revealed in the personal reflections proves that there is still plenty that has escaped demoscene historians so far. In particular, the formation of the early illegal scene is little known, as well as the links between the U.S. and Europe. Another issue that is highlighted by the interviews is how sceners tend to focus on visible figures, such as well-known coders or swappers, and omit less central scene members, such as hangarounds (cf. Muggleton 2004/2000, 82–104). Scene researchers have often inherited the same practice from their interviewees and textual sources, and the less known borders of the community have, thus, remained largely unexplored.

Contemporary Discussions

One more way to go back in time to the late 1980s and early 1990s is to read contemporary discussions of the period. Probably the best source for them is disk magazines (*diskmags* for short) that could be described as scene journalism. Together with the scroll texts found on demos and intros, there is practically no other surviving and as easily accessible collection of contemporary thoughts. I have already used diskmags as a valuable source in earlier studies dealing with the adoption of different computing platforms by the demoscene (Reunanen & Silvast 2009; Silvast & Reunanen 2014). Similar, although paper-based, *zines* have been common among several subcultures, where they have served various purposes ranging from self-expression to social networking (see Duncombe 2005/1997).



Figure 2. Sex'n'Crime #10 (1989) main menu.

By reading two of the earliest diskmags, *Sex'n'Crime* (for Commodore 64, see Figure 2) and *Zine* (for the Commodore Amiga) it again becomes clear how games, piracy and demos initially co-existed side by side in the scene circles. Both of these mags originated in Germany, which was the center of the Euro scene at the time. *Sex'n'Crime* served the cracker scene and frequently featured game reviews, top cracker charts written by the editors, plus plenty of heated scene rumors. In *Sex'n'Crime* #3 from 1989 there is an interesting statement by OMG, well in line with the discussions of the previous sections:

A lot moved to the Amiga and the others stopped cracking as the police was cleaning Germany. So, many people started coding demos or they just decided to be legal forever and coded a few games.

Moving from cracking to demos, as seen from his perspective, was more of a necessity to avoid sanctions than strive for self-expression. Another possible coping strategy was to move into game programming, which I will shortly return to. Police raids and the busting of high-profile pirates were frequent topics also in *Zine*, which published several articles on the legal status of software piracy in different European countries⁹ (see Zine #2 and #3). While *Sex'n'Crime* was mostly an

⁹ The legal status of software piracy varied among different European countries. The reports found in *Zine* were often alarmist and speculative with plenty of uncertainty about legislation and its upcoming development.

illegal magazine, *Zine* represents a transitional diskmag where the shifting focus from cracking to demos can be observed. Already in 1990 and 1991 there were commentaries that would have seemed out of place only a couple of years earlier:

Very soon there won't be any coders who are coding games, no software-companies who sell games on AMIGA, because it's not worth selling them because none is going to buy them and so companies and coders don't get enough money to continue their job. (Action, Zine #7)

Powerful Amiga-scene is the only thing that can "cure" Amiga's reputation and amount of programs. You should reduce (or stop) cracking programs. (Pasi Kovanen, Zine #11)

R.A.W. (for the Amiga, see Figure 3) and *Imphobia* (for the IBM PC compatibles) can be considered as two representatives of prime demoscene-oriented diskmags that were published just before the discussions started moving to the Internet in the latter half of the 1990s. *Imphobia* started as a mixed publication, but became demo-only by 1993. The increasing divergence between demosceners and crackers was aptly captured in the interview of Tom Jansen in *Imphobia* #4 (1992), where he stated: "I have no favorite crack groups, I dislike all of them." A figurative generation gap was opening in the scene, when newcomers joined in and did not subscribe to the values of the pioneers¹⁰:

Newcomers are disease in the scene. They don't know anything about the past, give a strange look if you say Pure Byte, Warriors Of Darkness, Megaforce, Fusion, Ikari or Ackerlight. They don't respect the old guys or old groups. But.... The Scene would also wither without them.¹¹ (Grendel, Maggy #10)

The above disdain is clearly linked to two things: power and recognition. Even though the writer laconically acknowledged that the scene would not survive without new members, at the same time it was evident that they should respect the first generation for their accomplishments.

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¹⁰ This kind of disdain is nothing new: for instance, Hebdige (2010/1979) mentions how newcomers were accused of trivializing the original mod style.

¹¹ A follow-up and a longer statement on newcomers can be found in Maggy #11.

Thornton's (2005/1995) concept of subcultural capital is easily applicable here: the ongoing changes threatened to diminish the value of the capital acquired with hard work and years of participation. To despise something as seminal as cracking can be seen as an approach that let newcomers omit the existing "economy" and define one on their own.



Figure 3. R.A.W. #9 (1995) index view.

One more notable change, also related to the generation gap, is how in the mid-1990s' demoscene mags computer games were an almost unacceptable topic. The demoscene had become increasingly self-conscious and independent, and drew the line between itself and other hobbyists. (Reunanen 2010, 29–30, 77.) In contrast, game development was a theme that did receive attention, as a number of demo authors started viewing it as a possible profession that would let them utilize their skills in the working life, which they had to face sooner or later (for example, R.A.W. #5). On the Commodore 64 the threshold to move into game programming had not also been high (Sex'n'Crime #5, #11). Many of the 1990s game companies do, indeed, have their roots in the demoscene (Saarikoski 2004, 205; Sandqvist 2012). Demosceners getting employed by and founding game companies was – humorously – even lamented, since many of them ceased their demo-related activities shortly thereafter (R.A.W. #9).

Moving from the scene to the working life can be considered as a form of incorporation.

Applying the skills acquired as a cracker or demo coder in the IT industry renders underground

activities harmless and comprehensible from the society's point-of-view and returns them back to the mainstream. A deviant, or at least unknown, lifestyle is trivialized into a sort of pre-school leading to an honorable career. From a subcultural capital perspective, the currency gained in one context is turned into real money in another. The two are more closely related than what it might appear at first: Thornton (2005/1995) observed a similar conversion of subcultural capital into economic capital in her study; several people made their living out of the club culture as DJs, club organizers and clothes designers.

Based on the diskmag articles, it would seem that the demoscene had practically departed from its illegal roots by 1993. However, reading the contact/swapping ads found in their own section paints a somewhat different picture. Among other ads there are references to "hot stuff" or more directly to warez and illegal swapping (R.A.W. #5, #6). There were good reasons to not advertise illegal content publicly, especially if you provided your full contact information, but according to the interviews with former swappers, it was very common that the same people distributed both demos and warez at the same time. For some of the respondents even the whole concept of a legal swapping seemed contradictory¹². As Bacchus put it in his interview: "Never heard of [a] legal swapper."

The developments that took place between 1988 and 1995 are clearly reflected on the pages of the diskmags, even if in a condensed and edited form. The gradual emergence of a purely demo-centered community during the early 1990s is most evident in *Zine* and *Imphobia*, that both changed their orientation during the period. As a counterexample, swappers seem to have acted as nodes that linked the illegal and legal sides together at least until the middle of the decade

Conclusion

I started by re-examining the canonical birth story of the demoscene and now, at the end, I shall conclude that it should be considered as a constructed narrative that ultimately serves purposes other than historical accuracy. Especially during the interviews it became clear that the purported split is a question of perspective: early cracker/pirate sceners perceived demos as a natural

¹² For an example of the hardships of legal swapping, see *Maggy* #11 and "How to Be Completely Legal" by Obligator.

continuation of their early endeavors, whereas demosceners felt a need to distance themselves from the first generation.

Internal and external factors involved in the divergence are numerous, and no single one of them can explain the course of the events alone. Firstly, the market share of a computer or software platform is a strong external factor that cannot be controlled to any significant degree by the community, but needs to be reacted upon one way or another. The commercial demise of a loved platform, such as the Commodore 64, creates a junction point where an individual has to either stay aligned with the aging computer, or move over to another system and learn new skills — or even drop the hobby altogether. Crackers and swappers, in particular, were directly affected by the disappearance of new software and, thus, needed to reiterate their position. Another external factor is the tightening of the previously loose copyright legislation, which exerted pressure on software piracy that started becoming illegal in many European countries in the late 1980s and the early 1990s. On the other hand, as can be seen in the previous sections, wide-spread alarmism, coupled with unsettling news and rumors, probably had more effect on the community than the actual laws themselves.

