Homebrew and the Social Construction of Gaming
Community, Creativity, and Legal Context of Amateur Game Boy Advance Development

by

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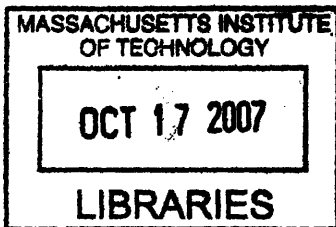MASSACHUSETTS INSTITUTE OF TECHNOLOGY

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ABSTRACT

This thesis challenges the common social construction of game development, which perceives the activity only within its commercial, corporate realm. As an exemplar of the many thriving amateur development communities, the self-identified "homebrew" Nintendo Game Boy Advance (GBA) development community is analyzed in-depth. This unique community is brought to the attention of scholars as an important intersection of game studies and amateur media studies, challenging the focus of game studies on commercial production.

The GBA homebrew community is studied from the personal motivational level to the social dynamics of the group. The analysis considers the blend of technological and cultural motivations brought to bear on the production and the content of the amateur games, and how amateur development facilitates skill acquisition outside of canonical academic structure, and opens access to professional mobility. The case study advances both historical and contemporary comparisons to other independent media communities. The thesis also examines discussions in the community around peer-judged competitions as a form of vernacular theory. The content of homebrew GBA games released into the community are further analyzed, with the construction of useful categories spanning genre, fan games, remakes, remixes, and tech demos. Nostalgia and parody in relation to game history are especially considered, as are demonstrations of technical skill ("tech demos") as a uniquely amateur practice.

The legal context of amateur GBA development is also examined. Nintendo maintains the GBA as a closed, proprietary system, and thus for homebrew developers access to information and legitimacy is blocked. Comparisons are advanced to historical examples of intellectual property enforcement in the emergence of corporate media in the 20th century. Amateur practice is found to be tangential to corporate interests, ignored both by the disinterest of corporations, and in blanket policies targeting piracy. Historical cases that legitimate reverse engineering of software are discussed for context. Thesis concludes that one cannot cleanly construct categories of amateur and professional as separate practices, and remarks upon the constant renewal and shifts in amateur development communities as new game platforms are released in the commercial market.

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Start

Amateur Game Development and the Game Boy Advance Homebrew Scene

What comes to mind when someone mentions video games? A likely image is the current generation of home systems played on a television; at the time of this writing, the Sony PlayStation 2, the Microsoft Xbox, and Nintendo GameCube – but brands are more or less guaranteed to roll over every three to five years as the industry "progresses" and offers a new slew of products to purchase. Or you might think of game franchises like *Grand Theft Auto* and *Splinter Cell*. Or, maybe you've heard about, or played, those increasingly popular "massively multiplayer" online games like *World of Warcraft*. If you don't identify strongly as a "gamer," you may play titles with mainstream and gender-balanced appeal, like *The Sims* series, or downshifting technologically, casual web games, like *Snood*. There are many other subgenres and modes of: dancing games, military simulations, sports, and so on.

What probably won't come to mind are games made by hobbyists, outside of the commercial industry. Games made for fun, and not profit, distributed among a group of like-minded amateur developers. You might be vaguely aware of someone you know who is making a game: a friend from college, your child, or the kid down the street. Maybe you're a professional software developer who dabbled with programming games as a kid but abandoned the hobby (or, like one former aspiring child developer I recently met, you work as a reviewer of literature and poetry for the Unitarian church). Making video games is still a highly specialized technical activity. Yet it is also more widespread today than ever before. Games have become increasingly commercialized – for multiple

years running, sales of video games have already outstripped Hollywood box-office sales. But from the first video game, created by MIT graduate students forty years ago, to the big business dominance of today, there has been a continual through-line of hobbyist development.

Games, in short, have been socially constructed as a commercial medium. It's taken for granted that the "real" games are those made by the companies with the most recognizable names, for the systems advertised online, on television, and in magazines. This has largely been true not only in the public view, but also within the gaming community. There are some encouraging exceptions: aggregator blogs like Slashdot Games cover stories involving amateur development one or two times a week, and events like the annual industry-sponsored Independent Games Festival help raise the profile of work by students, hobbyists, and unconventional start-ups. That doesn't mean hardcore gamers are always oriented towards the newest franchises. As successive generations of game platforms launch and fade, "retro" game nostalgia for systems from the Atari 2600 of the early 1980s to the Super Nintendo Entertainment System of the 90s is increasingly prominent in game culture in the form of inter-game allusions, t-shirt logos, cover bands, and journalistic references. But overall, gamers *do* tend to remain focused on the field of commercial production, old or new.

A Gap, a Wedge: Making Way for Amateur Game Studies

The limited social construction of video games described above has so far extended also to academia. Amateur game development is a doubly neglected topic of inquiry, caught in a gap between two fields which themselves have yet to transcend niche

status: game studies on the one hand, amateur media studies on the other. My research

aims to intersect these fields by studying in depth at one case study – the community of

hobbyists who create "homebrew" games for the Game Boy Advance (GBA) handheld

platform produced by Nintendo. By understanding the motivations, methods, industry

interrelations, and cultural reservoirs of these game makers, we can learn more not only

about how and why hobby-based game development functions, but also how alternative

media production communities form in relation to and in the shadow of established

commercial industries. In this sense the economic backbone of the medium is certainly

not to be forgotten; indeed, mainstream game platforms like the Game Boy Advance,

dominated by major electronics conglomerates, provide fruitful historical comparisons to

the rise of other creative media industries, particularly radio and film.

If the rapidly emerging area of game studies is newly coalescing, its disciplinary

identities, and therefore the implicit assumptions driving subject matter and methodology,

remain uncertain. Like film studies in the latter half of the 20th century, which was able to

legitimate itself within the academy by finding a home under the wings of English and

comparative literature departments, game studies has faced the institutional challenges of

visibility, respectability, and funding. Its home bases are disparate, but two prominent

approaches include the formalism of ludology, seeking to map a set of analytical building

blocks unique to the interactivity of games (not just digital games), and cultural studies

that interpret personal and social meaning in acts of gameplay.[1] Both of these approaches

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[1] For representative samples of work in ludology grounded, see Markku Eskelinen's "Towards Computer Game Studies" and Espen Aarseth's "Computer Game Studies, Year One"; a hallmark of this work is its focus on the underlying elements of games, such as quantifiable rules and feedback loops generated by player interaction. In cultural studies, Henry Jenkins' "Game Design as Narrative Architecture" is an example of an attempt to integrate interpretive and experiential theories from other media into games, drawing particularly on concepts of vernacular and cultural storytelling from Russian formalism and French theories of the everyday.

are valuable for my investigation, especially as points of reference against which to represent the distinctiveness – if and where present – of amateur game production. This is urgent because in game studies to date the focus has been almost exclusively on the traditional commercial channels of game development and distribution. A handful of scholars have written about the rich world of "mods" (modifications to commercial games, produced using tools provided by the original production company),[2] and occasional works delimited to an entire genre or form, like Montfort's *Twisty Little Passages*, will devote substantial consideration to subsets of non-commercial development, but the wider field of amateur practices has gone unmentioned.[3]

Another factor traditionally missing in academic game studies is a consideration of the socioeconomic conditions of production. Thankfully, this dimension is increasingly visible in the strands of political economy of Kline et al's overview of the industry, and in Castronova's economic assessment of the interface between game-world and real-world value in massively multiplayer online games. Study of political ideology as a determinant of game development is also gaining in popularity, as a point of confrontation in Schleiner's *Velvet-Strike* project, or as a subtext in Galloway's "Social Realism in Gaming." Because amateur game producers like the GBA homebrew community are non-commercial yet profoundly influenced by the commercial, my project can contribute to the further definition of these social and cultural through-lines. This is an important counterbalance to the ahistorical tendencies of formalist analysis inward towards the product, rather than the process. As Huhtamo accurately warns us,

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[2] On mods, see Postigo's "*Pong* to *Planet Quake*," and Huhtamo's "Game Patch" for examples.
[3] For instance, Montfort's book focuses on a particular kind of game/software (in this case interactive fiction, the game form of which are often called "text adventures"), but which also recognizes and fully integrates the role of amateurs into the analysis.

"comparisons across time are risky.... The student hackers that created *Spacewar*, considered the first computer game, have little in common with today's commercial game developers and even with game patch [e.g. mod] artists." Yet such historical bridges are also native to the activity of amateur (or commercial, for that matter) production and vernacular in their own self-representation, and therefore we must seek to engage them, if cautiously. In the GBA homebrew scene the past history of games, both as an interactive form and an industry, is a constant presence; in other words, as Huhtamo continues, despite "widely different cultural contexts... digital culture has already had time to create a history and a memory."[4]

In media studies broadly, the amateur is a crucial wedge category because it complicates the simplistic dichotomy between producers and consumers common in media scholarship. In our corporate dominated media environment, one of the central debates of media theory and cultural studies has been the relative agency of media consumers (the non-corporate public) in resisting the (assumed) hegemonic control of the major media conglomerates.[5] This argument plays itself out in political economy charting the increased control over distribution as corporations consolidate and make use of newly resurgent horizontal or vertical integration strategies (reprising past monopolistic and oligopolistic practices from the 19th and early 20th centuries).[6] Intellectual property scholars show the increasing power of copyright and the decreasing pool of the public domain, as commercial media producers fiercely suppress appropriations of their imagery or brands, using the juggernaut threat of legal force against small and vulnerable potential

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[4] Huhtamo "WEB STALKER SEEK AARON."
[5] For a pessimistic view of the impact of media and technology on society, see Horkheimer and Adorno; Postman; and Toffler. For a counterargument, see Neuman. For various mid-points theorizing the uses and effects of media, see Hall; Blumler and Katz; and McLuhan.
[6] See Bagdikian, McChesney.

defendants to prevent a judicial reckoning under the fair use provisions of copyright law.[7]

The consumer response is investigated in fan studies revealing the active engagement of

listeners, viewers, readers, and players as they re-write commercial storylines and media

worlds in their own prose fiction, original and remixed digital videos, and online game

personas.[8]

The prominence of fan media has been an important step in getting beyond the

producer/consumer divide; but it is insufficient to encompass the wider category of

amateur production. Fan work demonstrates how everyday people cluster around specific

existing commercial frameworks to create genuinely novel forms of participatory

community. But, built into its terminology is the presumption that these non-commercial

productions emanate a pre-established corporate universe, at least as a point of departure.

Fan trends are visible in amateur GBA game development, but true fan-based games

represent only a small fraction of the total output of the community – much of which still

engages commercial precedents of aesthetics and genre. The cultural studies elements in

my project have been more directly influenced by writers focused on the social

construction of emerging media technologies. Two particularly informative works have

been Susan Douglas' *Inventing American Broadcasting*, on the rise of radio, and Patricia

Zimmermann's *Reel Families*, on amateur film. Each looks at the rise of media forms

familiar in the 20th century as commercial industries, while also recognizing the equal

importance of amateur practice from the point of social and technological inception on. I

complement these historical analyses with comparisons to contemporary amateur

practices, such as zines, indie rock music, and open source software.

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[7] See Lessig, Coombe.
[8] See Jenkins, *Textual Poachers* and "Quentin Tarantino's Star Wars?"

The Game Boy Advance: From Global Game Industry to Hobby

The GBA is one of the most popular handheld gaming systems of all time, with over 65 million units sold through the end of 2004 (eclipsed only by the combination of its predecessors, the original Game Boy and revised Game Boy Color). In fact, continuing the benchmarking against Hollywood box office sales so common in journalism and scholarship about the game industry, one report placed Nintendo's total 2003 revenue from the GBA at $1.5 billion, higher than that of any single movie studio.[9] Nintendo released two physical versions of the system, the first, known simply as Game Boy Advance in the spring and summer of 2001, in Japan and the U.S. respectively. Less than two years following, March 2003 saw the company debut the follow-up Game Boy Advance SP ("Special"). The two models are compatible and differ only in their physical layouts. Both are small, comparable to a cell phone, held between two hands and with a 3-inch full-color LCD screen.[10] The SP was widely considered to be a partial response to consistent customer complaints about the original's dark screen, which lacked a backlight and depended on external illumination, creating particularly difficult play conditions for a portable gaming system. In addition to a more usable internally lit display, the SP added a rechargeable battery and a smaller, more pocket-friendly "clamshell" design only slightly wider than the screen itself. Especially given its smaller form factor, the SP has become near ubiquitous – it is usually not hard to spot one when taking public transit in an urban area.

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[9] "Nintendo GBA Beats Hollywood Blockbusters," NintendoHead.com.
[10] Despite its name, the earlier Game Boy Color had only a limited color range, able to display a maximum of 56 simultaneous colors. The GBA, by comparison, has a "tiled" graphics mode in which it can access 512 colors at once (via two 256 color palettes), and a bitmap mode in which the full 15-bit color range (32,768 colors) are available.

Fig. 1: The original Game Boy Advance from 2001, at left, and the sleeker, updated SP model, released 2003, at right.

Given its prominence, it is unsurprising that the machine has attracted a substantial community of amateur developers. These amateurs refer to their hobby as "homebrew" development, and collectively have made available several hundred titles over the past two years through the central community website gbadev.org. It's safe to assume that a great number of additional titles have not been made as visibly public, as with any amateur community it is difficult to estimate the total number of complete games or game demos created given the lack of any formal catalog.

The GBA hardware on which the games are played is proprietary and dedicated to games. This distinguishes GBA homebrew from much other amateur game development. A hardware platform is considered to be functionally "dedicated" if it is narrowly intended for a specific use or set of uses. For instance, a decade ago, a cell phone would have been considered a device dedicated to making phone calls, but with considerable diversification over the past few years into other forms of communications and information retrieval (text messages, news, sports and weather reports, calendars, games,

etc.) we can no longer think of cell phones as primarily dedicated to voice communications in the way the landline telephone has maintained this primacy.

GBA amateurs are not the first or the only community developing games for dedicated platforms: the original Atari 2600, launched in 1977, seems to have maintained the strongest amateur development community over time, and other popular systems of the past, such as the Nintendo Entertainment System (1985 U.S. release) and more recently the Sega Dreamcast (1999 U.S. release), have also garnered a large amount of attention from homebrewers. But they are one of the latest and most prominent. Developing for a dedicated games-specific console like the GBA as opposed to an open, multi-purpose platform like a personal computer introduces unique challenges of access that are pivotal in understanding the technological and legal bounds against which the homebrew scene operates. Nintendo seeks to keep the GBA a "closed" system – they do not publicly provide detailed information on how to create software for the system. Instead, they reserve such information for commercial developers whom they approve. For the non-professional homebrew scene, the primary consequence of this closed technological and social system is a lack of access. Homebrew GBA development takes place unofficially, without Nintendo's consent.

The homebrew scene is based almost entirely online, and revolves around a small network of websites. Because this practice is not a "standard" use of Nintendo's video game console, hobbyists are involved in a substantial amount of reverse engineering and tinkering with the system's hardware and technical internals, such as its ROM layout and BIOS.[11] Websites like the community flagship gbadev.org are therefore crucial for the

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[11] ROM, which stands for Read-Only Memory, technically is a label describing a level of data access, not a physical form or a file type. Colloquially, however, it has become a noun form indicating a block of data

exchange of such "hacked" technical information, program source code for operating the machine, and PC-based tools for manipulating graphics and sound data into formats usable on the GBA. One aspect crucial to understanding how homebrew GBA development differs from other kinds of hobbyist computer programming (for instance, on a widely understood and open standard such as the PC) is this intense focus on technical specifics – a product of Nintendo's close guarding of the machine, but also of its inherent technical limitations in comparison to "modern" computer systems of the past decade.

The GBA is also not the first handheld system to attract a significant following in homebrew console development. That honor goes to its Game Boy brand predecessors.[12] But even for earlier game systems such as the Atari 2600, homebrew development did not emerge as a practice with communal properties, with a sense of a shared membership and protocols of conduct and evaluation, until the mid-1990s. The rise of the internet as a commonplace service in middle-class families in the U.S. and Europe, explains this shift. While households harboring enthusiastic hobbyist programmers might be noticeably ahead of the technical adoption curve, 1994 provides a floor date before which the state of the telecommunications infrastructure and internet services made internet access difficult to procure. Pre-internet online networking services such as CompuServe were

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containing a complete piece of software for a standalone electronic console such as the GBA or similar video game (or other purpose) embedded device. In this usage, ROM may refer to data kept in a file on a PC, or (the same data, byte for byte) "burned" onto a hard cartridge for direct insertion into the GBA machine (both commercial and unofficial varieties of such cartridges exist). BIOS refers to software embedded within the machine itself (i.e. firmware), and controlling access to its basic functions. Information on ROM and BIOS usage is normally only given to official Nintendo developers, and must be independently discovered by unofficial hobbyists.

[12] The original Game Boy was released in 1989, and the brand has dominated the handheld video gaming market from that point forward. Game Boy Color, seen as a modest improvement technologically over the initial system, was released in 1998 as a means of rejuvenating the Game Boy brand in lieu of the more thorough overhaul that became the Game Boy Advance.

available, but these tended to be more centralized commercially and policed legally, and lacked the hacker spirit that characterizes homebrew game coding.