The demoscene has often emphasized its creative nature; the best programmers, graphic artists and musicians have been held in high respect by the community. Seen in this light, it is hardly surprising that an increasing interest on creative endeavors has been proposed as a major reason for the split. It seems, indeed, valid to talk about generations here, since the newcomers of the 1990s did not necessarily share the same history with the 1980s pioneers, who often did not extend their scene career beyond a few active years. Real-life pressures and "growing up" popped up frequently as reasons for leaving the circles.

The rotation can be considered as an indigenous reason that explains why the practices of the community were in constant flux. For some, the changes appeared unwelcome or even threatening, since newcomers were not equally impressed by old fame – in other words, the existing subcultural capital. The split has been emphasized by demoscene members as part of a quiet power struggle over who gets to define the scene and decide what is valuable. One example of reiterating the practices is how "pure gaming" started increasingly turning into a

¹³ Note how the concept of "pure gaming" still leaves open the possibility that even the most devoted *WiderScreen 1–2/2014: Skenet – Scenes*

despised hobby in the early 1990s' demoscene discourse, in dire contrast to the first generation, whose activities were inherently tied to computer games.

The pirate–demoscene split illustrates the complex mechanisms of how a community is born out of another, establishes its own practices and repurposes the existing ones. Having said that, it is also evident as to how such a separation is not a binary one: there have been links between the two communities as long as they have existed, and by time divergence can even turn back into convergence. Moreover, the fluidity of sceners' identities lets willing members cross the border between different cliques and generations, and thus identify with more than just one group.

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Imphobia #4 (1992)

demoscener could play games at times, but doing only that would be considered inappropriate.

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Chapter 7 Multiple Users, Diverse Users: Appropriation of Personal Computers by Demoscene Hackers

Antti Silvast and Markku Reunanen

7.1 Introduction

The demoscene is a technically oriented community that emerged in Europe in the 1980s. Concurrently with the growing popularity of the home computer, the members of the demoscene wanted to distance themselves from the common uses of computers such as productivity or gaming. Instead of utility or entertainment, their interest lay in creative experimentation, comparable to the original MIT hackers or the Lévi-Strauss-inspired concept of "tinkering" used by Turkle.¹ They formed an international community, eventually called "the demoscene" or just "the scene," once it became aware of its existence. The main artifacts of the demoscene are demos that showcase the programming and artistic skills of their creators. Simply put, a demo is a computer program that displays a series of real-time visual effects combined with a soundtrack.²

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¹ Steven Levy. 1984. *Hackers: Heroes of the computer revolution*. Garden City, NY: Anchor Press/Doubleday. Sherry Turkle. 1984. *The second self: Computers and the human spirit*. New York: Simon & Schuster.

²Petri Saarikoski. 2004. Koneen Lumo: Mikrotietokoneharrastus Suomessa 1970-luvulta 1990-luvun puoliväliin [The Lure of the machine. The Finnish microcomputer hobby from the 1970s to mid-1990s], Nykykulttuurin tutkimuskeskuksen julkaisuja 83, 190–206. Jyväskylä: Jyväskylän yliopisto; Anders Carlsson. 2009. The forgotten pioneers of creative hacking and social networking – Introducing the demoscene. Paper presented at the Re:live: Media Art Histories. Conference proceedings, Melbourne, 16–20; Antti Silvast, and Markku Reunanen. 2010. The demoscene – An overview. Editorial for the *Rhizome* special issue on the demoscene, May 17.

The demoscene has flourished mostly in Western and Northern Europe, with some activities scattered around other parts of the globe. Other main locations where home computers were available and commonplace, such as the United States or Japan, had equally enthusiastic user communities striving to display their skills, but they assumed different forms, such as the hacker or otaku culture.³ Soon turning 30, the scene is still a predominantly male community in which women might feature but not necessarily receive recognition. There has not been much research on the social class of its members, but most probably they represent the middle class.⁴

So far, most studies dealing with the demoscene could be called descriptive. Many authors have charted the most visible practices and artifacts but mostly omitted major factors such as the wider cultural perspective, the emotional dimension, and the diversity of the community. In general, you could say that most of the writings start with a broad overview of how the scene was born and then move on to describe a range of demos, groups, and parties. The doctoral theses written by Nordli, Saarikoski, and Botz serve as counterexamples, where the community is placed in a wider context of gender studies, cultural studies, or media art.⁵ A comprehensive bibliography of demo-related publications is available online on the *Demoscene Research* page (http://www.kameli.net/demoresearch2/).

We aim to continue these efforts by placing the demoscene in a wider perspective. Our particular interest lies in the appropriation of the personal computer by the demoscene members. Motivated by international discussions on the diffusion of technologies and our previous published article, we propose that the demoscene is not just a group of "end-users" that deploys technology as envisioned by its producers. Instead, in order to demonstrate how greatly the demoscene hackers are involved with the appropriation of the computer, we focus on two theories: the concept of "scene" denoting the thematically focused and self-expressive character of the demoscene and demosceners and the concept of "script" highlighting the diverse and original practices of use that these people construct for personal computers.

In order to research the phenomena, we conducted a study of texts produced by the community. As one of its earliest communication media, the demoscene created disk magazines, or diskmags for short, electronic magazines which were circulated

³ Douglas Thomas. 2002. *Hacker culture*. Minneapolis: University of Minnesota Press.

⁴Markku Reunanen. 2010. *Computer demos – What makes them tick?* Licentiate thesis, Aalto University, School of Science and Technology, Helsinki, 24–26, 48.

⁵ Hege Nordli. 2003. *The net is not enough: Searching for the female hacker.* Trondheim: Norwegian University of Science and Technology; Saarikoski, *Koneen Lumo*; Daniel Botz. 2011. *Kunst, Code und Maschine – Die Ästhetik der Computer-Demoszene* [Art, code and machine – The aesthetic of the computer demoscene]. Bielefeld: Transcript Verlag.

⁶Everett M. Rogers. 2003. *Diffusion of innovations*, 5th ed. New York: Free Press; Turo-Kimmo Lehtonen. 2003. The domestication of new technologies as a set of trials. *Journal of Consumer Culture* 3(3): 363–385; Nelly Oudshoorn, and Trevor J. Pinch. 2003. How users and non-users matter. In *How users matter: The co-construction of users and technology*, ed. Nelly Oudshoorn and Trevor J. Pinch, 1–28. Cambridge, MA: MIT Press; Markku Reunanen, and Antti Silvast. 2009. Demoscene platforms: A case study on the adoption of home computers. In *History of Nordic computing 2*, IFIP advances in information and communication technology, ed. John Impagliazzo, Timo Järvi, and Petri Paju, 289–301. Berlin: Springer.



Fig. 7.1 Creating the Scenes through Diskmag. R.A.W. #6, 1993—a typical diskmag contents page

on diskettes by regular mail. Similar commercial publications had appeared as early as 1981, but the demoscene changed the concept significantly to fit its own needs and style. For an example of what diskmags look like, see Fig. 7.1. These magazines were a direct means of debating social relationships, practices, as well as technology, such as hardware and software. To say it short, all that is fundamental to the demoscene.⁷ Whereas some diskmags, such as *Sex'n'Crime*, were published by game companies, most were produced, edited, and disseminated by sceners themselves. The "insiders only" nature of these publications meant that the attitudes and views were hardly ever toned down. The magazines were typically written in English and circulated among international audiences early on.⁸

To represent different eras and the scenes of various computer platforms, we chose five diskmag publications as our source material: *Sex'n'Crime* (published on the Commodore 64, 1989–1990), *Zine* (Commodore Amiga, 1989–1991), *R.A.W.* (Commodore Amiga, 1991–1996), *Imphobia* (IBM PC, 1992–1996), and *Hugi* (IBM PC and online, 1998–). Similar diskmags exist in several languages, but all of our material was written in English. In addition, whereas some of this material concerns national issues—for example, demo production in Finland or anti-piracy in Belgium—most of it pays little attention to nationality. Out of a total of 54 issues,

⁷Reunanen and Silvast, Demoscene platforms.

⁸ Reunanen, Computer demos, 71.

we collated around 200 stories, including articles, interviews, editorials, and reader feedback, selecting relevant quotations from each story in order to observe the scripting taking place inside the community.

7.2 Technology Appropriation Within a Scene

When considering the adoption of technology that took place in the demoscene, our starting point was the theory of *diffusion of innovations* by Everett M. Rogers. Rogers emphasized two key subjects: by *innovation* he understood "an idea, practice, or object perceived as new by an individual or other unit of adoption"; and by diffusion "the process in which an innovation is communicated through certain channels over time among the members of a social system." The underlying idea of this somewhat technical description is straightforward: innovations, that is, new ideas, practices, or objects, are first communicated to and then adopted, rejected, or reinvented little by little by the communities that deploy them on a daily basis. 10

As Rogers sought a generic framework for innovations and their diffusion, he consequently looked at an extensive range of users. According to his empirical cases and examples, the users of technology can be individuals or informal groups, formal organizations as well as whole organizational sectors, farm workers in a village as well as high schools, medical doctors, or all the consumers in the United States. While such generic frameworks are of great importance, they can also be problematic: when operating at the level of such "social systems" or "communities" in the broadest possible sense, perhaps we lose some of the particular traits of specific user groups. Can a community ever be considered uniform, discarding the actual diversity of its members? And can we presume that people simply belong to a professional or other community, disregarding the continuous efforts required to keep a social group focused and coherent?

A concept not included in Rogers's vocabulary (who preferred to speak of social systems or communities), but relevant to this study, is a *scene*. According to the sociological analysis of post-traditional community building by Michaela Pfadenhauer, a scene has the following characteristics:

a) [A scene] does not constitute itself due to common life circumstances (such as milieus) or professional interests of the participants, b) [it] features a significantly marginal degree of obligation and binding character, c) [its] structure is not in principle selective and excluding and calculated for an exclusive set of participants but which nonetheless d) [it] acts as a thematically focused community-building forum for experience and self-stylization.¹²

⁹Rogers, Diffusion of innovations, 36, 35.

¹⁰ For further developments in the context of ordinary technological "trials," see Lehtonen, The domestication of new technologies as a set of trials, 363–385.

¹¹Rogers, Diffusion of innovations, 24.

¹² Michaela Pfadenhauer. 2005. Ethnography of scenes: Towards a sociological life-world analysis of (post-traditional) community-building. *Forum: Qualitative Socialforschung/Forum: Qualitative Social Research* 6(3): 1–15.

While scenes are often discussed in relation to music, clothing, or consumption styles, the concept also explains the technology users' scenes—in fact, perhaps due to the popularity of the concept in media, also the demosceners adopted the term. In our case, the concept of a scene enables us to focus on specific technology users who are bound together by common interests, rather than, for example, their region, profession, or other position in life. Another useful feature of a scene is its emphasis on the *ways* these communities are built. Scenes, according to Pfadenhauer, are a matter of constant negotiation. The boundaries of the scene and its common styles and themes are not self-explanatory: instead, the sceners themselves have to produce knowledge related to the orientation of the scene and the skills required from a worthy member. To analyze a scene, therefore, it makes sense to go where the communication is taking place: to those debates through which the members of the scene are enacting the possibilities of the personal computer and its users.

7.3 Scripting Technology

In the past 20 years, various works of Science and Technology Studies (STS) have discussed the concept of a technological *script*.¹³ Scripts, by definition, are assumptions about the potential uses of technology: they attribute "specific competencies, actions and responsibilities to users and technological artifacts." By another definition, a script is a framework related to technology that defines specific kinds of actions, specific kinds of actors, and "the space in which they are supposed to act." ¹⁵

A well-known early application of the notion of script is found in a study by Steve Woolgar. ¹⁶ Woolgar discusses technological scripts in relation to engineers and designers of microcomputers, concluding that the design phase of technology always limits how technologies can be interpreted and used by different social groups. In this article, we apply the concept of "script" to study how technology

¹³ Steve Woolgar. 1991. Configuring the user: The case of usability trials. In *A sociology of monsters: Essays on power, technology and domination*, ed. John Law, 57–100. London/New York: Routledge; Madeleine Akrich. 1992. The de-scription of technical objects. In *Shaping technology/buildingsociety: Studies in sociotechnical change*, ed. Wiebe E. Bijker and John Law, 205–224. Cambridge, MA: MIT Press; Madeleine Akrich, and Bruno Latour, A summary of convenient vocabulary for the semiotics of human and nonhuman assemblies, in Bijker and Law, *Shaping technology/building society*, 259–264; Oudshoorn and Pinch, *How users matter*. For a more recent development concerning the active figuration of technology by their users and their designers, see Sampsa Hyysalo. 2009. Figuring technologies, users and designers – Steps towards an adequate vocabulary for design–use relation. In *Use of science and technology in business: Exploring the impact of using activity for systems, organizations, and people*, ed. Frans Prenkert, Enrico Baraldi, Håkan Håkansson, and Alexandra Waluszewski, 291–313. Bingley: Emerald Publishing Group.

¹⁴Oudshoorn and Pinch, How users matter, 9.

¹⁵Akrich, The de-scription of technical objects, 208.

¹⁶Woolgar, Configuring the user, 57–102.

users themselves view the capabilities of users and technological artifacts and thus reconfigure and reinvent technologies.¹⁷

In the following analysis, we focus on the technological scripts that have been produced for the personal computer by the demoscene hackers. These scripts are divided in two to highlight their individual characteristics. Firstly, we study how demosceners construct the practices of using computers in different situations. Secondly, we underline how new personal computers are also understood by sceners as "scripting" those computing skills that their owners have.

Our basic assumption here is that being in the demoscene is not only about learning to program or create digital art. It is also a matter of adopting a specific disposition concerning technology. This disposition determines how sceners apply their computing skills, present themselves, compete with each other, and take a stance on other sceners. As we will discuss, these observations lead to relevant conclusions that help to understand the computer hobbyist culture in general, as well as user communities' technological scripts.¹⁸

7.4 Me and My Scene

The Scene as a Stage

Originally, the concept *scene* literally meant the same as a stage. In her article on scenes and community building, Pfadenhauer quotes the following definition that directly mirrors this aspect of a scene:

(T)he word "scene" reflects an emergent urban psychological orientation – that of a person as "actor", self-consciously presenting him—or herself in front of audiences.¹⁹

As far as the demoscene hackers' communications in our source material are concerned, the definition seems accurate. "The demoscene" and "the demosceners" were ongoing subjects of debate throughout two decades from 1989 to 2009 and also across various computing platforms, from the Commodore 64 to the Commodore

¹⁷For a corresponding study of a personal computer, see Christina Lindsay, From the shadows: Users as designers, producers, marketers, distributors, and technical support, in Oudshoorn and Pinch, *How users matter*, 29–50. In other cases, such "re-figurations" by users have also reflected back to the level where technologies are designed by their producers, see Hyysalo, Figuring technologies. Our study, possibly due to the limitations of the source material, could not unfortunately observe similar examples.

¹⁸ Alf Rehn. 2001. *Electronic Potlatch – A study on new technologies and primitive economic behaviors*. Stockholm: Royal Institute of Technology; Alf Rehn. 2004. The politics of contraband – The honor economies of the Warez Scene. *Journal of Socio-Economics* 33(3): 359–374; Jukka Vuorinen. 2007. Ethical codes in the digital world: Comparisons of the proprietary, the open/free and the cracker system. *Ethics and Information Technology* 9(1): 27–38.

¹⁹ John Irwin. 1977. Scenes, 23. London: Sage, quoted in Pfadenhauer, Ethnography of scenes, 3.

Amiga and the IBM PC. A notable turn can be observed in the texts of the early 1990s, when the community's self-awareness began to grow, which led to a clearer separation between the scene and other computer enthusiasts.²⁰

Nonetheless, recognizing the scene as a "psychological orientation" can only be a starting point. In a practical sense, presenting oneself to others involves more than individual adopting an attitude. Self-presentation is also a social practice and as such, requires discipline and recognition by peers: one should be able to express oneself confidently to others while not appearing pretentious. In the discussions on what constitutes a good display of skill, demosceners seem to be highly aware of this aspect, starting with a fundamental issue: how should you include your name in a demoscene production?