Some resourceful tinkerers working on game consoles like the Sega Genesis, NES and Super NES in the early 1990s did achieve and share some modest level of development via local area dial-up BBSes (bulletin board systems) and extended networks like FidoNet.[13] But there was not the communication and distribution infrastructure to provide the necessary levels of knowledge, code, and ROM sharing (licit and illicit). The same applied to handheld systems like Atari's Lynx and Sega's Game Gear – though nascent groups formed around these handhelds, they were not able to make sufficient technical progress, or establish strong enough social ties to sustain themselves. In the mid to late 1990s, online communities sprang up around homebrew development for older systems which generated a particular blend of cultural and technical interest, like the aforementioned Atari 2600. For instance, AtariAge, the central hub of 2600 hobbyist coders, claims the first publicly released piece of homebrew software for the machine dates to 1995.[14] This history is also in line with the formation of other hobbyist game and software development communities outside of homebrew console games; Montfort places the current incarnation of independent text-based

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[13] BBSes were computer programs that allowed users to dial-in remotely via a modem. Because of its dependence on normal phone land lines available to consumers, a BBS was usually tied to a local physical community (or more precisely, an area code within which long distance calling charges would not apply). Although only one caller could connect to the BBS at any given time, the board served as a community hub for the reading and writing messages, exchanging files, playing of games, and many other activities that prefaced the internet-based web today. FidoNet was a technical protocol by which BBSes in different locales could synchronize themselves to extend the range of communication to a network of smaller boards; FidoNet only connected a small subset of BBS, most of which stood alone.

[14] "Atari Age – Rarity Key," AtariAge.

interactive fiction at 1993, suggesting a wider resurgence of hobbyist interest in "obsolete" hardware and genres.[15]

When it was released in 2001, the GBA quickly joined this list of game systems targeted by hobbyists. But, unlike the commercially dormant Atari 2600, or interactive fiction, the GBA is a dominant product in the games industry today. This creates legal tensions around the necessary activities of reverse engineering that homebrew coders engage in; it can also lead to anxieties in aesthetic judgments over the feasibility of amateur media in relation to the "higher" production values of commercial industries. Programming the machine can also be seen by homebrewers as an attractive mode of learning technical skills in a hobbyist context that could be applied to professional game development later. And there is special aesthetic appeal: the system's 2D-based graphics, in opposition to the 3D presentation of today's home (e.g. non-handheld) consoles, make it the contemporary carrier of an older visual and gameplay style for which homebrew developers harbor a childhood nostalgia.

The History of Homebrew

In contemporary usage, the term "homebrew" usually denotes amateur software development for proprietary, dedicated systems, rather than open platforms that officially support user-driven programming. But there is a pre-history both of this terminology and the hobbyist practices out of which it arose. Before there were dedicated game consoles or a game industry – before personal computers even existed – the first computer game, *Spacewar*, was developed by graduate students at MIT in 1962. Notably, *Spacewar* was not conceived of as a commercial product, unlike major precursor media such as radio,

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[15] Montfort, *Twisty* 194.

film, or television. While the game's programmers, members of the famous "original

hacker" Tech Model Railroad Club (TMRC), did have an institutional affiliation with

academia and by this association (and the rare access to computer equipment it provided)

the military, they never devised their game in an entrepreneurial spirit.[16] This is quite

unlike an inventor like Marconi, who was initially an "independent" (both in terms of

wealth and affiliation) and something of an outsider in the scientific community, yet

always intended for his radio technology to be a commercial application. He quickly

established a company to patent and to market his point to point radio.[17] Likewise with

film, the Lumiere brothers in France quickly commercialized footage made with their

portable camera, and in America, Edison was already an established inventor notorious

for his business exploits and zealous legal protection.

As Levy notes, when *Spacewar* was created, there was no commercial market for

it – there were only fifty physical machines made that could run the game software, and

they were all owned by academic and government institutions.[18] The hallmark of

entrepreneurs, however, is that they *make* markets, as future Atari founder Nolan

Bushnell did when he created an arcade model of the game in 1971. Seemingly too

complex for the average player, his *Computer Space* failed, before he tried again and

wildly succeeded the next year, with *Pong*. The TMRC hackers who wrote *Spacewar*

simply didn't have this drive. The following decade, starting in 1975, the Silicon Valley-

based Homebrew Computer Club began meeting, the seedlings of the personal computer

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[16] The canonical account of the development of *Spacewar* is Levy 50-69.

[17] Marconi, it turned out, was dead wrong about the ultimate direction of radio. He imagined a business-to-business model of communication. In fact, in an extremely instructive lesson on the social construction of technology, the notion of broadcasting that we usually find synonymous with the radio medium (or at least as its default, dominant form) did not even arise until the 1920s. See Douglas *Inventing*, 3-28, 315-22.

[18] Levy 230.

revolution. It was here that the term "homebrew" seems to have come into its first prominent usage with regard to building and programming computer hardware and software. But also as important, it was here that tension over commercialization arose, as those who believed code should be shared freely clashed with those like Bill Gates and Paul Allen who felt that profiting from their work was not only the intelligent thing to do, but also their right.[19]

The Homebrew Computer Club was a meeting of hobbyist tinkerers. Though it was started with an explicitly pro-social and anti-corporate agenda, members in the club, and small companies outside it, inevitably began not only trading spare parts and code snippets but selling each other semi-standardized hardware kits – modems and memory cards – and operating systems that facilitated the programming process.[20] Legends such as Steve Wozniak and Steve Jobs emerged from the club to found Apple Computer, and Gates and Allen similarly benefited as a provider of software to group members. But the more common story was of casual entrepreneurs who made only modest profits, not as a way of getting rich, but simply to further fund their hobby. The Homebrew club prefaced the era of personal computers, and though it was never oriented towards nor very concerned with games, its lower-key entrepreneurs set the stage for the prominence of shareware and small business computer game developers in the 1980s.

It is the 1980s that provides the bulk of the history and mythology on which today's homebrew development draws. Key archetypes were born. There was the "kid in his bedroom" who turned his solo-made games into a sustainable business. One such figure, a celebrity especially in England, was Jeff Minter, also known as the Yak. Despite

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[19] Levy 229.
[20] Levy 213-21.

dropping out of university, Minter first traded and then sold his initially amateur games, enabling him to found Llamasoft, a company which published several well known titles for the popular Commodore 64 home computer.[21] A later, better known and more exaggerated variation of this narrative involves the founders of id Software: led by natural born programmer John Carmack, id's early-90s games *Wolfenstein 3D*, *Doom*, and *Quake* made the company's founding trio multi-millionaires, largely initiated from outside of the traditional framework of commercial game publishing. Another legend, at the employee level: Mark Cerny. At the age of seventeen, Cerny had already developed *Marble Madness* for Atari, considered a classic of 80s arcade games and the genesis of a whole subgenre of game design. As a company, Atari more than any other brought to the game industry an aura of a Wild West, anyone-could-make-it frontier. One of the company's key programmers, Howard Scott Warshaw, recounts, "[t]here were people there who were boatmakers, people who had been professional gamblers for a while….[t]here was one guy who literally, a year or two before he got to Atari, had been a bum in the streets of Berkeley."[22]

These are the reference points of game programming and computing culture against which the internet-enabled game console homebrew scenes of the 1990s formed. Like the physicality and technicality of the machine itself, these precursors shaped the expectations and aspirations of homebrew GBA developers. And as Huhtamo noted, any game programmer today is in a substantially different historical situation than that of *Spacewar*'s inception. Hobbyist GBA coders operate in a an environment of restricted technical access both tempting and threatening, an age of commercialization that has

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[21] Minter, "The History of Llamasoft."
[22] Warshaw, Interview.

raised the economic stakes of game development, a popular culture in which gaming (but not game-making) is mainstream – yet one in which legends of do-it-yourself designers abound.

Understanding the GBA Homebrew Scene: Approach and Structure

The remainder of this project is divided into three core chapters. Each approaches the GBA homebrew scene from a specific perspective in terms of both subject matter and methodology. In succession, the chapters cover: 1) community and social structures; 2) content and aesthetics; 3) legal and discursive positioning. Throughout all is an interleaving of the technical specificities of the GBA as a machine, seen as initiators and modifiers of personal and communal undertakings. In this manner each chapter also operates at a different level of analytical scale, zooming in and pulling back to reveal points of interest visible from one view but not another.

Chapter 1 is about the people of the scene; using quotes from the homebrewers themselves, mixed with the positioning of Nintendo as a global brand, it assesses the motivations and evaluative and communicative protocols that sustain the group. Chapter 2 theorizes the actual games and software produced by the scene. By reading the aesthetics and technical properties of amateur games against their social underpinnings, it attempts to organize the output of the community as a set of key design trends reflecting the situation of hobbyist production. Chapter 3 investigates the commercial game industry's relationship to homebrew development. Using legal precedents and discursive analysis, it seeks to place these amateurs into a larger framework of commercial domination of the game medium, and in relation to historical instances of social

construction in earlier media. Finally, the conclusion reflects further on future

communities and trends challenging the social construction of games in our society.

Level 1

Code, Community, and Compos

From Technical to Social Structures

When gbadev.org, the hub of the GBA homebrew scene, announced their annual

programming competition (or "compo") for 2004, an ambitious twist distinguished it

from previous events: instead of releasing entrants' games online, for free download, they

would manufacture and sell a GBA-compatible cartridge collecting the top selections.

Suddenly, hobbyist projects became potential commodities. Perceptions of quality shifted

– technical prowess, a cornerstone of reputation within the scene, was diminished in

favor of gameplay longevity. The stakes were raised as the members of this usually

inward-facing group pondered a mode of distribution that could position themselves in

front of a new, wider audience. There was a sense that the scene had to prove itself.

> *Marciano*: "If you're going to publish a cart, I think it sets a whole new level of
> expectation for the quality of a compo game."[1]

Tempers flared over the best way to conduct the contest, and anxieties about professional

standards of production percolated.

> *dj-ceejay*: "Just because the games are going to be sold doesn't mean that you can
> demand professional (read expensive) quality."[2]

The 2004Mbit competition made these tensions manifest, but their roots lie deeper, in the

personal motivations, commercial interlocking, and cultural resonance that support this

community of amateur media producers. By looking more closely at these foundations,

we can better understand why these hobbyists prefer competitions as a sustaining

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[1] "GBA Development Compo," gbadev.org.
[2] "What do you think of the games in compo," gbadev.org.

structure of their collective activities, what features they share with other non-professional and alternative media practitioners, which aspects are common to amateur video game development more generally, and those that are peculiar to the situation of GBA homebrew.

All amateur communities need ways of sustaining themselves as coherent groups, to establish reputations and identities, to become and remain visible to each other, and if desired, to outsiders. In a society that confers legitimacy on "professional" (e.g. for profit) work, amateurs lack the extensive scaffolding maintained by companies, professional organizations, and educational hierarchies (academic and vocational). This has a fundamental, qualitative impact on the kinds of conventions that allow outsiders to register their presence. Howard Becker uses the term "art world" to refer loosely to communities of media producers; an art world is "an established network of cooperative links" perpetuated, adapted, and put into practice by "all the people whose activities are necessary to the production of the characteristic works which that world, and perhaps others as well, define as art."[3] The strength of Becker's approach is its basis on a model of social construction rather than artistic essentialism. He can encompass not only "high art" such as fine painting and literature, but also the less formal and inherently ephemeral performativity of improvisational jazz, and the craft or folk creators who "do not care whether what they do is art or not... and find it neither demeaning nor interesting that their activities are not recognized as art by people who do care about such things."[4] Becker discusses the different conventions that hold a productive community together. Conventions govern the way resources are managed between members, the division of

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[3] Becker 34-5.
[4] Becker 37.

labor, the distribution of products, and the aesthetic standards and relative values that determine whether one member is christened an "artist" while another is simply a "clerk" in the underlying material supply chain.

Within hobbyist communities, evaluation and competition is different from that of the professional world. The capitalist system evaluates most professionals in terms of their commercial success; this may be a direct measurement (e.g. in terms of an individual's income) or an indirect one (the sales of their company in a work-for-hire capacity), but at base there is some monetary scale involved. Amateurs certainly engage in financial exchange as well – in the purchase of equipment and materials, in the maintenance of membership organizations, and in the cost of distributing their work. Zine authors, for instance, usually pay for paper and xerox production costs, though given the unofficial and "oppositional" nature of the form, commercial costs are sometimes circumvented through informal networks of cooperative subversion.[5] Zine readers will often send a few dollars by mail in exchange for the finished zine; payment may be made, but the amount is a rough calculation that approximates a perceived cost of personal time and material resources, nothing like the procedures used to position a product within the marketplace. In short, amateur media economics is not "rational" when viewed from a commercial perspective.

Bourdieu accounts for these alternate vectors of motivation by conceiving of the entire "field of cultural production" as an interrelation of multiple, autonomous fields, each governed by its own basis of competition, each maintaining its own internal "economy" of balance.[6] Monetary capital is often a dominant factor in the distribution of

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[5] See Nguyen, Duncombe for stories of such schemes.
[6] Bourdieu *Field of Cultural Production.*

societal power, but Bourdieu also described other forms of capital such as symbolic, cultural, and academic. Symbolic capital, for instance, measures relative degrees of prestige or reputation within a particular community. Cultural capital accounts for the concept of refinement or "distinction," the (perceived) ability to appreciate a type of culture, whether it is "high" fine art, or "low" cult media. This chapter maps the different forms of capital at play in the community of GBA homebrew producers. This requires starting at the level of individuals, understanding the specific motivations that drive their activities – symbolic, economic, and otherwise. From there we can begin to see the group as a coherent community, with emergent social structures designed to reinforce and convert between these different forms of capital. At each point of social articulation, I interleave an understanding of the technical conditions of production, because even in a media community almost wholly existent online, materiality is never far from consideration. Finally, having charted the outline of this practice, I return to the 2004Mbit competition, as a helpful and highly visible moment of self-reflection by GBA homebrew members.

Upgrading: Technical Mastery and Professional Mobility

In her discussion of the widespread practices of amateur radio enthusiasts in the early 20th century, Susan Douglas identifies "technical mastery" as the primary draw for hobbyists. Douglas situates these amateurs in their societal context, tying the desire for applied technical skills to the broader emergence of corporate American culture. In the new regime of office work the importance of physical strength was diminishing – while the recognition of more cerebral problem-solving was on the rise. For young males,

especially in urban settings, the knowledge one gained from amateur radio experiments tapped into a popular culture narrative of middle class upward mobility. In the era of the inventor-heroes Edison and Marconi, technical sophistication represented the latest application of the founding ideal of American ingenuity. Plenty of hype and in some cases real promise encouraged boys to adopt the radio hobby. Today, many homebrew GBA developers are similarly attracted to the field because of the double opportunity for technical mastery and – hopefully – professional entry that it provides.

A large percentage of GBA hobbyist developers are young, college age or high school students. Many are in university pursuing computer science degrees. In the traditional world of most academic departments, a chance to work on games, even if only on the side, is the fulfillment of a childhood dream. Others are even younger: *dagamer34*, a prolific contributor to online forum discussions, is a fourteen year-old from Texas. Predating GBA homebrewers by one-hundred years, radio amateurs followed a similar demographic: "primarily young, white, middle-class boys and men who built their own stations in the bedrooms, attics, or garages… most prevalent in urban areas."[7] Where the "radio boys" held informal club meetings over the airwaves to share advice – and boast of technical accomplishments – the GBA homebrew scene revolves around a handful of websites, such as gbadev.org. Online, coders seek and offer help in solving each others' programming problems from mundane, run of the mill setup errors to harnessing obscure and complex features of the GBA's graphics hardware. They exchange messages on web-based discussion boards throughout the day, sneaking a bit of time at work or school, and continuing on well into the night.

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[7] Douglas, *Inventing* 196.

Despite radio's novelty as a de-spatializing technology, amateur operators were physically based in cities, where economic and manufacturing growth was occurring. Similarly, despite the internet's ability to connect developers worldwide, GBA hobbyists remain concentrated in highly developed locales which also form some of the largest hubs of the professional game industry: the U.S. and Canada contain approximately 43% of gbadev.org discussion forum members, with Europe encompassing 44%;[8] Scandinavia is moderately over-weighted within Europe, comprising 19% of that sub-sample.[9] Interestingly, Asia represents only 4.5% of the scene despite Japan's long recognized presence as an epicenter of innovation in game design.[10] Early radio and GBA hobbyists both emphasize physically isolated activity in a domestic space: such radios used headphones that meant only one person could listen at a time, while GBA homebrewers out of necessity invert the "intended" use of the system as a portable device by tethering it to a home PC. The descriptions of "garage" or "bedroom" coders in today's popular

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[8] Obtaining completely accurate information on the geographical distribution of the community is challenging, as only a minority fraction of the over 3500+ registered discussion forum members on gbadev.org list their locations. (In addition, casual readers may access the forum without registering.) I drew my statistics from the 674 members who did list a physical location as of 01 Oct. 2004. If U.S. states are given equal billing with non-U.S. countries to account for their large concentration, the top 5 locales of gbadev.org forum members are: 1) United Kingdom; 2) Canada; 3) Sweden; 4) California; 5) Netherlands. Note that this informal analysis also excludes internet traffic through channels outside of the gbadev.org forums, such as gbadev.org website hits, IRC (chat) channels, and other community websites and forums. Still, I believe these counts give a reasonably accurate sketch of the scene, given the dominance of the gbadev.org forums within it.

[9] Though this deserves a more in depth cultural and economic analysis, I believe this is partially due to the prominence of the Scandinavian region in the "demo scene," a form of multimedia hobbyist programming that originated in the 1980s and which serves as an ancestor of both the GBA homebrew scene and the mod music scene described by Lysloff.