At basic level, people add their names to their work in order to make themselves known among their peers. As the writer below reflected in 1989 in a Commodore 64 diskmag, the activities of the game cracking scene, which was the forerunner of the demo scene, started out as tinkering for tinkering's sake. Subsequently, the writer found it logical that people included their names in the cracks:

Ever since people used their computer, they acted in big waves. In the beginning some people just cracked a game for fun. Later everyone started putting his name in his cracks so everyone could see how good he was. (Sex'n'Crime #3, 1989)

According to this short quotation, there is a direction from including your name in the crack and being seen as "good." In another text from the same period on the Commodore Amiga, a member of a newly formed cracking group states: "We aim to be a major force on the cracking scene in Europe and to be able to deliver the highest quality-wares to our contacts" (Zine#1, 1989). It is as if "being good" would again be a case of confidently announcing it to others.

Other members of this scene, however, do not just look at such announcements. They see a piece of work which they might admire or not. If one wants to be good or even better than others, it must therefore be proved. This happened to one commentator: according to his story in a 1990 Commodore 64 magazine, a particular scener "once again proved that he is superior to all other so-called crackers. He put the 210 files of 'Curse of Ra' into only 3 files and packed it down to approx. 350 blocks. This is yet another world-record!" (Sex'n'Crime#21, 1990). The background to his story is a competition to see who can make the smallest possible game file and thereby create a world record. As we can see, one sentence and its deployment of three figures—210 files, 3 files, and 350 blocks, respectively—is all that it takes for the record to be proven. While the details about the competence of this scener are certainly not self-explanatory to an outside reader, they were very meaningful to the writer.

On the other hand, if the claim of "being good" is not substantiated, the scener might face marked hostility from others. In fact, claiming to be something and exhibiting something else was viewed as misbehavior and reflected over and over

²⁰ Reunanen, Computer demos, 29–30.

again in the source material. In the text below, a scener expresses his feelings about such negligence when viewing a new demo:

Another thing is all this shit about inventing new routines. I saw a demo from a group that claimed to have invented a new raster line style. The only difference I saw, was that they consisted of extremely ugly colors. That's stretching the limit if you ask me. (Sex'n'Crime #3, 1989)

Similar examples of "stretching the limit" of claiming to be good are so significant to the sceners that they have invented their own word for it: someone who is a "wannabe" is often referred to as a *lamer*.

Winners vs. Losers

For the demosceners, the concept lamer is a way of classifying people. It is the opposite category of the elite, "something only a few people are because of outstanding deeds and great fame" (R.A.W. #4, 1992). But lamer is also more than a fixed category of people. In disk magazines, lamer is constantly defined in relation to the practices that supposedly belong to the scene. It would seem, therefore, that the features of a lamer cannot be defined conclusively: instead, lamers have to be actively discussed by the demoscene in order to keep the concept alive.

One scener, for example, wrote: "I personally think a lamer is a wannabe, trying to be better than he really is. In the past, lamers used demo-makers to do some lame shit and spread it, just to let other people know they were alive" (Sex'n'Crime #9, 1989). "Lamers," according to the text, announce that they "are alive" but at the same time do not demonstrate that they are competent users of the personal computer. To the writer, this is proved by the fact that lamers are using "demo-makers": software tools that accordingly do not require programming skills but can be used to produce demos. Similarly, for another writer who comments on the "definition of a typical Amiga freak and a lamer," the issue is that "lamers would like to be famous. But he isn't (sic) because he can't do anything" (Zine #2, 1989).

In summary then, a lamer does not know how to use a computer for purposes seen as serious by demoscene hackers. Regarding the concept of technological script, lamers are end-users trying to appropriate demoscene scripts while lacking the necessary technical skills. In some source material, a lamer is explicitly a computer gamer: "[lamers] use only their Amigas to play games" (Zine #2, 1989) or he is a "person who uses his computer only to play games" (Imphobia #1, 1992). Moreover, according to this same article, lamers may try to cheat their way to fame by buying demos or "ripping" (in practice, stealing) other authors' music and graphics.

There is also more to the enactment of a lamer than his lack of skill. A lamer lacks other specific but different modalities: interest and appreciation. One writer on the IBM PC characterizes the group this way: "the people with no interest in the scene and in demos, scene music, and graphics whatsoever—the, I write and mean the word honestly, LAMERS" (Hugi #19, 2000). The following quote shows that

not only does the writer disrespect "lamers" and their competencies; much worse, he thinks that lamers are not treating demosceners with enough respect for their dedication and their creativity. He reflects on an experience from the computer events called parties:

Also, the atmosphere is spoiled when a party consists of 85-90% lamers - the feeling is just not the same when you know that the guy next to you really thinks you're some kind of a weirdo, bothering about something as antique as Amiga, bothering to make productions for free, for the fun of it, though that is what being creative is all about—but he doesn't know, does he? (Hugi #19, 2000)

The word "lamer" therefore seems to have several social uses for the sceners. The notion not only pinpoints those people who lacked the skills, it also seems to identify who the elite demosceners actually were. According to one writer, the lamer was once indeed even a "proud word" for "what's the point in being elite if there are no lamers?" (R.A.W. #6, 1993).

However, it should be noted that during the last 10 or 15 years, the word has started falling out of use. The heated discussions and group wars of the late 1980s and the early 1990s have cooled down significantly, and the general tone of the more recent publications is notably more laid-back. In spite of such increasingly relaxed attitudes, it is evident that the original mindset has by no means vanished, even if it is not brought forward as aggressively as before.

Thus, the script for using personal computers in the demoscene is one consisting of competition, recognition of skill, self-assertion, and hierarchy. As harsh as it may sound, such factors color most of the community's practices, as reflected in the examples above. Competition does not take place merely under the hood but is made totally visible and explicit through mechanisms such as ranking lists, competitions, and online/off-line discussions. Competition is also accepted as a natural part of being in the scene, hardly ever questioned or criticized. Similar evidence from comparable communities, such as different generations of hackers and the warez scene, suggests that technologically oriented, dominantly male communities often share the same features.²¹

7.5 Me and My Computer

The relationship between technological innovations and users that appropriate them is a multidimensional issue, which applies to demoscene enthusiasts as well.²² From a purely practical perspective, new computers, upon arriving in the market, enable more advanced self-expression, higher quality graphics, and better music and, therefore, should be desirable. Yet this is hardly the case when you look into the discussions of the demoscene hackers. Regardless of the scene members' technical

²¹Levy, *Hackers*, 115–118; Thomas, *Hacker culture*, xvi; Rehn, The politics of contraband, 359–374.

²²E.g., Oudshoorn and Pinch, How users matter.

competence, the adoption process consists of several stages that correspond to the model proposed by Rogers: *innovators* try out new platforms, influential *early adopters* make them acceptable, until the *early majority* and eventually the *late majority* follow. *Laggards* will trail behind, possibly resisting the change altogether (it should be noted that Rogers' concept of a "laggard" is not to be taken as derogatory). This adoption process by the demoscene members is markedly emotional, as illustrated by the following quotes:

OK, you'll be able to do much better and faster routines, but everybody knows that you're not one of the best coders then, you just have got one of the best Amigas! So nobody will be that impressed by your work. (R.A.W. #6, 1993)

With Windows'95 taking over the PC platform, where is the demo scene to migrate to? Should we comply and write Win'95 *compatible* demos (AGHHHHH!) Should we search new frontiers like Linux or OS/2? Or should we change the rules so that each group has to write his own small little demo operating system. (Imphobia #11, 1995)

In addition to the aforementioned high appreciation of skill, there are other influential factors: the unwillingness to change the status quo and nostalgia. The skills painstakingly acquired on one platform would need to be relearned on another, and at the same time, the emotional bond between the user and the familiar computer or operating system would need to be broken.²³

High emotional involvement between people and home computers was observed by Sherry Turkle already in 1984, when microcomputers had not yet become commonplace. She calls the emotional bond "the holding power of the computer." A crucial factor in the relationship is *mastery*, the feeling of being empowered and in control.²⁴ Likewise, the relationship between the demoscene member and his/her computer goes far beyond the tool level. Letting the old computer go would mean insecurity—losing the mastery.

At the same time, demoscene members are a part of a community, which has its own common orientations. The members do not make purely individual decisions about how they use their computer. The community as a whole needs to react to a changing technological landscape in some way: it cannot change the external world, only its own dispositions. While some of these dispositions persisted in our materials as we have shown, it was clear that the demoscene's assessments concerning new platforms were also adjusted over time. According to previous studies, the scene will eventually adapt to new computer platforms because of practical reasons, regardless of the amount of initial resistance.²⁵ Likewise, the initial script of a computing platform will change radically over time during its life span from novelty to obsolescence. What starts as a viable computer eventually ends up a relic, only remaining in existence thanks to the commitment of its users.²⁶ The demoscene, a

²³ For more discussion on computer "platform wars," see Saarikoski, Koneen Lumo, 128–137.

²⁴Turkle, *The second self*, 50–76.

²⁵ Reunanen and Silvast, Demoscene platforms; Reunanen, Computer demos, 100–102.

²⁶Lindsay, From the shadows.

community centered on skills, can be an ideal site for deploying such relics against their—perceived—irrelevance in the world external to the scene.

Finally, to better understand the traits of the demoscene, we should also reflect on the relevance of not only the users but also the "non-users" of new technologies in this scene.²⁷ For various reasons, a person might willingly or unwillingly refuse to adapt to a new platform and thus become a laggard, according to Rogers's terminology. In an extreme case he might even leave the community altogether. In our source material, there were few examples of such quitting—just one person reported about a demoscene "break" which he used to party with his friends and ride his motorcycle (Raw #1, 1991). Hence, in this case, non-use was framed as a matter of not engaging with computing at all. But on a more general level, resistance to new platforms through their non-use evokes interesting interpretations, such as the generation gap between sceners of different ages, loss of sense of community around particular platforms, attitudes towards the tech industry and its practices of using personal computers, and boundaries of the scene, to name a few.

In summary, demoscene computers and skills cannot be treated in isolation but rather define each other on several levels. An ideal demoscene computer should not be "too old" for serious tinkering by the user, nor be "too advanced" as otherwise its tinkering will not—perceptibly—require serious computing skills. A computer that is "old" has an aura of mastery, but its user also runs the risk of being a laggard and, therefore, losing touch with the rest of the community that has already moved on. Resolving this tension is an inherent part of the scripting of the personal computer by the demosceners.

7.6 Conclusions

We studied a group of specific technological scripts: the ways that a group of computer users, the demoscene hackers, view their own competence, social relationships, and technical objects. The results illustrate that the adoption of the personal computer by the community is by no means a simple process. In fact, the predominant script of the computer—such as those communicated through advertising and the computer gaming industry—is heavily questioned and filtered through the demoscene's own orientations. These users' scripts were rich and diverse and covered varied aspects of computer use: indeed, they involved not only the potential uses of technology as envisioned by designers and engineers but also specific skills, knowledge, interests, self-expression, and even how the users enact their social relationships.

We concentrated on two aspects of the demoscene's adoption of computers: the construction that defines specific computer users as winners (elite) or losers (lame) and how a scener's skills are shaped by the possibilities of his computer and how the possibilities of the computer are in turn shaped by the skills. Even a new platform

²⁷ Oudshoorn and Pinch, How users matter.

can be used in an acceptable way, and, likewise, the lack of skill is reprehensible in spite of nostalgia or status quo. To us, such attitudes—"scripted" in detail by the sceners themselves—represent an interesting addition to the knowledge that pertains to the appropriation of the personal computer in its local uses.

When considering possible directions for further work, researchers could study the gendered nature of the demoscene script. Gendered issues are frequently mentioned in the source material: indeed, many texts state explicitly that the demoscene is a predominantly male hobby. The reasons for the lack of female sceners are reflected in some articles as well as in disk magazine interviews with women involved in the demoscene. An analysis of these texts would be an interesting contribution to the debates on the gendered nature of computer hacking. The generally male script of computing, combined with the male script of the scene, can make it extremely difficult for women to enter the circles as equal members.

Disk magazines proved to be a valuable source for our study. Their contemporary nature and the sheer volume of text—thousands of issues each with dozens of articles—would be sufficient for several studies with different viewpoints. One possibility would be to differentiate more between the various kinds of material in the diskmags: articles, editorials, interviews, reviews, and reader feedback. The wide range of computer users and uses are portrayed in these articles. Furthermore, the social diversity of the demoscene could be documented in more depth by subsequent studies, taking into account not only the various computer platforms and the temporal developments related to the scene but also national and gendered particularities of the different *demoscenes*.

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Crack Intros: Piracy, Creativity, and Communication

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This article examines "crack intros," short animated audiovisual presentations that reside at the crossroads of software piracy, creativity, and communication. Since the beginning of the home computer era in the late 1970s, users have copied and shared software with one another. Informal swapping between friends quickly evolved into organized piracy, known as the "warez scene," which operated across borders. Starting in the early 1980s, pirated games were often accompanied by screens where groups boasted their accomplishments and sent messages to others. The screens soon turned into flashy intros that contained animated logos, moving text, and music. In this article, we describe crack intros from three different perspectives: first, through their history; second, by treating them as creative artifacts; and, finally, by considering them as a communication medium. The three perspectives offer a novel peek into the practices of early software piracy and its little-known creative aspects.

Keywords: software piracy, creativity, crack intros, digital culture

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Introduction

In this article, we explore how so-called crack intros are embedded in the history of software piracy. Software piracy is often discussed as a set of practices related to the unauthorized release and copying of commercial microcomputer programs. In contrast, we discuss how a particular community, known as the "cracker scene," was established and further reproduced through communication between software pirates. Customarily, those who removed copy protection—that is, "cracked" computer software—added small "crack intros" before the original title screen. Both the textual and audiovisual content of the intros served the purpose of improving the social status of a particular cracker group. Based on an empirical analysis of selected intros, we demonstrate how these objects were used in the processes of communication and meaning making within the community.

This study sheds light on the historical background of the contemporary "warez scene" (see Rehn, 2004). When studying the historical phenomenon of the cracking scene as well as the online warez scene, it is clear that artifacts such as crack intros and NFO (info) files are a persistent part of the practices of unauthorized software copying and circulation (Vuorinen, 2007). The cracking scene, most active in Europe in the 1980s and early 1990s, was a self-conscious and highly organized community. It was one of the most prolific hacker cultures in 1980s Europe (Alberts & Oldenziel, 2014; Wasiak, 2012; for critical discussion on hacker culture in general, see Thomas, 2003) and could arguably be called the first internationally networked digital subculture (Carlsson, 2009; Schäfer, 2011). One visible example of related activity is the network hacker culture, as described by Taylor (1999) and Thomas (2003), operating on and beyond the borders of legality, which makes it a perceived threat to society.

Crack intros have gone largely unnoticed by authors who have written about related topics such as media art or software piracy. The largest body of research dealing with intros can be found in the context of demoscene-related publications. Crack intros are often mentioned as predecessors of computer demos (e.g., Carlsson, 2009; Reunanen, 2010; Tasajärvi, Stamnes, & Schustin, 2004), but few researchers go further than that, except for Polgar (2005), who provides a peek into the history of crackers and their intros, Botz (2011) who discusses them from an artistic perspective, and Reunanen (2014) who questions the canonical story about the origins of the demoscene. "Illegal Guys" by Wasiak (2012) is one of the few scholarly works on the roots of the European warez/cracker scene in the mid-1980s.

Piracy is primarily regarded as the practice of duplication of media artifacts. The role of user-created audiovisual artifacts is scarcely recognized in the literature despite its relevance for the social construction of technology and consumption (Jenkins, 1992; Oudshoorn & Pinch, 2003). Recent studies on the role of "digital material" in the shaping of contemporary cultures related to the use of ICT provide an interesting framework for the analysis of the history of crack intros. As van den Boomen, Lammes, Lehmann, Raessens, and Schäfer (2009) claim, digital cultures should be considered as "material practices of appropriation, and new media objects as material assemblages of hardware [and] software" (p. 9). To understand the structure of such cultures, it is necessary to equally consider "material artefacts and facts, configured by human actors, tools and technologies in an intricate web of mutually shaping relations" (van den Boomen et al., 2009, p. 9).

In this article, we take a critical look at crack intros to fill in some remaining knowledge gaps. The article's three main parts provide three different points of view. We start with a historical overview of the roots of software piracy and the origin of crack intros. Next, we consider the audiovisual properties of intros and analyze them as works of art that follow certain conventions. Finally, we examine the communicative aspect of intros: What messages did they convey, from whom, and to whom? As the main corpus of source material, we examined intros themselves as well as disk magazines ("diskmags") that were circulated among the community and contained contemporary discussion on various topics of interest (for more on diskmags, see Reunanen, 2010). The three perspectives provide a multifaceted view of the practices of the cracker scene, which resides at the crossroads of software piracy, creativity, and communication. Our focus here is on the formative years of the scene, when its visual style and practices emerged on the widely popular Apple II, Commodore 64, and Amiga home computers in the 1980s and early 1990s.