[10] Given the greater degree of mainstream cultural acceptance (and game designer celebrity) enjoyed by games in Japan, it is curious that homebrew game development for consoles has not become a widespread phenomenon there. There are, however, notable Japanese communities of amateur computer game development based around other specific forms, such as the overhead role-playing game (RPG) genre, 2D side-view fighting games, and space-themed shooters in the tradition of *Gradius, R-Type,* and *Ikaruga*.

press thus have a discursive continuity with the public imagination's vision of the urban radio amateur at the turn of the century.[11]

The upward mobility of last century's radio boys described by Douglas is not perfectly analogous to the position of amateur game developers today. Radio was a medium not yet commercialized, and young amateurs were often idolized and idealized by the popular press. As government regulation arrived, hobbyists felt the pressure from the encroaching interests of industry and the military, and the practice was marginalized into the quirky world of ham radio that most of us are familiar with – or perhaps even only vaguely aware of – today. GBA homebrewers start from this position of weakness: game development is commercialized and consolidated, and hobbyist visibility in public is low.

Lord Graga, one member on gbadev.org, is typical of the community's demographic but a technically skilled standout member of the scene. In 2004, his games *Llamabooost* and *Fred Firefighter* received first and second place in coding competitions held by the website PD ROMs, which has also interviewed him about his GBA coding experience. *Lord Graga* lives in Denmark and is sixteen years old. His success is indicative of the egalitarian nature of the scene, which like many other non-professional programming communities considers itself a meritocracy, irrespective of age; in the open source movement, projects such as the influential Apache web server and Debian Linux operating system are prominent examples.[12] There is, unsurprisingly, a certain pride in

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[11] Douglas, *Inventing* 196-207. The social construction of "the garage" as a site of hobbyist practice, particularly in American culture, deserves its own in depth study. Besides amateur tinkering with radios and computers, it resonates with other fields like the "garage rock" movement of the 1950s and 60s. The garage label also has strong computer-oriented roots in the creation of the original Apple computer in the mid-1970s (Levy 253).

[12] Mazzochi.

being an equal member of such a group in one's teenage years. *Lord Graga* playfully proclaimed "I am the king of the world. 16 years old on the first [of] [M]ay, and I have already won a compo :D"[13] In another discussion thread, a fourteen year-old briefly claimed bragging rights – until he was usurped by another coder (astonishingly) only twelve years of age.

Fig. 1: Lord Graga*'s first place entry* Llamabooost, *from the PD ROMs Coding Competition 2.*

Beyond the technical specificities of the GBA, or even game development more generally, the homebrew scene is a way for young hobbyists to learn the entire practice of programming outside of the formal context of the education system. *Lord Graga*'s experience is a prime example:

> "I came into the GBA scene with no idea about C coding, compilers, assemblers, registers, and so on. I started out… thinking 'I can do this' all the time… it just went on from there, and today I am pretty good with C, somewhat good at ARM ASM, and I understand most of the GBA hardware completely."[14]

As a student at the pre-college level, *Lord Graga* says he doesn't have any local friends who enjoy programming. The function of internet-based programming communities as a social conduit is echoed by others, like *sajimori*, who says he "[s]tarted coding years ago when I moved to a new city and didn't know anybody."[15] Demonstrations of technical

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[13] "Everybody's Profession???" gbadev.org.
[14] Lord Graga, Email Interview.
[15] "Everybody's Profession???" gbadev.org.

skill generate a symbolic capital of reputation within the scene. *Lord Graga*: "I only do it for the pleasure of 'geek respect.'"[16] This phenomenon, a crucial driver of motivation, is similarly captured in open source communities by the term "egoboo" (short for ego boost).[17]

Yet in the overwhelming majority of cases, GBA student developers also see their homebrew experience as a chance to break into the professional games industry. As *Lord Graga* wryly put it, "I plan to go pro, but it will probably be for a later handheld, since I still need 9 years of education."[18] Getting hired as a "legitimate" game developer is a tall order, and most aspiring programmers know that job listings at any reputable company demand hands-on technical experience – with established, commercial game platforms. Newly minted college graduates with bachelors in computer science face a Catch-22 when trying to get their first game programming gig – if you haven't *already* demonstrated your knowledge of industry standard technologies, you don't meet the minimum qualifications. Homebrew coding provides that technical mastery. This recognition can go both ways: several professional GBA development companies recruit (at no cost) on gbadev.org, posting open job positions.[19] This cooperation between aspiring amateurs and the commercial media industry is also common in other communities, notably hobbyist and fan-based digital filmmakers and film students.[20]

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[16] Lord Graga, Email Interview.
[17] Kelty.
[18] "GBAmbitions," gbadev.org.
[19] Companies who have posted such job listings on gbadev.org between July 2004 and February 2005 include Big Blue Bubble, Backbone Entertainment, DC Studios, Handheld Games, and Helixe.
[20] Jenkins, "Quentin Tarantino" 287.

Low-Level Programming: Situating Technical Mastery

Technical discussion topics on gbadev.org outnumber those relating to graphics,

sound, game design, and story combined by a ratio of roughly five to one.[21] When asked

why they program for the GBA, homebrewers will commonly mention technical appeal:

> *Lord Graga*: "…the hardware itself is extremely interesting to a lot of people. It's
> simple, yet you can do some rather advanced things with it... It's a certain
> satisfaction to sit down and start writing a game/demo/whatever for this machine,
> since you are so close to the hardware."[22]

> *dagamer34*: "You have complete control over the hardware."

> *ScottLininger*: "I started GBA programming about a year ago after my wife
> bought me an SP and I fell in love with the thing."

> *notb4dinner*: "I bought my GBA SP to kill time on the train and it was just such a
> cute little machine I couldn't help but have a go at programming it. Pleas[a]ntly
> it's just as cute on the inside as outside."[23]

The feminization of technology in this language, traditional to the vernacular of male-

oriented hobbies such as car hot-rodding, shows a bleed into fetish, as the external

aesthetics of the plastic form blend with the allure of its internal electronics.

Technical mastery can be distinguished from the more general category of

programming skill by its insistence not simply on the behavior and construction of

software (in this case computer or video games) but more importantly on the underlying

electronics hardware that physically enables that software to run. This is an important

distinction – the practice of software development is increasingly dominated by "high-

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[21] This is based on my own count of forum topics and posts, conducted 05 Jan. 2005, at
<http://forum.gbadev.org>. Though one might argue that this unscientific survey may not accurately reflect
the distribution of efforts in the scene, looking at these posts shows little qualitative difference in length,
language, or content between those dealing with technical vs. non-technical topics. Again, given the high
degree to which public discussion in the homebrew scene is confined to these hub websites (e.g. there is
little in the way of additional, outside channels which might support less technical talk), we can at least see
that technical subjects are the most prominently placed and visible form of communication between
members. Still, this is meant to be a high level view of the community, not a definitive quantitative analysis.
[22] Lord Graga, Email Interview.
[23] "Everybody's Profession???" gbadev.org.

level" tools that direct the computer's actions independent of any knowledge of specific hardware. Object-oriented programming languages such as C++ and Java, and software APIs (application protocol interfaces) are built on a principle of abstraction away from hardware, emphasizing *what* behaviors are possible, not *how* such behaviors are carried out by the machine.

Creating software for a machine like the GBA carries a prerequisite of technical mastery that necessitates a return to the focus on hardware more common in an earlier era of game programming. Today most common game development platforms available to hobbyists follow the trend of de-emphasis on hardware specificity in favor of portability (i.e. the ability to run a program on multiple kinds of machines); this is true of both commercial packages like Microsoft's DirectX, and the popular open source Simple DirectMedia Layer (SDL) library. There is much to recommend high-level software development tools and methodologies: they facilitate the reuse and sharing of source code and algorithms, allowing programmers to build on the accomplishments of others and to work more effectively in groups; they can be much simpler to maintain over time as technologies evolve, and they make it practical to swap out one component of a system without affecting the whole; and they reduce the amount of knowledge required of any one programmer by isolating it into units. But while these features of high-level design may be favorable to the goals of both academic computer science and commercial software development, some hobbyist game programmers find their motivations elsewhere. Efficient professional software management practices value the ability to capture past solutions and make them accessible to others within the company –

homebrew GBA developers, by contrast, regularly "reinvent the wheel" by duplicating

behaviors normally thought of as basic building blocks of programming.[24]

Technical mastery speaks to different desires, emphasizing a process of tinkering

and discovery over the "blind" reuse of abstraction. The label of "low-level"

programming, often used to describe this kind of machine-focused activity, is particularly

apt in its suggestion of spelunking. Indeed GBA homebrew development involves

exploration and mapping, as demonstrated by exhaustive documentation projects like

GBATEK that uncover each and every capability of the GBA's hardware through lengthy

trial and error.[25] While a high-level approach uses textual representations to indicate or

invoke behaviors, the low-level equivalent will trigger those same behaviors by directly

tweaking numerical values within the computer's memory. For example, the GBA

provides hardware support for what are known as sprites, rectangular blocks of pixels

(usually representing an object or character within a game) that can be placed on screen

at different positions, sizes, orientations, and depths in relation to one another. Sprites are

essential to almost any 2D video game built for a dedicated game console. In a simple

case, a programmer might wish to make all sprites visible or invisible at some point

during gameplay (for instance, sprites might be turned off when the player pauses the

game).

One simple way to do this would be via a high-level function call such as C++

would provide, by including the line "setSpriteVisibility(FALSE);" within our source

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[24] An example from my own experience in GBA programming includes the need to write a conversion function for changing a numerical integer representation into a textual (e.g. string) format so that it could be displayed on the screen as a series of individual characters rather than as a single number within the machine's memory. For example, the number 5892 is processed using mathematical functions into its standalone components, '5,' '8,' '9,' and '2.' This is behavior, provided with most implementations of the C language that few programmers would expect to have to write in a commercial context.

[25] "GBATEK Specifications," no$gba.

code to make sprites invisible. But GBATEK specifications tell us that in order to

accomplish the same task on the GBA, we must manipulate the "display control register"

(known as DISPCNT for short) by changing its numerical value. A register is a kind of

raw interface to the computer's processor, where pieces of data are stored and retrieved.

First, we find that DISPCNT is located at address 04000000h inside the GBA's

memory.[26] DISPCNT is a register composed of 16 bits (each of which can be set to 1 or 0,

true or false); together the 16 individual bits make up one large number stored in the

register. To make all sprites on the GBA screen invisible, we must set bit 12 of the

DISPCNT register to 0 – but we must be careful to avoid disturbing the other bits in the

register, or we will inadvertently affect unrelated aspects of the screen's status, since

altering one bit changes the entire number. So we must first read the register's current

status, "mask" out the bit we want to change, and, after figuring out the new value for the

entire register, write the new number to its location in memory. While the high-level

equivalent at the start of this paragraph may still appear esoteric to the technically

uninitiated, the general difference in "level" and effort between the two methods is likely

clear.[27]

The low-level nature of GBA programming means the community values the

programming process equally to – if not more so than – the final product. Register

manipulations and similar activities are error-prone, and in order to succeed the group

must be willing to share not just information but also encouragement and appreciation.

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[26] Numbers with an '-h' postfix indicate hexadecimal (base-16) as opposed to "normal" base-10 numbers used in everyday life. While this distinction matters technically, it is of little consequence for the non-technical reader, other than to contribute to the overall sense of numerical manipulation present in low-level programming.

[27] It is worth noting that one can make use of high-level programming tools like C++ on the GBA; doing so, however, still requires understanding the low-level equivalent, which is then "packaged up" into a high-level function call serving as shorthand.

Consequently, small technical victories that might be unimpressive to non-homebrewers are praised by programmers who themselves had to make the same, painful initial steps toward competence. The scene must be tightly knit as a group of insiders. Yet it is also a hobby with transient membership, open to serious outsiders seeking entrance:

> *grumpycat*: "What makes it cool is that we're all enthusiastic. Beginners welcome - we all start somewhere… and when you get your first single color sprite on the display, moving up and down with the buttons, we'll all cheer you on."[28]

This communal urge of self-reinforcement, of "just wanting to give back to the community," is also a linchpin of many open source software development.[29]

When GBA homebrewers speak of being "close to the hardware," or having "control" over the machine, they refer to this low-level, numerical programming. It is important to note that low-level operations are not necessarily more mathematically complex than high-level ones. Low-level manipulations of the GBA's CPU registers and memory can involve a great deal of math, but usually only arithmetic, and rarely as difficult as a high school trigonometry class. Nor does it involve hands-on physical alteration of electronics (though some crossover homebrewers with a special interest in electronics do modify the hardware itself). Instead, low-level GBA homebrew stubbornly refuses to go the way of "pure" software, occupying a mid position between program code and machine hardware, and reminding us of the roots of computer programming in electrical engineering. *Lord Graga*: "Working without any kind of API is raw geek satisfaction."[30]

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[28] "Homebrew games on the DS," Warp Pipe.
[29] Kelty.
[30] Lord Graga, Email Interview.

The Sociotechnical Spectrum of Homebrew Game Development

Two dimensions of the GBA in particular help us to map its relationship to other kinds of amateur game development: the qualitative nature of its technical engagement as described above, and its cultural context as a commercial product and driver of one of today's foremost media industries. From a technical perspective, there are other game platforms with substantial homebrew communities that offer both greater and lesser degrees of complexity and challenge. And this distinction holds true socially as well – other systems do not provide the same motivations of professional mobility and transgressive reverse engineering that are central to the GBA's appeal.

One especially vibrant non-professional game development practice is "interactive fiction," or IF, a general term that encompasses the popular "text adventure" games of the late 1970s and 1980s. [31] Users interact with a work of IF textually, reading English (or other natural language) descriptions of an environment, and then typing responses that cause certain actions to occur within that simulated world. Nick Montfort identifies two core components that set IF apart from other electronic forms: its world model (the mechanisms by which the computer contains and maintains a textual representation of objects and surroundings), and its natural language parser (responsible for analyzing the words inputted by the player). [32]

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[31] Interactive fiction is the preferred term because of its breadth. Not all IF programs are entirely game-like in that they may not have directed goals or a measurable score, for instance. Many also emphasize their literary construction, suggesting more appropriate comparisons to poetry or playful non-game forms such as riddles. Several IF programs (or at least their text adventure subset) are nonetheless generally considered to have been quite important to the history of video games and the development of the form. Infocom, the publisher of the best known text adventures such as *Zork*, *Deadline*, and *Planetfall*, enjoyed strong financial and critical success in its early and mid-80s heyday. For a history and theory of IF, see Nick Montfort's *Twisty Little Passages*.

[32] Montfort, *Twisty* vii-ix.

Unlike the GBA's low-level programming, IF creators commonly use high-level

toolkits and specialized scripting languages that provide significant scaffolding,

eliminating the need for consideration of the hardware on which the program will run.[33]

Software toolkits are also popular in other hobbyist development communities, like

adventure games and RPGs, genres focused on storytelling and "world building," where

toolkits save time by facilitating graphics, sound, or input programming.[34] In contrast,

though GBA homebrew may privilege certain genres for both technical and aesthetic

reasons, it does not draw on generic, user interface, or gameplay conventions as core

values; it is by definition machine-specific.

While IF provides an example of a community less oriented towards technical

mastery, we should be careful not to overestimate the GBA's prominence in this regard.

The GBA is certainly not the video game console that provides the most "extreme" or

challenging target for developers inclined towards technical intricacy and immediacy.

Among game consoles that have sustained popular homebrew development communities,

the Atari VCS/2600 has the strongest claim to that title. Dominant in the home video

game console market of the early 1980s, the 2600 is a notoriously difficult machine to

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[33] This approach has clearly been a conscious decision, established by the pioneering text adventure development company Infocom with its first commercial release of the game *Zork* in 1980. Because Infocom was facing a fragmented and quickly evolving personal computer market, they decided to code their products not for a specific hardware platform but instead for an intermediary program also created by them, the Z-machine. They then created variants of the Z-machine for each existing and emerging computer platform they wished to target commercially (Montfort, *Twisty* 126-7). When non-commercial independents began writing their own interactive fiction in earnest, they followed the hardware-independent toolkit route as well, building systems like TADS (The Adventure Development System) and Inform, the latter based on the original Z-machine (Montfort, *Twisty* 196-7, 202-4).

[34] For instance, AGS (Adventure Game Studio) supports a lively scene of graphic adventure makers in the style of Sierra and LucasArts' commercial hits like *King's Quest* and the *Secret of Monkey Island* from the early to mid-1990s (heirs to the text adventure). The AGS website is a good source of information on this community, <http://www.adventuregamestudio.co.uk>. Another such example is the Japanese program RPG Tsukuru (in English, "RPG Maker"), a commercial product for Windows that supports the creation of many amateur-produced role-playing games in the 2D, top-down perspective common to the genre on Nintendo's SNES console in the mid-1990s. (Thank you to game researcher Kenji Ito for alerting me to this group of amateur RPGs; email to the author, 19 Mar. 2004.)

program, and its harsh limitations have been discussed by Wolf ("Abstraction") and Wen. For instance, while the GBA has 288k of general purpose RAM, the 2600 has only 128 bytes – three orders of magnitude less. Similarly, the GBA has 96k of video-specific RAM; the 2600 essentially has none at all.[35] The 2600 was viewed as formidable even in its 1980s heyday: "There's a certain class of programmer that can deal in microcode like that. If it were easier, we wouldn't have these programmers, because they'd be bored. The VCS is an absolute challenge."[36] Yet twenty years later, the 2600 homebrew scene is thriving, with one of the most developed amateur communities of any game system.[37] And there is evidence that GBA coders are also aware of the relative technical "luxuries" they enjoy, as revealed by a recent gbadev.org forum thread regarding 2600 homebrew, aptly titled "And you think you've got it rough…"[38]

As a commercially active product, the GBA also offers its homebrew programmers a professional relevance absent in older formats such as interactive fiction or the Atari 2600. To illustrate, while the 2600 uses a decades old (and commercially inactive) CPU, the GBA's ARM processor is one the world's most popular for embedded devices, and thus the skills involved in programming the GBA are applicable not only to the games market but to other major areas of the software industry.[39]

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[35] The 2600 has only a crude system for storing on screen graphics through special registers that approximate a very small amount of video RAM with a handful of pixels. For example, the PF ("playfield") register has 20 bits, each of which represent one of 20 pixels for the currently visible scanline of the background image; each pixel has to be either a foreground or a background color, and all 20 pixels shared the same two color choices. "Stella Programmer's Guide (Unofficial HTML version)," Alien Bill Productions.