History of Crack Intros

The phenomenon of mass software piracy began along with the introduction of the Apple II computer in 1977. This hardware platform became popular in the United States, and its popularity fueled the growing market for recreational software (Campbell-Kelly, 2003; Ceruzzi, 2003). Such software became massively copied among peers, and software developers introduced copy protection systems with the intention to limit piracy. The beginnings of copy protection systems have been described by Steven Levy (2010). Removing the copy protection measures required some programming skills, and later games were not simply copied but also included a signature containing the nickname of the person who had removed the copy protection. Such signatures, referred to as "crack screens" (see Figure 1 for the Star Trek Promethean Prophecy crack screen) were customarily included in game title screens displaying the game name, the logo of the producer, and a graphic that provided the player a glimpse of the game theme. The signatures were originally simple statements, such as "cracked by . . . ," sometimes intentionally misspelled as "kracked by"



Figure 1. Star Trek Promethean Prophecy crack screen, Apple II (1987).

Image source: Apple II Crack Screens (n.d.).

The development of more complex cracker signatures started a few years later in Western Europe, after the introduction of the highly successful Commodore 64 (for details on the history of the C-64 and Commodore, see Bagnall, 2005). From the beginning, on the C-64 software cracking was primarily a group practice. The early C-64 game cracks preserved in the extensive C-64 Scene Database show that the European cracking phenomenon began in West Germany and the Netherlands around 1983. Groups such as the German JEDI and Dutch ABC Crackings included their signatures in game loader screens, often with some correspondence to the original publisher or the author of the game.

Aside from the simple "cracked by" statement, groups developed other strategies that aimed to provide game players with a clear statement that the original game had been repurposed as a scene artifact (Vuorinen, 2007). Interestingly, groups used several different methods to propose that they belonged to a creative industry parallel to the software industry. One such strategy was to use a name that was a parody of a corporate name or had some reference to a renowned software publisher. For instance, one of the early games cracked by JEDI contained the signature "Electronic JEDI" next to the name and logo of the original publisher—Electronic Arts (*One on One* game crack intro, 1983; see http://csdb.dk/release/?id=48618). This particular release is also important for the history of the cracking scene as one of the first instances of scrolling text on the bottom of the screen, which would later become

a persistent element in crack intros. In another crack intro from the same period, ABC Crackings modified the Electronics Arts logo consisting of a cube, a sphere, and a cone. At the bottom of the screen, it states: "Broken by ABC Cracking" (ABC Crackings Intro, 1985; see http://csdb.dk/release/?id=61401).

While all these manipulations are clearly reminiscent of the techniques already used by crackers on the Apple II, the crack intro as a cultural artifact is an invention of the European C-64 scene. According to one insider definition, a crack intro, frequently abbreviated as "cracktro," can be any independent screen placed in front of a copied game—as opposed to a modified splash screen of the original software (Zimmermann, 2001). The transfer of a cracker's signature into a separate intro allowed for more artistic freedom and, at the same time, enabled its reuse for other game titles. With an intro presenting the credits for the crack in bold type, the original game title screen no longer needed to be altered and, thus, remained intact. Thus, the invention of the cracktro can be interpreted as the scene's transition from the occasional act of subtle software vandalism to a more systematic and self-conscious "cracking trade."

In the mid-1980s, along with the massive software piracy on the Commodore 64, software companies started to introduce increasingly complex copy protection systems aimed at hindering mass disk copying. Furthermore, the copy protection scheme was hidden deep in the game code. Thus, copy protection removal became increasingly challenging and required extensive knowledge of computer architecture to understand how a particular protection scheme worked. From that time on, cracking a game released by a high-profile software company became a significant achievement and earned merit among crackers. A crack intro turned into a manifestation of technological proficiency, but also of deviance (Becker, 1963; Goode & Ben-Yehuda, 2009/1994). In the mainstream discourse, deviance is primarily considered antisocial behavior, but here we can observe how a group of young men manifested their deviance as a social practice with the aim of highlighting their capability and masculinity, thus earning prestige among peers.

Several scene groups tried to gain easy recognition by including their intros in games cracked by others. This practice, sometimes called "recracking," was heavily condemned by the scene, because it was in stark contrast to the ideal of talented authorship. For instance, influential *Illegal* magazine editors ridiculed U.S. and European cracking groups that simply added their intros without actually cracking a game:

The reason why I'm so pissed off on them is that they have completely spoiled our 64 scene, now THANX to the YANKS everybody wants the game super-fast, they don't even look at the game, they just bang their intro on it and send it off and getting the false satisfaction that they're big pirates. (*Illegal #29*, 1988)

One can only shake one's head looking at the SHARKS. . . . They took the BARD'S TALE 3 ORIGINAL COPY from PAPILLONS and put their intro on it. Great job! But unfortunately the game didn't work anymore . . . Hahaha! (*Illegal #29*, 1988)

Eventually, crack intros were released for virtually all computer platforms and game consoles. An extensive collection of crack intros for even the most obscure machines is included in the Pouët.net database. However, the most popular platforms for crack intros were clearly the C-64 and its successor, the Commodore Amiga (see Maher, 2012). Later, with the introduction of Internet platforms, especially peer-to-peer protocols, the cracking scene evolved into the online warez scene, which distributed a great variety of files, such as music and movies, in addition to games. Rehn (2004) describes how the warez scene adopted the small NFO file, distributed with the software, as a means of communication, which plays a role similar to crack intros.

These days, crack intros have become a target for preservation efforts by the community and can easily be browsed on enthusiast websites, such as the C-64 Scene Database (n.d.), Cracktros.org (n.d.), Intros.c64.org (n.d.), and Pouët.net. Classic intros have been re-created and imitated by the WAB—We Are Back project (n.d.), which lets visitors view replicas of the originals running real-time inside a Web browser window. Such endeavors highlight the cultural importance of crack intros and demonstrate how they have already become nostalgic objects for the hobbyists of the late 1980s and early 1990s. The preservation of demos, crack intros, disk magazines, and similar artifacts is no different from the preservation of digital games or new media art. The challenges and solutions proposed by Wands (2006), Paul (2007), and Newman (2012) are well in line with the efforts of the scene that is trying to ensure the longevity of its digital heritage (for examples of demoscene-related preservation, see Hastik, Steinmetz, & Thull, 2013; Reunanen, 2010; Woods, 2008).

Crack Intros as Creative Artifacts

Questions related to the role of creativity in the making of digital artifacts have been raised by researchers exploring the digital art world (Cham, 2009; Grau, 2003; Mealing, 2002). Likewise, the issue of creativity was extensively discussed on the scene forum, in line with the practices of the community. One of the defining rules of the scene was that a group should be creative in three respects: the speed of software acquisition from suppliers, the practices of copy protection removal, and the making of audiovisual content for crack intros.

There is a certain resemblance between the social features of the graffiti scene and the cracking scene. Success in the cracking scene requires proficiency with both copy protection removal and complex audiovisual effects programming; but it was also necessary to "develop a style" (Lachmann, 1988, p. 237). Howard Becker, in his study on social deviance, claims that deviance depends on the communication of the behavior to a particular relevant social group: "The deviant is one to whom that label has been successfully applied; deviant behavior is behavior that people so label" (1963, p. 9). Delinquency and deviance are common themes in youth and subculture studies, dating back as far as the 1920s (Hodkinson, 2007). Crackers intentionally labeled themselves as deviants to gain subcultural capital by emphasizing the illegality of the practices of cracking and game distribution (for further discussion on subcultural capital, see Thornton, 2010). One of the synonyms for a cracker, popular among the community in the late 1980s, was "illegal guy," and, likewise, the cracking scene was sometimes referred to as the "illegal scene" (Wasiak, 2012). Crack intros were a crucial element of performing deviance in the

software pirates' social world (cf. Blackshaw & Crabbe, 2004). For instance, sometimes intros included claims about challenging big companies by removing complex copy protections:

THE NEW PROTECTION'S TIME IS ALREADY OVER, AND THE BRAINY REBELS AMONG US WAIT FOR THE EVER SO SLOW REACTION OF THE BIG COMPANIES! YOU MAY START TO PANIC, MY DARLING, PANIC, FOR THERE'S NO PROTECTION AGAINST US! WAITING FOR THE SLOW MOSTER'S MOVE UNTIL NEXT TIME, YOURS TRULY ANTITRACK/LEGEND SIGNING OFF! (Shadow of the Beast game crack intro, Legend, 1990; see http://csdb.dk/release/?id=39988)

To gain fame, a cracking group was supposed to manifest their skill by copy protection removal, but they were also supposed to communicate their endeavors in a well-defined way, by incorporating crack intros with a recognizable look. Likewise, graffiti enthusiasts communicate their social position with the act of deviance by making graffiti in prohibited, well-guarded, and inaccessible urban sites and by displaying creativity with a personal visual style. As noted by Lachmann (1988) and MacDonald (2001), the combination of both features, the illegality and the visual style, was necessary to become recognized as a successful author in the graffiti scene. The first "cracked by" signatures added on software welcome screens share a communicative function similar to graffiti tags with recognizable statements such as "Kilroy was here."

A brief visual historical analysis of crack intros can be useful for several reasons. First, it provides insight into aesthetic appropriation strategies of computer subcultures. Second, it helps to trace the development of a distinctive set of stylistic elements, which, in turn, not only influenced game programming but led to what we know today as the demoscene (Reunanen, 2014). Third, it illustrates how the self-image of the cracking scene changed over the years from a loose collective of home computer users reverse-engineering software into an efficient network of pirates who were competitive in delivering fast and reliable cracks as well as in creating their own brand and programming innovative visuals.

One of the first intros to feature animated elements was released by German Cracking Service in 1984. The three letters "GCS" emerge from the top of the screen, split up, and follow an angular path before moving to their final position (shown in Figure 2). Probably inspired by the moving typography of TV commercials or station identifications, the floating letters introduced an element of suspense. As opposed to being a simple text message, the display of the cracking credits became a dramatized experience.



Figure 2. German Cracking Service crack intro, C-64 (1984). Source: Authors.

The GCS scheme returned in intros from Dutch Software Group (DSG Cracktro, 1984; see http://csdb.dk/release/?id=59084), Bert (Bert Cracktro, 1984; see http://csdb.dk/release/?id=60129), Swedish Cracking Crew (SCC Cracktro, 1985; see http://csdb.dk/release/?id=18466), and other releases from 1984 and 1985. Various visual styles existed, ranging from stripes resembling national flags of the cracking team's origin (this heraldic format was popularized by sports computer games such as *Summer Games* by Epyx) to simple hand-drawn graphics or logotypes built on an extended text character set and, sometimes, static noise produced by randomly changing screen colors.

Groups such as ABC and Terrasoft Inc. released some of the most experimental intro designs, but 1985 marks the end of the initial trial-and-error-phase and the prevalence of specific elements that more or less formed a basic layout for cracker intros. This included, almost always, a black background, a logotype that was no longer displayed using a simple character-based font but done as a pixel graphic, several lines of static text, and a scroller at the bottom of the screen. Long introductory phases of letters floating around were abandoned in favor of short animations supported by sound effects, such as group logos sweeping in with a wind noise or unfolding in a deep sawtooth wave, or spelling out the credits synchronously with the sound of typewriter strokes (Botz, 2011). This composition concept was heavily

inspired by the opening screens of contemporary computer games (Reunanen, 2010), but it was stripped down to a characteristic formula.

While keeping to the basic disposition, it gradually became a matter of innovation to put as much screen content as possible in motion. Animated scenes were not easy to implement, because the average 8-bit hardware was usually limited to moving small objects across the screen, such as spaceships, projectiles, and aliens in a computer game (Montfort & Bogost, 2009). However, careful low-level assembly language programming made it possible to change screen properties such as colors or horizontal shifting while the raster beam of the TV monitor drew the screen. This was used for creating "raster bars," resembling massive horizontal metal pipes, either static or oscillating up and down, or "colorcyling" text lines and logotypes. An example of this style can be seen in the *Dynamic Duo* intro from 1986, made by Flash Cracking Crew (see http://csdb.dk/release/?id=54050). Line-per-line adjustment of horizontal screen shifting applied a rippling or waving effect on logos, as in the *Pulsoid* crack intro by Ikari (see Figure 3).



Figure 3. Intro used in several games cracked by Ikari on the C-64 (1988). Source: Authors.

Competition within the cracking scene had an important impact on the concepts of cracktro programming. The innovative value of an intro was a matter of not merely well-balanced design and skillfully executed graphics but properties that could be measured and increased, such as more colors, bigger logos, or smoother movement. Constantly expanding the parameters of the contemporary standard, intro programmers needed to go beyond the limits of standard programming techniques and discover tricks to be applied to the graphics hardware, forcing the video chip into unintended behavior. For example, telling the video chip to start drawing the screen at the wrong position could result in a flexible routine for moving large graphics across the screen quickly (Hotline intro, Hotline, 1988; see http://csdb.dk/release/?id=99706).

One group concentrating heavily on hardware tricks, named the 1001 Crew, was the first to make the whole screen border of the C-64—the broad frame around the display area which normally could not contain anything but a flat color—disappear. The 1001 Crew made it possible to place graphical elements inside the border, literally extending the display capabilities of the C-64 (*Amazing*, 1001 Crew, 1986; see http://csdb.dk/release/?id=742). This discovery was important for the scene, because it encouraged the 1001 Crew to release the production as stand-alone, without a cracked game. The technical stunt empowered the cracker intro to go solo, and to be later called a *demo*.

In 1986, the first cracker groups on the Commodore Amiga appeared (see Maher, 2012). The basic scheme of a cracktro did not change at first, but with increased processing power and graphical capabilities, visual effects were easier to achieve and were amplified by the flexible color management, which allowed for seamless gradients between background colors and the option to move more and larger objects around. The option to choose from a palette of 4,096 colors also enabled better solutions to graphical challenges, such as metallic reflections. Flat letters and logos turned into polished chrome (see Figure 4), and for about two years, cracktros on the Amiga looked as though they were cut out of metal (Botz, 2011).

The first substantial addition the Amiga scene contributed to cracktro aesthetics was threedimensional vector graphics. The development of various display routines took place almost entirely in demos, progressing from simple line drawings to flat-filled and, finally, shaded 3-D objects (Tasajärvi et al., 2004). The technique was easily adapted to crack intros, where pixel-based graphics were replaced by 3-D logotypes rotating in the middle of the screen or line vector scrollers emerging from the distance (see Figure 5).



Figure 4. Crack intro by Ackerlight with raster bars and metallic letters, Amiga (1988). Source: Authors.

Perhaps the most important contribution of the Amiga scene was the introduction of a new awareness of design principles. Previously, composition schemes and color selection had been a direct result of internal programming logic and technical implementations such as the direction of the TV raster beam. The new design attitude dismissed the old standards and drew inspiration from print media and movie titles. Carefully selected color palettes replaced rainbow-colored gradients and black backgrounds, as shown in Figure 6 (Polgar, 2005; Reunanen, 2010). Pixel artworks, logotypes, and 3-D objects were subtly shifted away from the center of the screen (see Figure 6).

The visual style of Amiga cracktros had a major impact on the aesthetics of future cracking scenes such as those of the IBM PC and game consoles. Communicating the act of cracking remained the main purpose, and the visual form of the crack intro served as an advertisement within the scene. Visual techniques were aimed at proving both mastery in the programming of a computer's video chip and the group's creativity. By demonstrating such skills, crackers communicated with their peers that they had

"developed a style" (Lachmann, 1988, p. 237), thereby increasing their subcultural capital (Thornton, 2010). The next section explores how crack intros merged visuals and peer-to-peer communication.



Figure 5. Crack intro by Zenith with a rotating three-dimensional object, Amiga (1993). Source: Authors.



Figure 6. Crack intro by TRSI, Amiga (1993). Source: Authors.

Crack Intros and Communication

Crack intros played a significant role in spreading the popularity of the cracking scene (Vuorinen, 2007). They also provided the audience with a sense of difference from the mainstream. Sarah Thornton (2010) describes how, in another context, club culture shaped a similar aura of "being underground" by, among other means, creating party leaflets and VJ presentations that shared a certain visual code, with the purpose of communicating to the partygoers that they belonged to the imaginary "underground scene." Paper-based zines are another closely related phenomenon, common among many fan cultures (Duncombe, 2005, 2008).