[36] Steve Mayer, quoted in Herman, "Atari VCS" 148.

[37] For a well rounded techno-journalistic overview of amateur Atari 2600 development, see Wen.

[38] "And you think you've got it rough…" gbadev.org.

[39] The Atari 2600 used a special, reduced version of Motorola's 6502 processor, a linchpin of the computer and game industries in its day (variants were used in Atari and Commodore's home computers, the Apple II, and the Nintendo Entertainment System), yet long abandoned in mainstream commercial development.

The GBA's prominence among today's gaming systems brings with it another cultural attraction: Nintendo closely guards access to its proprietary system, introducing a seductive element of transgression to amateur creation of GBA software. Lacking official documentation, the homebrew community must reverse engineer to decipher the machine's inner workings. This collective puzzle-solving again reinforces the importance of information sharing within the scene.

The powerful function of transgressive coding as a personal motivator is especially evident in related homebrew communities like that surrounding Microsoft's Xbox. There is virtually no technological distinction between the "closed" Xbox and an "open" high-powered Windows-based PC. Only its hard plastic case designates its status as a dedicated game system. Yet from the minute Microsoft released its console in 2001, it went from "just Windows" to a significant target for homebrew developers and hardware tinkerers. It even spawned a published book, Huang's "Hacking the Xbox: An Introduction to Reverse Engineering," which uses the console as a jumping off point to generally discuss technical and social aspects of development for and modification of proprietary systems.

On the other end of the spectrum of access is the GP32, a handheld game system made by the Korean company GamePark. The GP32 shares a number of characteristics with the GBA: it is a commercially active product roughly the same physical size, and is computationally similar (also using an ARM processor) yet more powerful. The GP32, however, as a product from a minor player in the game industry (essentially unknown in the US), is an open system that actually *encourages* amateur development, providing documentation and programming tools for free on its website. And indeed the GP32 does

support a substantial homebrew scene, roughly equal in size to that of the GBA. Unlike GBA programmers, GP32 coders enjoy the ease of access.

The GBA, Xbox, and GP32 are each single players in a wide field of homebrew console development that includes dozens. No single technological or social quality trumps the permutations of allure created by these various machines. Just as there are cultural reasons beyond the technical that drive the large community of Atari 2600 homebrew coders – the system's firm entrenchment in video game history and its distinctly limited techno-aesthetic style engender a palpable nostalgic pull – the GBA's enabling of professional mobility is a core aspect of its appeal, and its transgressive dimension "adds a bit to the thrill."[40] Chapter 3 of this thesis is dedicated to examining in greater depth the substantial legal issues which arise when amateurs and other "unauthorized" developers seek access to closed corporate system such as the GBA.

Production Nostalgia: The Solo Game Coder

In addition to the younger, aspiring professionals of the GBA homebrew community, there are a large number of scene members in their 20s, 30s, and occasionally older who are drawn to the GBA platform by nostalgia for single-person production. For these developers, a narrative of the games industry and medium stirs their passions as much as any desire for technological mastery. They believe that GBA game development is still technically feasible – especially for a single individual – where the rest of the current generation of home consoles, the Sony PlayStation 2, the Nintendo GameCube, and Microsoft's Xbox are placed out of reach. These nostalgic developers are often as strongly oriented towards industry practice as those seeking professional

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[40] Lord Graga, Email Interview.

employment, but their focus represents a shift in emphasis that one might term political. Their primary concern is not in joining the "already professional" space, but rather an underlying insistence that amateurs ought to have the capabilities to stand shoulder to shoulder with the commercial industry.

If accessibility to game production has decreased, it is at root a result of the industry's linking of aesthetics to high technology:

> The game industry is completely technofetishistic, with the value of games typically being judged on their technical merits... As games get bigger, they get more expensive. And the most expensive games set the standard for production values in all games. Games are complicated to produce and low-fi approaches are frowned upon. It's possible for a band to record an album in a garage over a weekend. But not so with games.[41]

Perhaps more so than other mutations in the mode of game production over the years, the transition from 2D to 3D-based graphical modes of has pushed the barrier to entry for amateur development past a critical point. With the emergence of 3D as the dominant reference point (cemented around 1996 with Sony's original PlayStation), mathematical prerequisites for graphical programming leave the arithmetic of low-level coding far behind; and the necessary time investment for graphics assets such as 3D models, and particularly animation, grows exponentially compared to the older 2D bitmap-based systems. This applies to PCs as well as dedicated consoles:

> *Lupin*: "I program the GBA because there is no real chance to program games for PCs unless you're a real math freak."[42]

Given the existing prominence of technical mastery within homebrew development, these changes must be understood as less about the technology becoming "too hard," and more about it becoming *too big*. The sheer scale of work required to power a machine like the

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[41] Zimmerman, "Independent Games" 125.
[42] "Everybody's Profession???" gbadev.org.

PlayStation 2 makes the prospect of a successful, complete amateur game produced by a single developer virtually unthinkable. On top of this magnification, the games industry has undergone intense consolidation over the past several years. While strict gatekeeper control over publishing has a long history in the industry (reaching its most notorious peak with the Nintendo Entertainment System in the mid-1980s), the technological curve combines with industry economics to make games produced by individuals or even small teams of "outsiders" exceedingly rare.

For members of the scene old enough to have experienced these changes, the GBA represents a possible return to a "lost age" in which the division of labor by specialization was not yet necessary, and production by a single individual was not only plausible but the norm. On gbadev.org, scene developers express concern over the technical feasibility of solo production overlaid by a barometer of the hobbyist's potential to match commercial practice:

> *Marciano*: "I believe that the GBA is a games platform in the style of the old Commodore 64 and other machines of that mid 80s era, in that it's available to a generation of homebrew coders and the programming and art requirements are such that [...] it's possible to realistically produce games on par with commercial efforts. I was a teen when the Commodore 64 was around, and my friends and I used to write games... Little things, nothing commercial, but it was fun and we learned about machine code, raster interrupts and sound. It was a great time... but we never considered the possibility of being able to actually release something... Homebrew kids in their bedrooms and dorms don't have a chance [today]... I see things going the same way with hand-helds. I think the march of technology is inevitable. 3D is coming big-time, and with it the art volume and the production costs are going to grow beyond the homebrew crowd again. The GBA, and this generation of homebrewers, may be the last time such a community comes together with a real ability to demonstrate talent at a commercial level."[43]
>
> *sajimori*: "I was too late for the days of 8-bit computing, and by the time I got started you had to compete with id Software [developers of *Doom* and *Quake*].

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[43] "GBA Development Compo,"gbadev.org.

GBA seems like my last chance to participate in a market where simple but high-quality games are still viable."[44]

If radio amateurs offer an historical point of reference, the leap of magnitude in technical complexity from radio to television could be seen as an analogous moment of bifurcation (and sharply decreased crossover) between hobbyists and professional practitioners. In contemporary alternative media, there is a related scenario in the rise of an indie comics movement that emphasizes individualistic production and control, in opposition to the team-driven "factory methods" of mainstream publishers like Marvel or D.C.

Yet all nostalgia also involves creative re-imagining. The technological and economic changes in the industry are real, but while video games in the 1970s and early 1980s included a great deal of titles (from landmark innovations to run-of-the-mill clones) created by developers who started as hobbyists, it remains unclear just how much greater the potential for a "kid in his bedroom" to publish a commercial game was, even then. While *Marciano* remembers the time when he and his friends were able to code their own Commodore 64 games, they did not pursue commercial outlets because, as he himself recounts, they did not "[know] the right people, or [have] access to an audience;" in fact, professional publication did not even occur to them.[45] Though he remembers the activity itself fondly, he discounts the resultant games as "[l]ittle things, nothing commercial."

Similarly, while commercial game development today overwhelmingly originates within the already-professional space, the GBA is clearly not the only platform suitable for amateurs to compete within the commercial realm. One example of such a platform would be Macromedia's Flash. Cheap, technologically and artistically accessible, Flash has arguably been a much more successful parallel to professional practice, in 2003 and

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[44] "Everybody's Profession???" gbadev.org.
[45] "GBA Development Compo," gbadev.org.

2004 yielding the commercial distribution of games such as *Alien Hominid* (for the GameCube and PlayStation 2), and *Zoo Keeper* (for the Nintendo DS), originally web-based offerings created by small, "indie" developers.[46] Flash also supports a number of modestly sized for-profit development teams looking to provide a viable alternative to the mainstream game industry such as gameLab,[47] and Large Animal Games, both drawing on the New York graphic design talent pool. Besides Flash, there are other initiatives like GarageGames, started by former industry insider Jeff Tunnell; the company encourages independent and "non-professional" game development by providing a commercial-quality 3D game engine for a relatively low fee.[48]

These examples are still the exceptions, but they help to demonstrate that the story of a "lost era" of game development's past and a "last chance" in its present serve as much as social drivers of the GBA hobbyist community as they are "objectively" validated assessments of industry economics. There is nothing new about anxiety over increasing industry bureaucracy and production scope: in 1979, early programmers at Atari lamented its takeover by executives who knew nothing about games; and again in 1993, Sierra founder Ken Williams noted that the number of people credited on a typical project had already reached fifty.[49] There is also evidence that some companies understand and appeal to this nostalgic narrative framing in their recruiting strategy. A

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[46] The original *Alien Hominid* is available at <http://www.newgrounds.com/portal/view.php?id=59593>, accessed 11 Jan. 2005. The original version of *Zoo Keeper* is available on the Japanese Shockwave site, <http://jp.shockwave.com/games/puzzles/zookeeper/zookeeper.html>, accessed 11 Jan. 2005; *Zoo Keeper* was also published in Japan commercially for the PlayStation 2, as *Zooo*.

[47] gameLab was founded by Eric Zimmerman, an industry critic and proponent of indie games cited earlier in this chapter.

[48] Tunnell was the founder of Dynamix, a highly successful development company in the early 1990s, creating well known titles like *The Incredible Machine* and *Betrayal at Krondor*. Dynamix, based in Oregon, was purchased by Sierra and its office eventually closed, making him a casualy of industry consolidation who can speak from experience first-hand.

[49] On Atari, Cohen 70-3; on Sierra, Levy 435.

recent job posting from Mobliss, a company developing games for cell phones – another

potential platform for solo production – asks:

> Do you long for the days when games were simple, fun, and emphasized
> gameplay over photorealistic 3D graphics? Are you interested in working in a true
> frontier for games and applications? ... Desired Qualifications: ... Fond memories
> of your Atari 2600, C=64, Apple][, NES, Amiga, Atari ST.[50]

This corporate advertisement is strikingly similar to that of the GBA homebrew scene:

> *Daniel Andersen*: "I have been coding since the C64 and I am happy that
> Nintendo etc. is around to bring alive those happy days when programming was
> fun! :)"[51]

This nostalgic temporal device has been familiar in indie music as well since at least the

1980s: "Chronology is an important framework for the narrative, especially as it charts

the significance of the music's movement from the margins (when it was 'authentic') to

mainstream recognition (its moment of perceived decline as artists and institutions 'sell

out')."[52] Zine authors in the punk music community likewise re-image a "golden age of

the Scene [that] is based on trying to escape the realities of the present."[53]

Branding: Buying In and Selling Out

Though it is well intentioned and reflects actual alterations in the mode of game

production, there is an internal inconsistency to rhetoric that sees the GBA as the last

bastion for solo homebrew coders. It is a product of the cultural prominence of the GBA,

and more generally Nintendo, as a brand. Implicit in these nostalgic remembrances is an

argument (sometimes explicitly stated) that game development should be reasonably

accessible, and at some level, commercially viable. Yet as discussed there are plenty of

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[50] "Mobliss."
[51] "Everybody's Profession???" gbadev.org.
[52] Kruse 14.
[53] Duncombe 64.

platform alternatives that offer these potentials more plausibly than the GBA – and without transgression – from the web-based Flash, to GamePark's GP32. If the highly similar GP32 is eminently more accessible, why do so many homebrew developers prefer the GBA? The answer lies in the cultural resonance of the Nintendo brand. GBA development has the double legitimization of being a game-dedicated device (an urge that draws coders to the Xbox vs. the PC) and a brand identity so successful that in the 1980s it was once (and for many non-gamers still is) synonymous with the medium of games. Homebrew GBA developers are left in the paradoxical position of transgressing against the closed nature of Nintendo's corporate and technological system in order to feel that they legitimately participate within it. This amounts not to a traditional brand "loyalty," nor to anti-corporate brand "hijacking" or cultural appropriation of the kind described by Rosemary Coombe, but a lateral repurposing of the system's commercial intent.

Because professional employment is a common goal, the GBA homebrew scene does not manifest the same tension over "selling out" that is inherent to many forms of alternative media production, such as zines and indie rock music.[54] The latter are founded on a "negative identity" that defines authenticity through opposition to dominant commercialism. Some zines treat "radical" political viewpoints such as anarchism, while others such as "fanzines" center on popular media like television shows or genre writing not considered unusual or controversial by outsiders. But the individualized, xerox-based nature of production and informal distribution remains substantially altered from that of the mainstream press. Indie rock, by contrast, is more likely to undergo periodic phases of polarization regarding both aesthetics and production techniques. Indie music labels will adopt practices such as "reclaiming" the 7-inch vinyl record as a distribution medium,

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[54] On zines, Duncombe 163-7; on indie music, Kruse 6, 14.

identifying with "local" sounds in geographically removed or "undiscovered" cities, and

revisiting musical subgenres out of fashion with big labels as a means of setting

themselves apart from the commercial.[55]

In contrast to these oppositional identities, getting one's GBA homebrew game

published commercially (the equivalent of being "signed by a major label" in music)

represents perhaps the ultimate achievement for a notable subset of developers, even if

very few actually attempt this transition. Despite the frustration over current industry

practice, a recent case in which a hobbyist found publishing success for a game he

created with friends from college was at least implicitly viewed not as a violation of an

ideal but as a potential for positive change, garnering nothing but congratulations and

support from the scene – as well as a discussion over the best strategies for attracting

commercial publishers in hopes of repeating the feat.[56] Contrast this to the firestorm of

debate among local music fans, fellow Seattle bands, and independent music labels when

the grunge band Nirvana made their major label debut in 1991.[57] While there is debate

within the GBA community over whether or not it is reasonable (in terms of

technological and human resources) for homebrewers to mimic professional production,

the aesthetics of commercial games are never questioned as a fundamental basis. And the

cultural attractiveness of the Nintendo brand (as opposed to the *actions* of the corporation

itself, as we will see in Chapter 3) is assumed as a starting point.

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[55] Kruse 6.

[56] See "Getting Published,"gbadev.org. This discussion thread relates *NovusAmour*'s success in finding a publisher for his game *World Reborn*.

[57] *Hype!*

Coding Compos: From Individual Motivations to Communal Structures

Because their activity is generally considered to be monetarily non-profit,

amateurs are more likely to use collective evaluative mechanisms not based on financial

gain. One enduring convention is the structured competition. Referring of amateur

competitions ranges from casual communication to rigid ranking. In photography,

competitions span from the local photo club to National Geographic, from highly specific

subjects to general aesthetic taste. In the early decades of the 20th century, young

(overwhelmingly) male amateur radio enthusiasts competed in "DXing," or trying to pick

up stations broadcasting from ever farther distances, from across the country to across

continents. Hobbyist magazines sponsored "How Far Have You Heard" contests: "One-

upmanship also fueled the practice, which fit in well with a culture – especially a

masculine culture – that used numbers and statistics like weapons to gauge prowess,

achievement, and determination."[58] Competitions are not exclusive of cooperation or

friendship – in fact their unstated aim is just that. Neither do they indicate a niche or non-

mainstream audience: some of the most prominent media events in our society are

amateur competitions such as the Olympics, or professional but non-monetary peer-

judged contests like the film industry's Academy Awards. Competitions exist where

virtuosity is a recognized goal of a group of practitioners.

"Compos" as they are known in the GBA homebrew scene, thrive in its mix of

technological exuberance and individualistic production. They serve as a major form of

distribution for homebrewers, raising awareness of each other's individual work. Though

sites such as gbadev.org serve crucial functions of aggregation and replication of

technical information, software tools, and on-going and finished game projects, the GBA

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[58] Douglas, *Listening* 74.

homebrew scene lacks a more robust persistent structure for sharing work. For instance,

while there is an "announcements" section on gbadev.org and PD ROMs in which newly

available homebrew ROMs are listed by their authors, visibility is fleeting – often just a

brief description and single screen shot before the file is "shelved" in the long,

undifferentiated lists of.[59] Missing is the high specificity of the mod music community's

"elaborately catalogued archives... with detailed charts of new and past hits" described

by Lysloff.[60]

Scene compos fill this gap, encouraging finished work over in-progress demos,

giving developers specific thematic or technical constraints to focus their efforts, and

centralizing and more thoroughly publicizing the distribution of homebrew productions.