Crack intros played a similar communicative role. Most notably, the greetings included in scrollers (lines of text moving across the screen) were intended to be read, reacted to, and appreciated by other members of the community. An article in *Maggy #11* (1991), a diskmag, explains the role of greetings as follows:

In almost every demo, intro or other product what can be imagined, you can see socalled "greetings." In other words, some person or group is greeting some other person or group. It is nice, because that is one way to improve "friendship." But, big BUT, the "greeting"-lists are usually kind of "cool-groups"-lists. . . . One reason to that "group-greeting" I see is some kind of status-thing. You have to show other people how "cool" contacts you have. And there are swappers who only get contacts to get more groups to their lists.

A member of the group Defacto2, which runs a website dedicated to preserving both warez scene NFO files and crack intros, recalled the importance of NFO files as objects that would initiate him as a member of the pirate scene:

In those days nfos never resonated as much for me as some of the other scene products such as scene "e-zines" (electronic magazines). That might have partly been because I had no idea what I was doing. I spent a significant time hoarding or at least viewing any nfo that I could get my hands on. This was to self-educate myself as to the function, structure and organisation of the scene. So I could at least bluff my way through conversations with other scene personalities. ("Q&a With Defacto2," 2013)

Similarly, members of the cracker scene could relate to greetings as personal messages, and users with no link to the scene could grasp the values of the community by learning how to read the textual and visual codes embedded in the intros.

We analyzed 50 randomly selected Apple II crack screens to chart their communicative aspects and better understand the chronological development from simple screens to more advanced intros. The study was based on Jason Scott's *Apple II Crack Screens* collection, consisting of 794 screens in total. Some of the images are monochrome and color variations of the same crack, so the number of unique entries is somewhat lower. Not many of the screens contain dates, but the cracked games represent examples from the early and mid-1980s, with the first dating back to 1981. See Figure 1 for a typical example of the early screens. We treated the screens as a corpus of text, which could then be coded and analyzed using content analysis as the method (see Krippendorff, 2004).

The most important element of a crack screen is the credits: All 50 screens contain credits of some sort. The most common types are the nickname of the cracker, his or her group, and the group that distributed the cracked game. Quite often the groups were not the same, which reveals that already in the early 1980s there were specialized roles among the pirates. A few even mention separate authors for the screen and the actual crack. Clearly, the early crackers were interested in gaining recognition among their peers, and making their names visible in the games that were circulated among the community was a good way to achieve visibility. The second most common theme found in the screens (47 cases) is the name of the game itself, which is hardly surprising, because most of the screens are defaced game title screens to begin with (and, at times, the crackers ironically left the original copyright statements intact). In the three remaining cases, there is no title in the original game, or the crackers use the space for more important information, namely the credits. As an interesting detail, multiple, often humorous, euphemisms are used for cracking when a game was "unlocked" or "liberated."

Another common type of content is BBS (bulletin board system) phone numbers from where more games could be downloaded. The early, colorful U.S. BBS scene is still little-known, but the personal recollections of O'Hara (2006) and Savetz (2012) provide a grassroots perspective on the Apple II, Commodore 64, and Atari scenes of the time. In total, 28 screens contain dial-up phone numbers, highlighting how communication technology was appropriated early on as part of the U.S. cracker culture. In contrast, European pirates kept swapping software actively on physical floppies until the mid-1990s (Polgar, 2005; Reunanen, 2014). It came as a small surprise that there were relatively few messages sent to other groups or crackers. As noted earlier, greetings became a fundamental practice later on. Messages typically were "thanks" or "special thanks" (25 cases) that were sent to people who had helped in some way with the release.

We ran a similar content analysis for 100 Commodore 64 crack intros from the mid- and late 1980s. The C-64 cracker scene could be considered as the second generation of pirates, and they were the first to produce many technically and visually innovative intros. The massive popularity of that computer—with up to 20 million units sold worldwide, according to the estimate provided by Forster (2005)—also meant that the number of cracks and users involved with the scene reached unprecedented levels. The total number of C-64 intros remains unknown, but the dedicated website intros.c64.org (n.d.) currently features as many as 9,225 intros from 1,980 groups. Reading through individual scrollers one by one using an emulator or a real computer is practically impossible, but luckily the Scrolltexts.com (n.d.) project has recently made available a large collection of automatically extracted scroll texts in a searchable format.

Despite all the possibilities offered by free-form text, most of the scroll texts are very similar to one another. Practically all of them (96 cases) show the name of the cracked game, and almost all (89 cases) show the credits, again highlighting how cracking without getting recognition is not worth the effort. Many of these intros also feature a big group logo, so the scroll texts were not the only place to include one's name (see Figures 2 and 3). As mentioned above, the same intro was frequently reused in different cracks by the same group with a different scroll text. In contrast to the Apple II crack screens, there are plenty of greetings: 64 of the intros offer a list of greetings to pirate friends. In eight cases, the greetings are presented as a group ranking list—one more indicator of the extremely competitive nature of the cracker scene.

Contact advertisements are present in 38 scrollers, some of them featuring the phone numbers of BBSs used. All in all, the amount of text found on scrollers is markedly higher than those on the Apple II screens; some of the greetings lists contain dozens of names. Another difference is the number of personal messages found in scroll texts: Other sceners receive direct thanks and, at times, serious insults. It would seem that, at this point in history, most of the active sceners were already members of a group, since our analysis did not uncover any releases made by unaligned individuals. All the scroll texts are written in English, which underlines the international nature of the cracker circles; the groups were located all around Western Europe and the United States, but they all used English as their lingua franca (see Wasiak, 2014).

Crack intros were by no means the only communication channel for the early pirates. A crack intro is an inherently noninteractive medium that did not let the community debate its current topics of interest, so other media were employed concurrently as well. Diskmags, such as *Illegal*, *Sex'n'Crime*, and *Zine*, were an important medium that also preserves the discussions for posterity (Reunanen, 2010). The same BBSs that hosted illegal games were also a platform for active discussions (O'Hara, 2006; Savetz, 2012). A collection of letters sent by mail-based swappers can be viewed online at Sceneletters.com (Scene Letters, n.d.).

Conclusion

This article explores how a multiperspective study of crack intros, creative pieces intrinsic to illegal software circulation, can contribute to a better understanding of software piracy as a cultural practice. Crackers in the late 1980s became folk devils during the "hacker peril" moral panic in European mainstream media (see Goode & Ben-Yehuda, 2009/1994; Saarikoski, 2004; Thomas, 2003). The study of crack intros shows how, under the media labels of "pirate" and "hacker," there is a complex international community. Dissecting the communicative role of crack intros sheds light on the cracking scene and on the development of an international communication network that predates the Internet era. The historical, artistic, and communicative lenses together reveal a multifaceted phenomenon that goes beyond the mere interchange of software: From the beginning, pirates also cared about style, skill, humor, and recognition. What might have appeared in mainstream media to be crime in the digital domain appears, beneath the surface, to be a highly social activity with its own distinctive traits, perhaps the most important of which is the competitive nature of the cracker scene, which is reflected in almost all of its practices.

Schäfer (2011) has discussed how contemporary participatory culture with various media practices is deeply engaged in the appropriation and remediation of objects produced by the computer and creative industries. A historical analysis of crack intros demonstrates how a community shaped by digital technology established a user culture in which the appropriation of commercial products was augmented with its own artifacts. This study provides a historical background that helps us to understand the roots of contemporary software piracy, which, apart from Rehn's (2004) work, is too frequently portrayed in a sensationalist light rather than objectively. There is a continuum of development from the Apple II crack screens of the early 1980s, to the C-64 and Amiga animated crack intros, and finally to the contemporary minimalistic NFO files of the warez scene to consider with different social and technical lenses. Because many of these objects are now preserved in online databases, it is possible to trace the roots of piracy-related phenomena using not only qualitative but quantitative methods.

Crack intros are still being created for contemporary computers and game consoles. These days, crack intros are separate executable programs that tend to refer to the original aesthetic code, consisting of scrolling text, group logos, and animated objects. In the 1980s, such visuals were largely dictated by hardware capabilities, whereas today's are mainly nostalgic artifacts, considerably different from the hardware-pushing endeavors of the scene pioneers.

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