Lord Graga: "I usually enter my games in competitions because that's where they get the

biggest publicity."[61] Compo guidelines vary broadly. Some are highly specific technically,

for instance limiting the total file size of ROM entries to 64k or even 4k bytes as a means

of rewarding skill in code optimization; others delimit the field to certain aesthetics styles,

such as the 2004 Game & Watch compo held by PD ROMs; and the GBAX compos of

2003 and 2004 allowed entries of vastly differing qualitative types: original games,

multimedia "demos" of technical skill, emulators that simulate *other* gaming systems on

the GBA, and the always popular remakes of classic games from the 1980s. Furthermore,

both the PD ROMs and GBAX compos extended their heterogeneity to technology

platform, soliciting ROMs not just for the GBA, but for other game consoles, from

handhelds of comparable technology to full-blown TV-based home systems.

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[59] See "PD ROMs" (standing for "Public Domain ROMs").
[60] Lysloff 239.
[61] Lord Graga. Online interview with PD ROMs.

This variety suggests that exhibition is the vital quality of compos. Judges are peers in the community, usually scene organizers who run websites; rules, timelines, and prizes are chosen with little pomp and circumstance. While this does not mean that compos are free of controversy (as I will get to below), it does indicate that GBA homebrewers are less interested in "formal" or standardized legitimation of their community than they are desirous of a means of motivating themselves to create and share their best work possible. What compos generate is reputation or symbolic capital within the community, but rarely outside of it – what Bourdieu refers to as a subfield of "production for producers."

Competitions in the GBA homebrew scene are similar to those in other communities of non-professional software developers: Montfort finds the annual IF Comp to be an equally central engine of motivation and publicity for independent interactive fiction writers;[62] digital music composers use them to establish reputation;[63] and common in the open source movement are periodic contests around particular design tasks, one popular example a community-wide solicitation for appealing graphical icons for the GNOME desktop environment.[64]

In contrast to these informal, grassroots networks is the annual commercial games industry-sponsored Independent Games Festival (IGF) in the realm of PC "indie" games. The purpose of the IGF is to raise the profile of games generated outside of the usual parameters of the professional industry, exposing that work to both professional game developers and public game players. While GBA homebrew compos may offer prizes in the form of hardware peripherals valuing between $50 and $150, the IGF offers two

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[62] Montfort, *Twisty* 207-10.
[63] Lysloff 239.
[64] Mazzochi.

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[62] Montfort, *Twisty* 207-10.
[63] Lysloff 239.
[64] Mazzochi.

separate cash awards of $15,000 each. More crucially, the IGF is not judged by peers but by industry insiders – for the 2005 competition, a jury of over thirty professional developers, designers, and marketers decided the awards.[65] In GBA homebrew compos, the same desire to "go pro" may be a driving force, but it is indirect in contrast to the close industry collaboration integral to the IGF.

Competitions, and the particular style of GBA compos, are only one kind of evaluative system employed by groups of amateur media producers. Duncombe, for instance, describes how zine creators and readers use an extensive network of reader-created reviews to share knowledge and opinions of other zines.[66] This practice is rarely seen in GBA homebrew. Part of this difference lies in the expressive nature of the medium. Zines are usually either deeply personal, highly topical (e.g. serving fan groups of all sorts), or both. The centrality of content and the inherently subjective experience of the form make written reviews a natural response. It is also a consequence of zine materiality. Zines are produced by thousands of individuals internationally, sometimes with extremely small print runs in the dozens (though reaching up to the thousands): there is simply no other easy way for readers to learn about the existence, let alone the quality, of zines without some kind of feedback and education mechanism. This function has grown so important to the medium that Duncombe describes an entire genre of "network zines" dedicated solely to the catalog and review of other zines.[67]

"Why aren't there any homebrew reviews?" asked a forum member on gbadev.org:

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[65] See the "Independent Games Festival."
[66] Duncombe 50-2.
[67] Duncombe 11, 50.

splatty: "…there really needs to be some type of website which posts screenshots and short descriptions about these games… there are apparently many more than one would expect, and many are quite good… I feel a bit sorry for the programmers who worked hard on their games and have them unplayed."

ScottLininger: "Wow. That's a great idea. I personally have spent hours wading through homebrew ROM lists on various sites, and it's frustrating because 90% of what's out there is unfinished and obviously only meant as a quick tech demo. There are some *awesome* homebrew games, but they're nigh impossible to find. A site that allows uploads and then community 'vote' reviews similar to downloads.com would be very tasty indeed…"[68]

These suggestions were received enthusiastically, yet after only two days and seven message posts, the discussion quietly died out. What happened? User *keldon* mentioned that there used to be a site providing some review-like information, but "people just got lazy I suppose." Lazy may be an unfairly harsh assessment; a more charitable explanation lies in the nature of homebrew production.

In much software development, both commercial and amateur, versioning is a standard concept and practice. Programs are built incrementally, through trial, error, and emendation. As the developer writes algorithms into human readable source code, he or she periodically compiles that code into executable programs that can be tested hands-on, enabling further refinement. In this cycle of development, innumerable intermediate versions or "builds" of the software are created, each time the source code is compiled. In commercial development, the public release of versions is carefully controlled – ideally, only stable builds that add substantially new and valuable features, or fix critical bugs, are turned into official versions of a product. In non-commercial open source development, strict and organized management of versioning is an even greater necessity; such projects often involve thousands of programmers across the world, each focusing on

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[68] "Why aren't there any homebrew reviews?" gbadev.org.

a specific aspect or problem in a decentralized collaboration (often having never met one another face to face).

Though homebrew development, like open source, consists of a network of participants, homebrew coders are usually working on their own individualized, personal games and programs, rather than contributing to one common, overarching application and design. Any given homebrew project may release a continual stream of slightly varying versions onto scene websites, through semi-structured (e.g. designated game announcements web pages) and informal means (such as discussion threads particular to specific projects or programming issues). Homebrew projects are rarely "done," and identifying a definitive version is both a time-consuming and frustrating process. Written reviews are an inefficient means of organizing such constantly shifting material. Compos have arisen organically in the scene because they better fit the evolving nature of its products. Each competition focuses communal attention on a handful of projects during the run-up to the entry deadline, and afterwards stimulates discussion of particular techniques. Though the ROMs submitted to GBA programming compos do become de facto or nominally "official" versions of those projects by dint of their greater visibility, it is also quite common for authors to keep altering and re-releasing new versions of those same programs after the compo has completed. This may be a point of distinction from interactive fiction competitions, in which entries appear to maintain a greater degree of stability, and judges do commonly supplement the contest with written reviews.[69]

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[69] Montfort, *Twisty* 209.

Anxieties of Influence: Judging the 2004Mbit Compo

The announcement of the 2004Mbit compo, with its promise of a "real" GBA

cartridge for the winners' work, generated considerable excitement within the community:

> *Marciano*: "I think this is a really interesting idea... a compo like this is a real gem."

> *ScottLininger*: "This is tremendously cool."

> *Sweex*: "I just want to say: GREAT IDEA! That will keep me up until 6am, instead of 2am during last year's compo! Bring on the espresso's [sic] ;-)"[70]

But it also brought out ambivalence over the technical and aesthetic standards of amateur

work in comparison to that of the professional:

> *Marciano*: "This raises the bar compared to previous compos considerably... Games that are just proofs-of-concept or have no sound won't cut it... Coming up with a unique game, with graphics, sound and (if appropriate) music, intro, high score, saved game all polished to production quality - that would make YOU buy it, is a real challenge. It's an opportunity to prove that homebrew development is more than blocky sprites moving around a screen with mozaic effects and pseudo-3D sheer transformations. More than scroll text with music playing. More than walking through a raycaster demo. It's very exciting in theory, but it's up to the talent on this board to bring it."[71]

For *Marciano*, the "official" nature of the physical production of a cartridge, and

especially its commercial context, calls for an entirely different set of evaluative criteria.

There is an obvious concern, usually absent in the scene, over legitimation in the eyes of

"outsiders" (implicitly, professional game developers). On one hand, he offers a healthy,

positive recognition that at their best, compos – and 2004Mbit perhaps more than others –

should act as forces of motivation, to qualitatively move the sophistication of the scene

"forward." He is enthusiastic and supportive of the scene. On the other hand, his call for

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[70] "GBA Development Compo," gbadev.org.
[71] "GBA Development Compo," gbadev.org.

"quality" raises questions about the status of hobbyist work, and the definition of
"quality," in the context of selling one's work as opposed to offering it for free.

After the 2004Mbit compo entry deadline, screenshots of the submitted games
were released to the community as a whole, while the compo entered the judging phase.
A debate ensued about the ways in which amateur work might, could, or should differ
from that of professionals. The controversy was substantially greater than around
previous compos:

> *warsong*: "I expected more from the compo entries... [they] are below standard in
> art and design... The games by themselves would not sell well, but selling them
> as a multi pack might have a chance."

> *Jagos*: "Have you seen 'Star Fortress Dendron'?, it has an incredible professional
> look... "[72]

In arguments over the quality of the submissions and the criteria of their selection, the
critics objected on the basis of visual appearance, originality, and genre: the games
weren't unique, simply repeating "tired" genres that have dominated the scene since its
inception; and the entries which did exhibit exemplary graphical styles were inexplicably
passed over in the selection process. *SimonB*, however, explained the judges' logic
cogently in the following exchange:

> *Jagos*: "Other games like ouzy being out in favour of the selected games is a thing
> that I cannot understand."

> *SimonB*: "Sure the game is good but I finished it in <1 minute, and considering
> the game is already 500Kbyte we did not want to include it in the cart. I think its
> [sic] strange that you cannot understand why a game that takes a minute to
> complete is not selected to be on the cart."

> *Jagos*: "...you said some time ago on the compo thread that you wanted little
> games that could be finished in a few minutes, not as long as commercial ones."

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[72] "What do you think of the games in compo," gbadev.org.

SimonB: "I did? When and where did I do that? I do however remember saying [quoting his previous forum post] 'nice and small games that you can pick up at any time and play for a few mins'. Of course what is meant by that is that you can pick it up at any time and play it for a few minutes then stop...and then play again for a few minutes later etc. I havent [sic] said that you should be able to finish the games in a few minutes. How much fun would it be with a cartridge with 7 games that each take a few minutes to finish? Playing a game for 5 minutes and finishing a game in 5 minutes are two *very* different things."[73]

Fig. 2: Two of the games in the 2004Mbit compo deemed to have the most 'professional' visual qualities – neither were selected as winning entries: ouzy, *left, and* Star Fortress Dendron, *right.*

SimonB's argument is for a game aesthetic specific to the conditions of production and reception of the 2004Mbit compo. Aspects typically heavily weighted in the evaluation of games, such as visualism, did not necessarily take priority. Instead, (perceived) length of potential gameplay was of foremost concern, followed by program stability (i.e. appearance of bugs), and file size. *SimonB*'s criteria are informed by the physical limitations of producing and selling a cartridge for the GBA. The compo rules specified that the final production cart would contain 32Mbit of space, meaning that it would accommodate seven games at a minimum – but more if space permitted. The compo organizers also believed that because the cart was being sold rather than offered for free, the nature of a "successful" game was altered. The scarcity of space and the perception

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[73] "What do you think of the games in compo," gbadev.org.

that a commercial exchange there required "customer satisfaction" were the driving

forces behind selection. Again, in response to *Jagos'* own game, *SimonB* explained that

> In your case it was the leng[th] of the game. I have already suggested to you to
> add a few more levels since it takes 5 minutes to complete the game, and since
> there is no real replay-value we would rather fit a few smaller games on the cart
> instead. Games that you can play for a longer period of time.[74]

What *SimonB* and other forum members were doing was engaging in what Thomas

McLaughlin calls "vernacular theory" – sustained reasoning done by "everyday" people

outside of the academy, responding to issues of personal concern, and usually connected

to a larger community of practice. Vernacular theory is spoken in "a critical language

grounded in local concerns, not the language spoken by academic knowledge-elites"; the

bases for such discussions "arise out of intensely local issues."[75] McLaughlin believes

that all people engage in theory of this type in one form or another. Because his intention

in rhetorically elevating everyday reasoning to the level of "theory" is not only to take the

arguments of non-academics seriously "precisely *as an argument*," but to reconsider the

way all argumentation, especially academic theory, is socially situated, McLaughlin's

vernacular theory is a useful frame for the activities of amateur media producers.[76]

In this spirit we can take the arguments on gbadev.org seriously as a local theory

of gameplay, a modest set of criteria for satisfactory games in the context of the

2004Mbit compo – but extensible to and reflective on the wider field of homebrew GBA

development and dissemination, particularly in relation to the established practice of the

professional. Most notable to me about *SimonB*'s reasoning is its adaptive nature,

operating neither as a wholesale reformulation of "professional" aesthetics nor as passive

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[74] "What do you think of the games in compo," gbadev.org.
[75] McLaughlin 6.
[76] McLaughlin 26.

repetition. Rather it involves real negotiation over how the scene ought to put its "best" face forward. In this case the overriding concern was that the customer must feel that he "got his money's worth" – not that the cart show the technical prowess of scene members. The result was that games like *ouzy* or *Star Fortress Dendron*, which displayed the most impressive and "professional" graphics, were given less priority. On the other hand, "originality" of gameplay did not seem to trump stability and re-playability either: winning entries include a *Pac Man*-style clone. Variety was also deemed important, as the selections encompassed several genres, including old stand-bys like puzzle (e.g. *Space Gems*), platformer (e.g. *Bengt: Swinger of Longarm*), and harder to classify titles such as the basketball-themed memory game *Swish-It*.

Fig. 3: The 2004Mbit compo entries spanned a number of tried and true genres, including the puzzler Space Gems, *left, and platform game* Bengt: Swinger of Longarm, *right.*

These decisions are controversial in the scene because the 2004Mbit compo represents one of the first concrete moments the community must to make lasting decisions about its ambivalent relationship to the professional world of game development and sales. In a sense, the decision to produce a physical cart is a "conservative" one, moving the scene towards the norms and restrictions of the professional. In the scene's "usual" software-only mode of operations, there is no

limitation on the number of ROMs available for download; compo judging is normally unconcerned with how well a title might sell. The digital exchange of ROMs is an unconventional use of the GBA technology, a more "alternative" form than one that apes retail commercial sales through manufacture and distribution of a physical cartridge, box, and manual. On the other hand, the compo structure has always served to remedy a crisis of abundance in the scene: the flood of ROMs of varying functions and qualities, from tech demos to non-game utilities to rudimentary clones by "newbies," to the occasional original and unexpected game "worth" playing. Compos provide order and evaluate this overwhelming body of output. The 2004Mbit compo goes this process one further, reinstating the economy of scarcity created by material production.

We can find related circumstances in other alternative media communities. Indie rock, for example, uses small run releases of 7-inch vinyl records (and recently hand-pressed CD-Rs) not only as a means of distancing itself from the commercial but as a mechanism for generating authenticity through scarcity. In both the music and game fan communities – alternative and commercial – "hardcore" members are prone to expend large amounts of energy collecting media artifacts. The GBA homebrew scene's decision to produce its own hardware cart may be one way of "harnessing" the interests of the larger community of gamers unaware of homebrew development by offering them a "collectible." I can only speculate now, but I find ample evidence in the past reporting of amateur development on high-traffic gaming news websites such as Slashdot Games to predict that the 2004Mbit compo cart (unreleased at the time of this writing) will draw considerable attention to the scene.

The 2004Mbit compo is *not* an attempt to become professional or for-profit: scene members voted in an online poll (by a large margin) to sell the resulting cartridge at cost.[77] But this community event is decidedly oriented towards the social construction of what the professional is, and what it should be. This too is a hallmark of other alternative media communities: "zines are obsessed with the *business*, in spite of the fact that 'fans' are supposed to be obsessed with the product."[78] The 2004Mbit compo heightened the stakes for those homebrewers seeking to become professional developers. It also challenged the community's insular, "only for each other" intentions – with evaluative criteria informed by but variant from commercial games – by the now real (as opposed to imagined) possibility of an outside audience only familiar with the "standard," accepted ,means of judging commercial production.

Though the 2004Mbit compo appears in many ways to be anomalous, a temporary shift in the scene's perception of itself as an amateur community participating alongside a commercial industry, it is nevertheless a fruitful case study for viewing these layers of self-understanding as they actively unfold, shift, and re-constitute themselves in excitement, collaboration, and argument. To fully understand the scene, however, a more representative survey of the variety of its production is necessary. In the next chapter, I analyze software germinated within the community: what kinds of games homebrew developers create, and why.

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[77] "2004 dev compo poll," gbadev.org.
[78] McLaughlin 58.

Level 2

Reveling in Restrictions

Relating Technology, Culture, and Aesthetics

The concept of genre, of certain aesthetic and formal characteristics shared by a group of works, is well known and quite advanced (if of course still evolving) in humanistic studies of media. Application of genre theory to games is relatively new, but some work is progressing in this area, particularly as scholars begin a "formalist" phase of game criticism, in which they attempt to identify structural characteristics unique to the medium of games. Mark J.P. Wolf, for instance, focuses on an element that all critics will surely agree is crucial: the interactivity between player and game. Wolf sets up a dichotomy between two major organizing principles: interactivity (actions taken by the player which alter the state of the game) and iconography (representational game content such as text, graphics and sound). He argues that while iconography may sometimes be appropriate for game classification, it is more likely to be misleading – for instance, by attempting to use a thematic "outer space" genre to link games as diverse as early arcade games such as *Space Invaders* with contemporary real-time strategy titles like *Starcraft*.[1] Against this, he suggests that we classify games based on similarities of their interactivity, or what is more commonly known as gameplay. This logical idea is in fact already how game players, the commercial game industry, and the popular gaming press tend to categorize games: role-playing game (RPG), first-person shooter (FPS), real-time strategy (RTS), etc.

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[1] Wolf, "Genre."

Yet a focus on formally similar mechanics of gameplay may miss certain underlying shared traits of games, whether they are technical or cultural. Programming algorithms that take particular advantage of the hardware platform may span games heterogeneous in terms of content and gameplay. Especially in an amateur context, elements of cultural critique that govern the *motivations* for developing games may not respect formal boundaries of genre. Bearing this in mind, in this chapter I approach the field of games produced by the homebrew scene not as a taxonomy of genres, but as a typology that groups games by their functionality. By this I mean the purpose they serve to their creators, as well as to the scene at large. I look at trends that influence both thematic content and gameplay, and are influenced by technical conditions of production and cultural relationships to the history of games. While homebrew GBA developers certainly favor an identifiable subset of genres, the categories I construct here – some vernacular to the scene, others my own identification and coinage – hopefully offer a more meaningful method of classification, a sorting algorithm if you will, that captures the internal logic that governs their development, not just their observed or received effects as playable computer programs.

Finally, in the groups that follow, I have limited my consideration to programs created by homebrew programmers that are either games or prototypes on the way to becoming games; though the scene has produced many interesting non-game applications worthy of discussion, from tools for music composition, to homemade GPS receivers and even a variant of the UNIX operating system. Bracketing this particular exploration around the form of games has been necessary pragmatically in terms of scope, and methodologically in terms of conceptual coherency.

Tech Demos: Process and Product

The largest single category of ROMs released into the GBA homebrew

community, most likely encompassing the majority of programs, is the "tech demo"

group. Tech demos come in several flavors, but as the name implies, their primary

purpose is to demonstrate technological skill. On the GBA this tends to equate with

visual accomplishments of graphics programming, but tech demos may also pertain to

other functional areas. They may be visually beautiful – or of the most mundane,

barebones presentation. Not a coherent genre in and of themselves, tech demos are

defined negatively, in relation to what they are not. Certainly not purposeless, they are

neither playable games nor functional software intended to enable some other creative

activity. Tech demos may be thought of as short form works, to be quickly experienced.

Often they inspire contemplation: like a puzzle, a tech demo can stimulate the user to

mentally re-construct its algorithm, to try to understand the programming behind the

effect of the demo.

Many tech demos are interactive in the sense that they accept and react to input

from the user. Sometimes the behaviors of tech demos may be similar to those typical of

games. One common feature, for instance, is the ability to use the GBA's control pad to

move an anthropomorphic character around a graphical environment. Often these demos

contain only some kind of visually coherent static world or "landscape," and a single,

user-controlled character. There may be minimal interaction possible with other objects

or characters on-screen, but usually the user is left to simply wander aimlessly with no

feedback, as in *Jetpack* and *Express* (pictured below). But even tech demos that exhibit

"game-like" interactivity are probably not best understood as games. While they may contain an artificial world, and a systematic set of rules, the vast majority of tech demos lack other features crucial to games, such as win and loss conditions or a quantifiable outcome.[2]
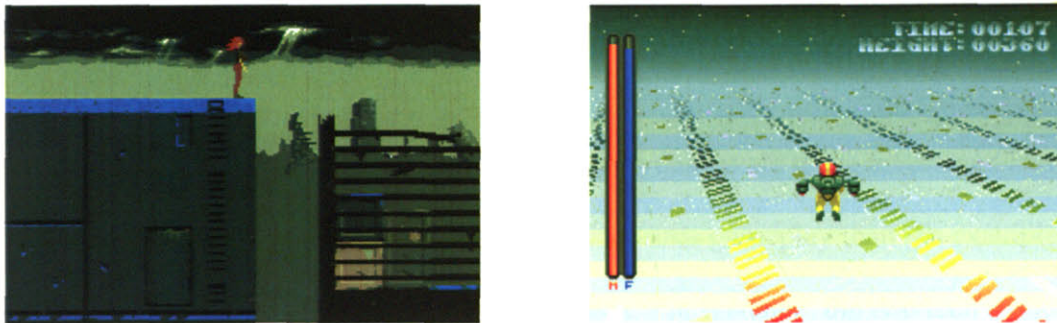

Fig. 1: In Express, *a female character walks through, but cannot interact with, an industrial landscape.* Jetpack *also features a single user in a flat, vacant world.*

Lord Graga's *Platform* demo is a borderline case: the user moves a short human figure clad in red through a small world (slightly bigger than the GBA screen) built of green tiles; if the user manages to maneuver the red figure to a door in the upper right area of the world map, the demo resets and the character is placed back at its starting position, in the lower left of the map. There is a rudimentary win condition, and thus one might technically consider this a game, if a very boring one. But it does not provide "meaningful play" in the sense described by Salen and Zimmerman. For play to be meaningful it must be both discernible (the user can see an immediate reaction to their manipulations) and integrated, meaning an action has not only present consequences, but "also affects the play experience at a later point in the game."[3] The platform demo contains a discernible reaction – the player reaches the door and the level resets – but that result is not integrated. The difficulty is minimal, and the same play choices are simply

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[2] Salen and Zimmerman 80.
[3] Salen and Zimmerman 35.

repeated to the user over and over in a loop, without any change in the state of the world. In other words, the demo provides play, but it is functional rather than meaningful. The play is meant to demonstrate a technical achievement such as a graphics engine and control scheme, that might enable meaningful play were its rules and content further developed.

Fig. 2: Lord Graga*'s generic platformer contains a rudimentary win condition when players reach the door in the upper-right.*

Tech demos are more often even less oriented towards gameplay than the examples cited above. For instance, the two tech demos below are typical in their focus on a single graphical effect. On the left is a "waterfall" created using the pseudo-3D technique known as "mode 7," in which each scanline of the screen is scaled progressively larger to make a surface appear to be receding into the distance.[4] In the context of GBA development this is considered worth demonstrating because the effect is not directly provided by the machine's hardware. Instead, the programmer must write code to calculate the appropriate scaling factor for each line and then configure the GBA to apply those levels of zoom as the screen is drawn in real-time. On the right is an image of a spinning, reflective 3D cube that is similarly difficult to program on the GBA, a device intended solely to produce 2D images. Such challenges make these demos attention-worthy to other members of the scene. The waterfall demo

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[4] "Mode 7" is a phrase that originated in the gaming press in the run-up to the release of Nintendo's Super NES in 1991. The name does not actually refer to any official graphics mode on the GBA, but has come to stand for a particular technical algorithm used to depict a 2D bitmapped surface projected into a 3D space.

allows the user to adjust aspects of its size, speed, and viewing angle, while the cube is
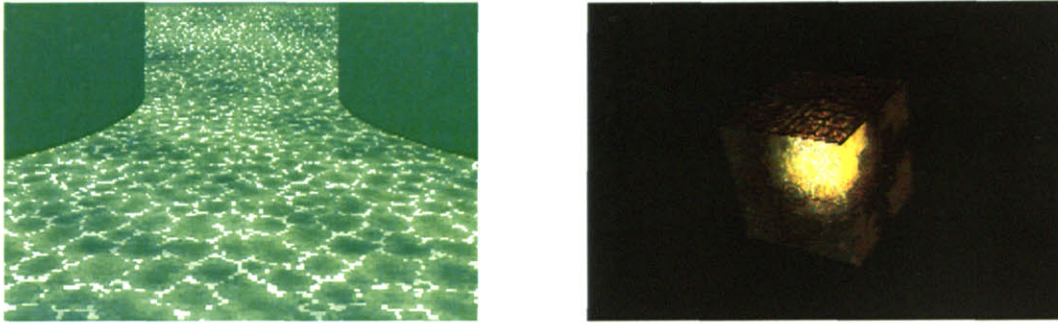
non-interactive.

Fig. 3: Tech demos usually focus on a single graphical effect, often one that is difficult to program, both showing off a coder's skills and serving as a guide for others.

A rarer audio-oriented achievement, *SPLAM!SID*, plays Commodore 64-based

SID (Sound Interface Device) music files on the GBA. Commodore's SID chip was a

popular tool for generating computer-based music in the 1980s, but its highly specific

mix of analog and digital circuitry makes replicating its unique sound difficult on the

GBA, which has sound hardware based on entirely different FM (frequency modulation)

voice synthesis techniques. While *SPLAM!SID* plays a pre-selected set of well known

SID songs, its real purpose is to demonstrate the coder's relative success (or failure to the

ears of the user) in simulating the songs' original aural qualities, rather than to function as

a limited jukebox.[5] Another example of a non-graphical tech demo is Scott Lininger's

low-level multiplayer application, which achieves the difficult task of getting two

physical GBA units to "talk to" each other, when the machines are connected via a link

cable.[6] Homebrew tech demos are closely tied to the priority of technical mastery within

the scene. Many include source code, and are thus a valuable repository of applied

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[5] Indeed, if a user (or programmer) wishes to play SID songs on modern hardware, there are options which are considerably more accessible than a GBA-specific application like *SPLAM!SID*. One popular example is the PC-based Sidplay 2.

[6] The link cable is a standard accessory for the machine which enables games to support multiple simultaneous players.

knowledge. Releasing tech demos publicly is a way for programmers to both gain

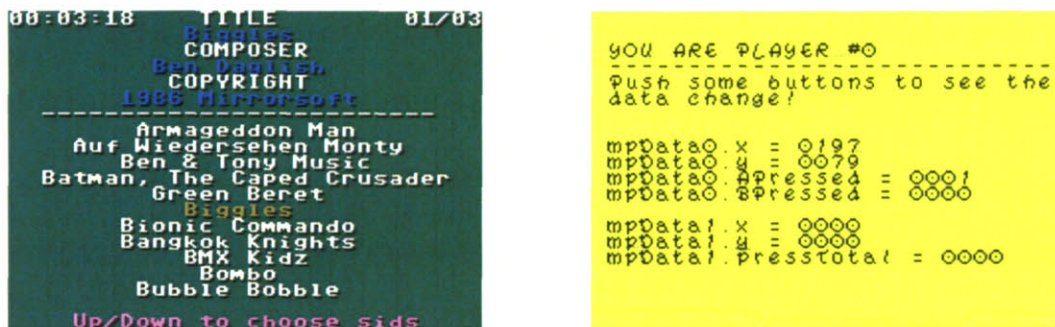appreciation from and provide helpful tutorials to others in the community.

Fig. 4: The SPLAM!SID *music player, left, and a low-level demo showing communication between two GBAs, right.*

Many tech demos, especially those such as *Express* that provide some form of

interactive play are intermediate, incremental releases of longer works in progress.

Developers exhibit these early versions to solicit creative and technical feedback from

scene members. But as many in the scene have remarked, a great deal of tech demos are

never turned into "finished" games:

> *blinky465*: "...so many games appear to dissolve into the ethers..."

> *ScottLininger*: "Projects going by the wayside is the standard for these sorts of efforts. It's no different than forming a garage band or a comedy troupe or a demo team. People grow up, get busy with other stuff, and move on to bigger, more exciting projects that never get done. I know, I've been there many times. ;)"[7]

When a programmer chooses to announce his tech demo to the scene, he often ignites

longer technical discussions about the specific algorithms involved in the work. In an

environment of highly individualized production, this can help to sustain motivation;

such a forum can also serve as a recruitment tool to assemble a small development team

beyond themselves.

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[7] "Just wondering… how many games ever got made?" gbadev.org.

poslundc, for example, was developing a technique for randomly generating a landscape with grass, water, and dirt in a naturalistic pattern. This design problem is not specific to the GBA hardware, and the following discussion focused on higher level aspects of programming, such as Perlin noise and A* path finding.[8] *Poslundc*'s project serves as a reminder that amateur development for the GBA platform includes experimentation with interesting algorithmic facets of graphics and game programming applicable beyond technical mastery of its specific hardware. It also highlights how personal game development projects motivate situated learning of programming as a skill (where educational or professional contexts might not strongly appeal).
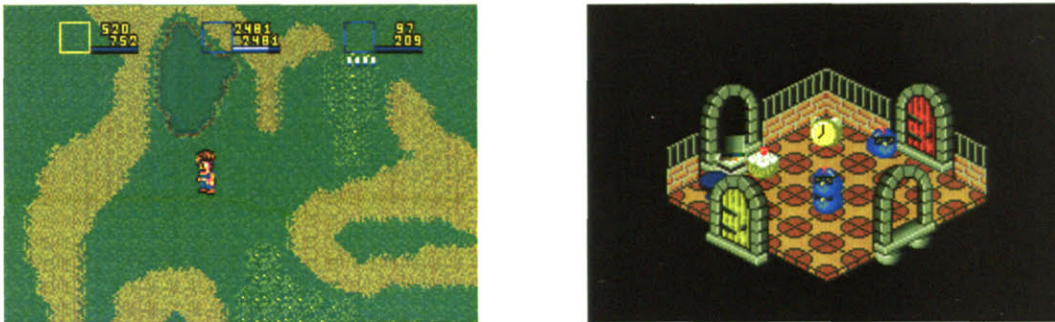
Fig. 5: The result of poslundc*'s finished landscape generation algorithm left; right,* blinky465*'s on-going demo of his isometric action-puzzle game.*

A more typical, GBA-specific technical discussion involved *blinky465*'s puzzle game with an isometric viewpoint.[9] As a visual mode popular in 2D games of the 1980s and 90s, the algorithm for isometric projection is well understood. Discussion instead revolved around the details of implementing the graphics within the restrictions of the

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[8] Perlin noise is a common technique for procedurally generating naturalistic graphic effects like fire or marble surfaces. A* is a standard artificial intelligence algorithm for calculating the shortest navigational path through a series of networked nodes; it is used in many games to guide computer opponent movement.
[9] Using isometric projection, the perpendicular co-planar X-Y axes are projected diagonally, at 45-degree angles from the screen display axes. The height axis is also typically halved, creating a perspective also sometimes referred to as "three-quarters" because it appears to "lower" the viewer to a position below a top-down, overhead view, but does not include perspective projection, keeping all objects scaled equally regardless of their position relative to the viewer.
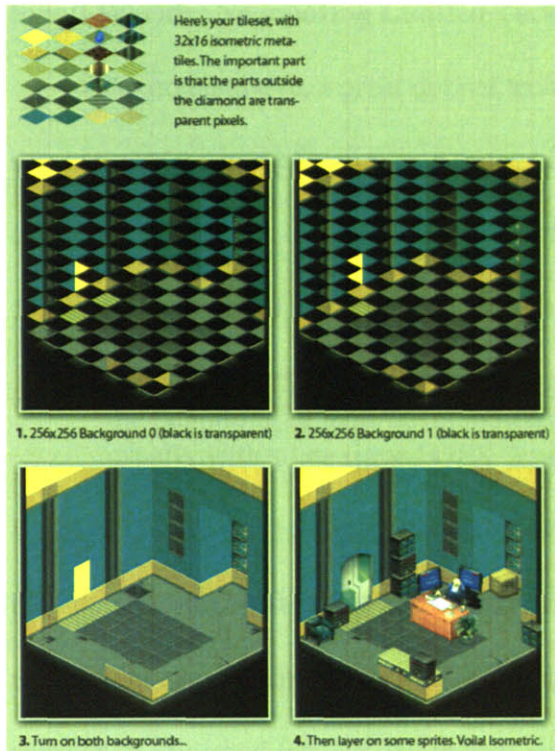
Here's your tileset, with 32x16 isometric meta-tiles. The important part is that the parts outside the diamond are transparent pixels.

1. 256x256 Background 0 (black is transparent)   2. 256x256 Background 1 (black is transparent)

3. Turn on both backgrounds...   4. Then layer on some sprites. Voila! Isometric.

Fig. 6: Scott Lininger's diagram of the method he used for rendering isometric tiles in his game, Star Fortress Dendron.

GBA hardware. While isometric "tiles" (e.g. depicting floors or walls) are diamond shaped, the GBA has a built-in system of square tiles. A range of creative solutions to this challenge were suggested, from finding all unique rectangular intersections between isometric tiles and re-rendering them into GBA-compatible tiles on the fly, to exploiting the availability of multiple layers of square tiles on the GBA to make the isometric tiles interlock smoothly by splitting them into alternating background layers of the GBA, like a checkerboard. Scott Lininger even included a detailed diagram of the latter technique, which he had used in his own project. Yet technical elegance was never far from sight:

> *DekuTree64*: "But the 2-layer method is so inefficient, because not only does it take 2 layers, but you also have half your VRAM wasted on the transparent pixels between tiles. I like Keldon's idea better. It would pretty much require dynamic loading of chars [i.e. tiles]… but I think you could get it pretty darn fast by writing specialized assembly code for each of the possible angles to be copied."[10]

Despite the heterogeneity of tech demos, they are unified in their focus on the programming process over its product, paralleling the social aspects of technical mastery discussed in the previous chapter.

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[10] "isometric games," gbadev.org.

Small Worlds: Negotiating Limited Technical and Human Resources

As noted above, a great deal of tech demos never become completed games. The most common cause of unfinished projects is an overly ambitious project scope – especially dangerous considering both the technical limitations of the GBA and the "part-time" commitment of many hobbyists with jobs and families.

> *LordGraga*: "Some people are brave (or foolish) enough to start with an RPG in the beginning of their development career, which always ends up as a small demo, usually with some ripped GFX [graphics] and no finished feel."[11]

Earlier I made a formal distinction between tech demos and games, based on the kinds of play they allow (open-ended and functional vs. goal-oriented and meaningful). But if there is one phrase which captures the additional, intuitive quality of a "game," it is the vernacular "finished feel." A game feels finished when it sustains interest over time, when it provides a variety of approaches and solutions to its challenges, when it surprises the player. By looking at those "finished" games released to the scene – games that offer meaningful play – we can see emergent trends.

I use the term "small worlds" to label a set of homebrew GBA games that, while spanning multiple genres, graphical styles, and technical implementations, are driven by an underlying design aim. Their "smallness" indicates no slight or negativity, but instead refers to both the spatial layout of their game worlds, and the algorithms of their technical approach. Small world games harness the built-in features of the GBA hardware that minimize the programming of game infrastructure; they resist the temptation towards indulgent programming to encourage a focus on the implementation of gameplay. Their design is also often cognizant of the on-going nature of homebrew development, in which additions are made in pockets of time snatched during late nights or vacations. In short,

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[11] Lord Graga, Email Interview.

they are an effective response to homebrewers' technical and social restrictions. I have

chosen three games that between them display a composite of traits inherent to small

world design.

Llamabooost is a top-down survival shooter in the tradition of the arcade classic

Robotron: 2084 by Eugene Jarvis, and a more immediately thematic ancestor, Jeff

Minter's *Llamatron: 2112*. As in those predecessors, *Llamabooost* restricts gameplay to a

single screen. The player controls a character occupying a relatively small portion of the

screen (roughly 1/16th of its width), able to fire projectiles in one of four directions.

Gameplay is simple – navigate the screen, shoot enemies, and collect bonuses. But

Llamabooost and its precedents continuously renew gameplay by injecting an ever-

increasing multitude of enemy characters into the level. The tension of gameplay is built

into its limited space, a frantic sense of enclosure as the player avoids surrounding

adversaries.

> *Lord Graga*: "I usually code smaller games which I can keep building on until
> I'm satisfied.... With games like Llamabooost I can add lots of stuff later if I
> wish... and I still have a finished product if I stop somewhere in the middle of the
> level/monster/powerup adding."[12]

Lord Graga supports the argument that games allowing for *incremental* alteration are

more suited to homebrew development. *Llamabooost* is designed from a sedimentary

approach in which a bedrock foundation of simple rules and code provides the basis for

further evolutionary additions. This can be seen below: in the early levels, the enemies

are all of one type, and defeat the player only on direct contact; as the game progresses,

new kinds of creatures appear, with additional capabilities. The walking flames, for

instance, hurl fireballs at the player.

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[12] Lord Graga, Email Interview.

Fig. 7: The first level of Llamabooost, *in with one type of unarmed enemy, left, and a later level containing fire-throwing adversaries, right.*

The key features of the game are in fact rather "obvious": essentially all of the gameplay mimics hallmarks of many successful 80s arcade games, and even the thematic content is inspired by a past title. I will deal with issues of appropriation vs. originality in more detail below, but at this point it is worth noting that bootstrapping one's design to "proven" successes is widespread in professional game development. The thematic choice of the llama shows an awareness of video game history as well: spurred on by Jeff "Yak" Minter's mid-80s company Llamasoft, based in the UK, the animal is a trope familiar to European gamers.

But beyond a cultural homage and a conservative reuse of gameplay mechanics, *Llamabooost* is technically well suited to the GBA, because its gameplay is entirely based around the movement of sprites. All mobile entities in the game (the player llama, the bonus llamas, and the enemies) as well as static items (e.g. power-ups that recover player health) are easily represented as 2D sprites. Because the GBA supports sprites as a basic feature, the coder does not need to focus on more sophisticated graphics programming techniques, like the planar scaling of the waterfall demo described above. To display a GBA sprite you simply the machine with an image and set its X and Y coordinates. And in *Llamabooost* each game level takes place on a single screen, without scrolling the

background image, eliminating the need to position the sprites relative to a moving "camera" as would be necessary in many top-down 2D games. The gameplay is enabled by a large number of simultaneous sprites, advancing to create the feeling of being trapped. The GBA provides for up to 128 sprites at any one time, an ample provision for creating this sense of visual overload. *Llamabooost* simply but efficiently makes the most of the GBA hardware.

The puzzle game *ClacQ* demonstrates the small world aesthetic differently. Puzzle games, the 80s title *Tetris* being the most well-known, must be included in any broad consideration of amateur game development. A genre popular (possibly most popular) with non-professional developers of many stripes, from GBA homebrew, to indie PC, to web games sold as shareware. The genre lends itself to hobbyist development because gameplay is similarly often constrained to one screen. A rectangular grid of graphical tiles is commonly used as a playfield. In contrast to a game like *Llamabooost*, however, which moves in fast real-time action, puzzle titles like *ClacQ* depend on bursts of concentrated investment by the player to solve each self-contained level or puzzle. Will Wright often describes the act of game-playing as one of mentally reconstructing an internal model of the game's externally displayed mechanics. By observing and interacting with the game's behavior on screen, the player increases his or her skill at the game by iteratively improving that psychological model.[13] Puzzle games maximize this offloading of computational and entertainment burden from the game mechanics to the player by inducing relatively long periods of non-interactive contemplation. Players proceed by a process of trial and error, reconfiguring the same small set of level elements over and over.

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[13] Wright.

In *ClacQ*, players must build a safe path for the traversal of an egg from one end of the screen to another. When gameplay begins, the player is presented with a field of disconnected gray blocks. By placing the appropriate "scaffolding" segments, a smooth route is paved. The levels quickly build in complexity by requiring such platforms to be chained together. *ClacQ* supplements this standard contemplative mode of play with additional, layered challenges to the player, some explicit, others revealed progressively. The most basic challenge is a time limit for each game level. While time restrictions are a common game feature, the short fuse of those in *ClacQ* creates an unusually hectic atmosphere, and again emphasizes reuse of design and content by increasing the likelihood of multiple attempts at puzzle completion. Incremental challenges prolong play as the game advances. When the player fails a level, he may restart the; but after the completion of level 10, the player is told to go back and solve the previous levels again, consecutively and without faltering. Against the expectation of having succeeded, the player is further challenged – without requiring any new content. While such a strategy risks player frustration, in the tradition of perfectionist and "precision" play it is an acceptable trope, more likely to induce a sense of renewal.

ClacQ's scaffolding theme takes maximal advantage of the GBA's tile maps, a feature common to dedicated game consoles designed for 2D graphics, but unusual on a more general purpose PC. In a tile map, unique square graphic units (such as the gray blocks and scaffolding segments below) are assigned numerical indexes, for reference. The programmer sets the values of each map cell using a tile index, and the GBA then automatically draws evenly spaced tiles. *ClacQ* uses tile maps extensively: besides the

obvious use of a map to represent the level's playing field, the animated, bright yellow

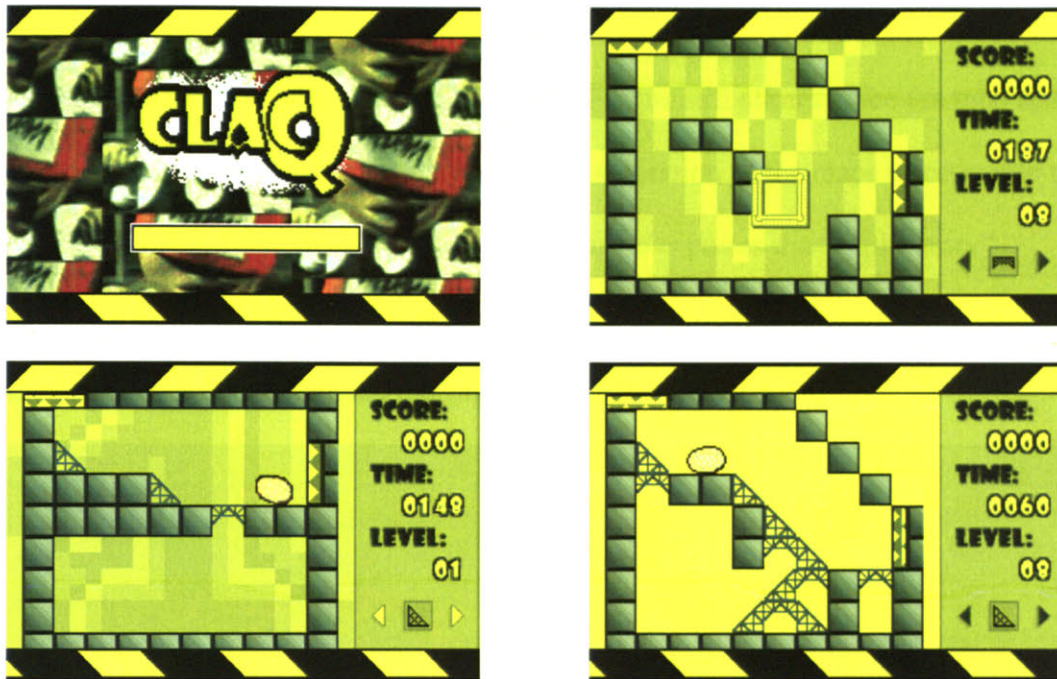background is also a coarser map scaled up to fill the screen.

Fig. 8: ClacQ *begins with a set of unconnected gray blocks (upper right); by bridging the blocks with scaffolding, the player ensures safe passage for an egg that rolls through the level (lower right). The interdependency of scaffolding quickly reveals gameplay dependent on careful planning and mental projection of spatial layouts.*

In *Megatroid*, another homebrew title dependent on tile maps, the play field exists

simultaneously on two, overlaid tile maps, but only one map is displayed to the player at

any given time. Combining action and puzzle play, the goal of each level is to find an exit,

within a harsh time limit (ensuring a breakneck flurry of jumps through game space). The

twist to *Megatroid* is that the player must switch between "dimensions," or tile maps, to

slip past a constant series of dead ends on one map by finding a through-route on the

companion map. This is a particularly subtle use of tile maps to technical advantage:

while *Megatroid*'s space of play scrolls through an area larger than a single GBA screen

(unlike *Llamabooost* and *ClacQ*), by using two maps (the GBA provides up to four) at

the same time, the designer avoids having to chain multiple maps together. Where a role-playing game would typically string several tile maps side by side to create a feeling of a large, connected space, the levels of *Megatroid* are the size of a single map. Maintaining two separate maps internally is easier, but the technique still allows twice the total space to be modeled – *and* it does so by integrating the separation of the maps directly into the game's mechanics. With this simple tactic, *Megatroid* captures the "exploratory" gameplay in expansive RPGs. By limiting visibility in a condensed space by, it depends on the player to mentally provide the gaps in its visual presentation.
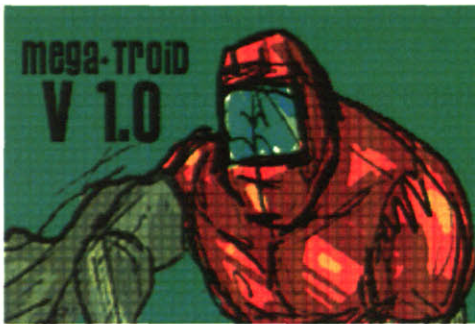
Fig. 9: In Megatroid, *the player alternates between two versions of the same space. Pressing a button toggles between the two spaces, without additional player movement (top and bottom at right).*

The small worlds of these titles use methods of gameplay (some tried and true, some novel) along with specific techniques appropriate to the GBA hardware to reduce development time and prolong play. While there are occasionally completed "large" games released into the scene, the small world approach has yielded a substantially higher percentage of success for those seeking the "finished feel." Many homebrew

projects that adopt the role-playing genre, for instance, games like *Buried at Moat* and (the aptly named) *Endless Tower*, demonstrate admirable technical and spatial engines, but lack the length of play, and replayability – the same traits valued in the 2004Mbit compo of last chapter – of their "smaller" siblings. They feel uninhabited, stretched thin across screen after screen of look-alike spaces.

Evidence of the success of the small worlds aesthetic can be seen in other hobbyist and indie game development as well, such as in *Oasis*, an attempt to distill the experience of a PC strategy game (such as *Civilization*) into a ten by ten grid; and in the single screen level "puzzle-platformer" *N*, described as a mix of the classic gold-retrieval game *Lode Runner* with a physics simulation. Both games won awards at the Independent Games Festival over the past two years. In interactive fiction, now a purely non-commercial form, shorter works have become standard in the community's annual competition.[14]
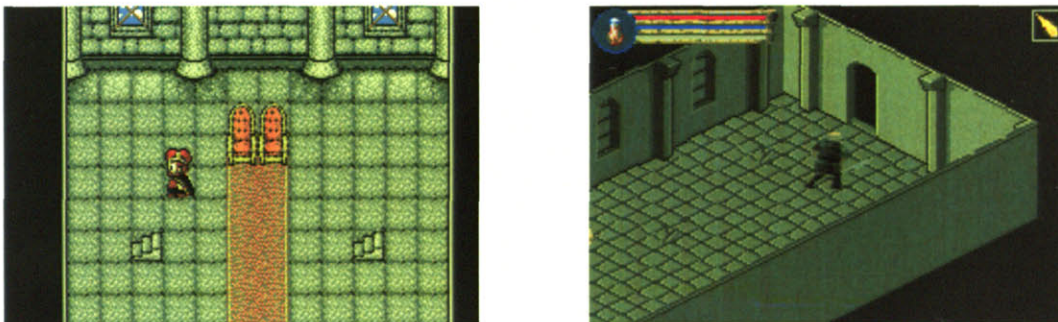
Fig. 10: Two RPGs that provide expansive, large-scale game worlds, but trade the opportunity for meaningful interactivity. Buried at Moat, *left, and* Endless Tower, *right.*

Genre Remediation and Parody: Intersecting Cultural and Technical Strategies

Some homebrew projects more explicitly and reflexively mimic past commercial genres as a means of cultural commentary. As *Llamabooost* hints at, "retro" games and

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[14] Montfort, *Twisty* 208.

play mechanics often serve as inspiration for homebrew works (as they certainly do for commercial games). The PD ROMs website's Coding Compo 2.5 from 2004 is a primary example of such reference at the community level.[15] Entrants were asked to create original games in the aesthetic and technological style known as "Game & Watch," after the brand name of early 1980s handhelds marketed by Nintendo (and copied by competitors such as Tiger Electronics). Game & Watch machines were technically rudimentary devices that each ran only a single game (as opposed to running multiple games via cartridges). Using an earlier variant of liquid crystal display (LCD) technology, the screen itself was pre-fabricated to contain all of the graphics for the specific game it was manufactured to support. For instance, if a character was to be portrayed walking across the screen, several black and white LCD segments representing the figure were placed at incremental locations. Lighting on and off these segments achieved the illusion that the character was "moving."[16] The stylized non-realism of Game & Watch's visuality shares more with 19th century pre-filmic inventions like the zoetrope than with the fluidity usually associated with digital animation.

The Game & Watch brand plays a critical cultural role in game history as one of the initiators of handheld gaming. A homebrew return to the style is not only a kind of homage to childhood memories, but also formally "appropriate" to the small form factor of the GBA. This connection is plain in the commercial sphere as well, as demonstrated by Nintendo's recently released (November 2004) DS (Dual Screen) handheld system (a successor to the GBA). Its design is not "new" or futuristic but instead patterned off of multi-screen Game & Watch units. In this regard both homebrew and commercial game

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[15] "PDRoms Coding Competition 2.5," PD ROMs.
[16] See Jaro Gielens' *Electronic Plastic* for a visual genealogy of the technological and corporate aspects of Game & Watch and related brands of single-game dedicated-LCD handhelds.

products are "remediating" the Game & Watch genre. In coining the term remediation, Bolter and Grusin largely focused on cross-media repetitions of formal conventions, such as adoptions of painterly lighting and soft focus by early photographers, or backflows between media like overlay additions to cable news in reaction to the multi-windowed and constantly streamed nature of websites.
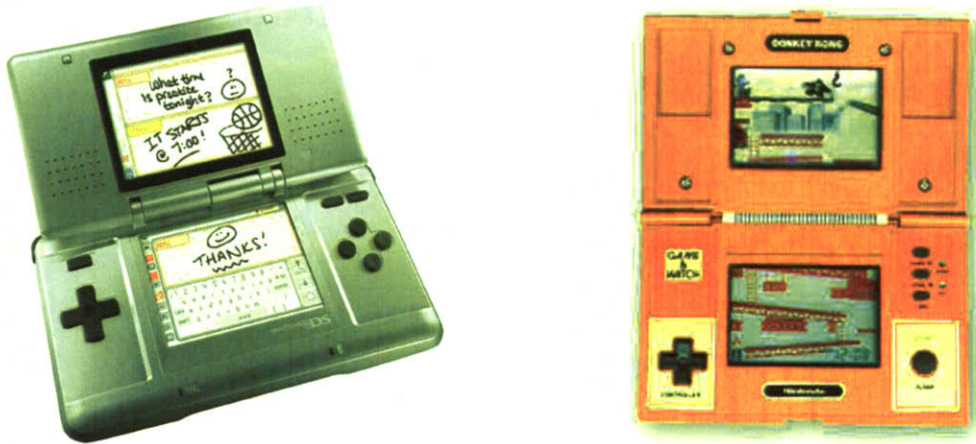

Fig. 11: The form factor of Nintendo's latest handheld, the DS (2004), left, is a descendant of the company's two-decades-old Game & Watch line a right (1982).

The PD ROMs Game & Watch compo is an intra-medial or local form of remediation. Replicating the older form on a more powerful and current piece of hardware also causes what Bolter and Grusin call hypermediacy, an intensified awareness of the artificiality of media. The compo entries re-create the entire look and feel of Game & Watch: grays and washed-out colors mimic the dull, monochromatic liquid-crystal displays, technological artifacts like the 'ghosting' of unlit graphical elements, and the illusion of non-electronic full-color printed backgrounds (a kind of miniature, bastardized transposition of the grand panoramas of the 18th and 19th centuries). It's worth noting that while the competition allowed entries designed for several console platforms, the GBA-based games as a group offer considerably more attention to these "realistic" details. By

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comparison, on the eight entries for the GP32 handheld (versus ten submitted for the GBA), their stark high resolution black and white imagery appears simply minimalist, without any of the recognizable technological genre markers discussed above. The GBA developers apparently feel a greater sensitivity to and appreciation of the Game & Watch aesthetic, again perhaps emphasizing Nintendo's resonance as a brand, in opposition to the culturally unmarked GP32.
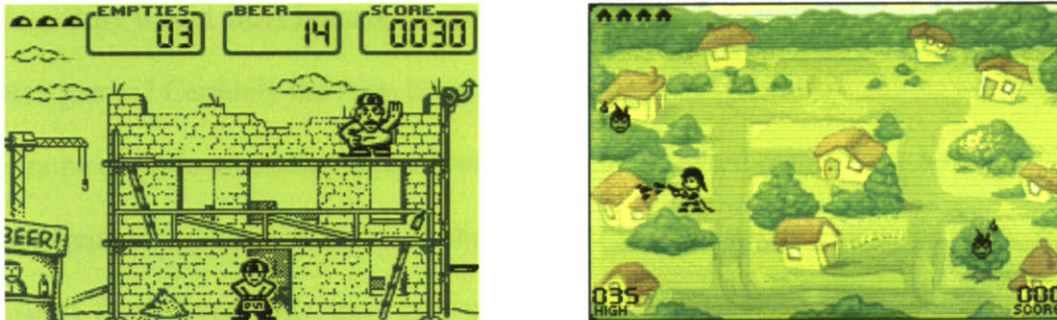

Fig. 12: The top two ranking entries from PD ROMs' Game & Watch-themed competition: Beer Belly Bill, *left;* Fred Firefighter, *right (note the faux color-printed underlay, a popular way to jazz up the games' black and white, herky-jerky movements).*

Game & Watch is a technical form of intense limitations, and its selection as a compo theme implicitly recognizes the role of the hardware platform in shaping the conditions of production and the aesthetics of games. In this sense it is metonymic shorthand for the "taking on" of technical restrictions purposefully tackled by homebrew GBA developers. In his theory of games, Bernard Suits describes the act of game-playing as the "selection of inefficient means." In Suits' view, a game is inherently inefficient because it involves intentional adherence to artificial constraints (the rules of the game in question) to achieve its designated goal. Suits uses the rather comical example of golf, in which the goal is ostensibly to get "a ball into a hole in the ground," yet this is accomplished not by simply placing the ball directly, but by using a golf club, standing at

the proper distance (far off) from the hole, and following the protocol of the swing.[17]

Extending this comparison to game-*making*, GBA programmers may be perfectly efficient at harnessing the machine's hardware, but their very decision to work with the platform in is the adoption of technical, and in consequence aesthetic, restrictions. The further circumscription of the Game & Watch's own constraints on the GBA externalizes this choice.

Why would GBA homebrewers want to re-create the "primitive" style of Game & Watch games? Certainly the form has nostalgic appeal, but it is also a strategy that shifts the frame of evaluative reference, allowing amateurs to avoid competition with the commercial, or rather, to compete on their own terms. By "stepping down" to this nostalgic genre, homebrew developers substantially increase the feasibility of their productions – it is a lot easier to code the non-animated graphics of the simple, iconic poses of a Game & Watch character. It also places homebrewers in a position of critique. It is difficult to discern the relative intention of Game & Watch look-alikes (and similar genre remediations) as homage or parody; many games offer a mix of both. Henry Jenkins, for instance, has shown how amateur digital filmmakers creating *Star Wars*-themed shorts balance their identities as fans with a self-recognition of their own status as outsiders and non-professionals. On the one hand they "buy into" and reaffirm the dominance of the commercial franchise. On the other hand, they embed comedic jabs at the auxiliary practices of professional production, such as excessively long lists of credits.[18]

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17 Suits 22-4.

18 Jenkins, "Quentin Tarantino" 293-4. Movie credits are, of course, a favorite site of playful engagement by amateur filmmakers; many a home movie begins with a series of Magic Marker and cardboard cards

Homebrew GBA games that follow "historical" genres also employ this sly criticism. The imperfect English of many 1980s and early 90s Japanese games is a common target – not only bad Japanese-to-English translations, but their generally simplistic and terse back-stories and player instructions. *Fred Firefighter*, for instance, a Game & Watch-styled game with a minimalist introductory sequence (not included in the compo version of the game due to time constraints, but released separately by the author), has a flame-shaped opponent arrive on screen and proclaim "YOU CAN'T STOP ME!," at which point the fireman hero slides in like a cutout paper doll and replies, "WE WILL SEE." A slightly-off linguistic style can be seen in title names like *Bengt: Swinger of Longarm* (an entry in the 2004Mbit compo of last chapter). And without apparent recognition of its logical inconsistency, *Megatroid* starts the player off with the lines "You have control of time / Warp between dimensions to survive" – after which gameplay begins and is, in fact, governed by a strict time. Again, the irony of this playful language is that it is difficult to tell which phrases are intentionally funny, and which are genuine mistranslations themselves by non-native English speakers in the scene. Such uncertainty is lacking in other non-professional game parodies, such as those offered by the popular online humor site Homestar Runner, which similarly spoofs game genres, but with explicit comedic purpose.

An exemplar of genre parody is the amateur adventure-RPG, *The Tragical Historie of Rodion and Rosalind*. The game's medieval language is reminiscent of classic computer RPGs like the *Ultima* series, with awkwardly tacked on uses of 'ere and 'tis. Playing it is an oddly satisfying, melodramatic experience. *Tragical Historie* is

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announcing that the following feature was "written, directed, produced, edited," and so on, all by a single individual, mimicking Hollywood's fascination over the titles and hierarchy of the production process.

surprisingly deep in its development of game infrastructure: it includes an item usage and magic system, shopkeepers who barter, and townspeople who wander and converse with the player (with as much realism as could be expected from any console RPG circa 1992). Beyond just a well engineered homebrew effort, its subtle flourishes show cognizance of game culture and history. Its battle system, for instance, uses a turn-based "cut-away" mode common to console RPGs such as the *Final Fantasy* series and other Squaresoft games. But rather than the expected fantasy weapons and spells, *Tragical Historie*'s fights are rounds of rock-paper-scissors, making light of the underlying statistics and elements of randomness that direct the combat in these games. In a nod to game characters' visual exaggeration yet limited variety of physical movements, the protagonist insists on somersaulting whenever he jumps or dismounts a ladder. As a result, dramatic flying leaps are common in quiet spaces like the town church or inn.

Fig. 13: At first glance, The Tragical Historie of Rodion and Rosalind *appears to be a traditional console RPG, with items, magic, and a medieval town (above). But subtle jabs at the genre are soon apparent, such as its rock-paper-scissors battle system, and the character's refusal to jump without flipping (below).*

Hutcheon describes parody in its purest form as playful but respectful, contrasting it to the "scornful ethos" of satire. The traits of *Tragical Historie* which expose or caricature the conventions of game genres create what Hutcheon calls the "knowing smile."[19] As Jenkins found with *Star Wars* fan filmmakers, such winks to the audience are a way of saving face; these amateurs "have made their peace with the fact that digital cinema is, in some sense, an 'imperfect cinema,' with the small and grainy images a poor substitute for the larger-than-life qualities of Lucas's original films."[20] The knowing smile faces in two directions, affording the amateur a chance to feel a sense of mastery and design sophistication in teasing out the more campy aspects of games past, yet acknowledging their own lack of resources.

One might also be tempted to look for homebrew content which takes a more overtly political or critical stance of commercial practices. But while I argued in the previous chapter that there are elements of transgression embedded in the initial decision to develop for the GBA, this sentiment is not evident in the end products of the scene. The closest situation would be self-aware, parodic elements in a title like Neil Kemp's *Mortal Konsole*, a limit case perhaps best described as a meta-fan-game. *Mortal Konsole* is a version of the classic video game of *Pong*, but in this case the "paddles" are represented by graphics of

Fig. 14: In this round of Mortal Konsole's pong-combat, Milton Bradley's little-known Microvision (the first cartridge-based handheld game system, released in 1979) battles Sega's Dreamcast.

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[19] Hutcheon 56, 63.
[20] Jenkins, "Quentin Tarantino" 300.

both famous and obscure game consoles. Though mimicking the first commercially successful video game, *Mortal Konsole* is not a tribute but instead a higher level "in joke" about the history of gaming (many of the game systems would only be recognizable to collectors, not to casual gamers). Its sampling is playful rather than subversive.[21] The practice can be seen as an alternative to the technical and fan-driven motivation of "remixing" I describe below.

Remixes: Sampling Commercial Content

Finally, there is a pair of trends in homebrew development which relate to game history by directly transplanting graphics and sound – and in some cases entire games, verbatim – into amateur-created works. I refer to these related but very functionally different types as remixes and remakes. Remixes make use of commercial content, but do not import the corresponding gameplay mechanics, nor replicate the function of the original work. In other words, they re-contextualize audiovisual elements, most commonly character sprites, usually drawn from popular franchises like the Mario or *Final Fantasy* series. Importing music and sound effects is far less common, probably because aural programming more generally lags behind in priority in GBA development. Sprite reuse is widespread in the homebrew scene, making an appearance in as many as twenty to thirty percent of publicly released ROMs.

To understand *why* homebrew developers make such regular use of existing content, rather than creating their own, it is useful to think about the functional

[21] See Shaviro 66-9 for a discussion of the range of applications of sampling or appropriation. Though the term is often associated with counter-cultural works, appropriate can be seen to serve a range of interests, from subservience, neutral pastiche, or active re-interpretation or scrambling of an original meaning. My own use of the term remix is intended to reflect the presence (and sometimes ambivalence) of some of these non-oppositional (yet perhaps also non-conformist) modes.

subcategories that motivate them. The first source of graphical remixing is technical

pragmatism, not cultural inspiration. The most prominent reason for remixing images is

simply the barrier to entry for producing graphics. While many talented "pixel artists"[22]

do exist in the scene, the homebrew skill set is heavily biased towards coders, not

illustrators. It is unsurprising that most remixing occurs in tech demos. Tech demos are

about learning, and many developers find it considerably easier, and more enjoyable, to

grab an animation sequence from a commercial source. They prefer to concentrate on

writing the underlying code driving those sprites than to suffer through the tedious

creation of "programmer art," a euphemism for the crude graphics of those for whom

visual design is clearly not a strong suit.
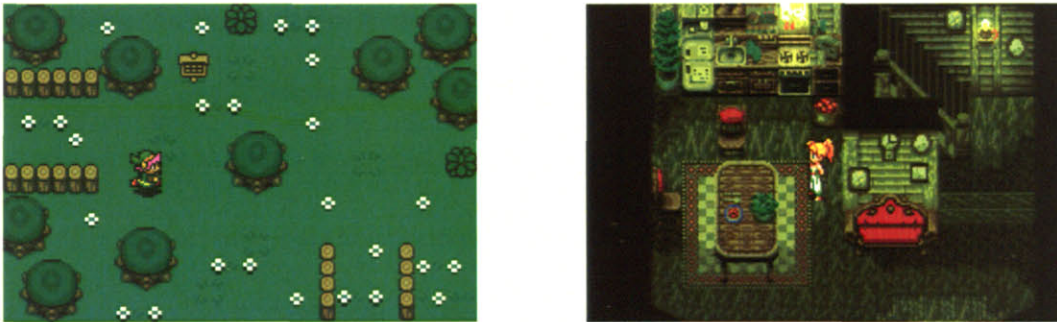
Fig. 15: Typical tech demos that reuse graphics from existing commercial games, in this case a variant of Nintendo's Zelda games, left, and a scene from Squaresoft's Chronotrigger, *right. These demos allow the player to move a character around a single screen and include simple collision detection, but have not been developed further.*

Yet the consistent choice of gaming's most beloved characters belies a secondary,

fan-driven interest in appropriating content. There are, indeed, occasional remix titles

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[22] The phrase refers to the focus at the individual pixel level, a mode of digital 2D art once standard in game development, but no more as screen resolutions have increased to the point where particular pixels are hardly visible, and 3D modeling and rendering demand a much larger share of the production pipeline. On the GBA's screen resolution of 240x160, pixel art is a technical necessity. But the style has also seen a revival – akin to the enforced limitations of the Game & Watch competition described earlier – in indie game development communities more generally. No doubt driven by a cycle of cultural nostalgia and "retro" styling as the next generation of designers emerges, pixel art has become quite popular with a contingent of graphic designers. The trend in this latter field is documented in collections like Francis Lam's *Pixel World*, Sabastian Mendez's *1x1*, and the design firm eBoy's self-titled anthology.

which are developed from demos into completed games. *Mario Balls* is a fine example of such exceptions, an action-puzzle game in which the player must align sets of colored balls as they roller coaster across the screen. The gameplay does not borrow the mechanics of a typical Mario platform game. But the title screen, level themes, and backgrounds are "skinned" with images of a variety of Mario characters. This "fan game" deftly integrates thematic content, giving it a coherency and production quality rare in a homebrew game. It also quite accurately mimics the process by which Nintendo and other corporations build their franchises through ancillary products. This strategy has been particularly amenable to puzzle games, which often do not tightly couple graphics and gameplay; a popular favorite in this vein would be *Dr. Mario* (1990) for the NES.

Mario Balls is a game-specific version of the kind of media fan culture documented by Henry Jenkins that often centers on television and movie series (though certainly on blockbusters of any type as well, such as the Harry Potter books). Most fan creations however, take a textual form as fan fiction, or audiovisual as short films, re-edited music videos, and original songs. Similar fan-generated content *inspired by* games is widespread, and is often encouraged by corporations, as in the case of *The Sims*. Actual interactive games as fan media are a relatively recent and smaller niche phenomenon, but driven by the same desire of media users or audiences to participate in the maintenance and development of these fictional worlds. The developer of *Mario Balls* answers this issue head on: "Why did I choose Mario as the theme of the game? Just because I love Nintendo, their games and hardware, and so wanted to be part of Mario's Story!"[23]

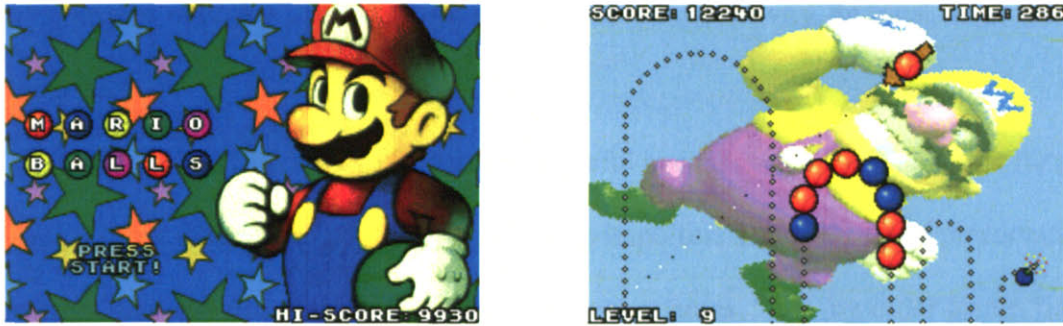
[23] Game manual, *Mario Balls*.

Fig. 16: Mario Balls *is a fan-created puzzle game made to look like part of Nintendo's flagship franchise.*

Remakes: Using Existing Games as a Motivational Framework

Complementary to but very different from remixes, the goal of remakes is to replicate, to varying degrees of fidelity and accuracy, the graphics, sound, and gameplay of existing commercial games. Remakes should be distinguished from console emulators, programs that allow less sophisticated game hardware systems, such as the NES, to be simulated on the GBA.[24] Once an underlying system has been emulated, *any* game originally designed for that machine can be played on the GBA. A remake works by a very different logic. Instead of executing the native binary code of the game on the GBA (as opposed to its initially intended target platform), the purpose is to independently reconstruct the *behavior* of the game. Writing an emulator is actually software, rather than game, development – the playing of games is an indirect effect enabled by the process. Writing a remake is game development at the primary level, technically and

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[24] It might seem surprising, given the simplicity of the GBA relative to other contemporary PCs and game hardware, that the machine could support emulators at all. (A rule of thumb is that a system must be ten times more powerful than a system it may emulate.) However, given the exponential curve of increasing hardware complexity, the GBA is quite capable (in the hands of a skilled programmer) of emulating a range of consoles and computers, usually from the early 1980s, but sometimes as late as the mid-1990s (for example, the Super NES). All in all there are dozens of emulators for the GBA, from DrSMS (supporting the Sega Master System), at <http://www.webpersona.com/drsms>, right up to SNES Advance, <http://www.snesadvance.org>.

inspirationally. Creating a remake is an intensely technical activity, an ideal target for perfectionism.

Contrasting emulators with remakes is useful because while both could be forms of preservation, they reflect qualitatively separate impulses. The function of preservation should not be understated. Indeed, as Eric Zimmerman notes, "playing older games [is] a hobbyist's trade.... [Games are] a medium without a history."[25] There are several movements beyond the GBA community aimed at the archiving of games and supporting materials (e.g. digital scans of printed manuals and retail box art). Along with emulators, these databases are reflective of a "collector's" approach, a vernacular museum (as other prescient attempts to archive popular media have been).[26] Remakes are ultimately less about preservation and more about nostalgia and homage to individual, personally cherished games. They are analogous to amateur practices including musical cover bands, the classic kit car movement, and hobbyist model airplanes.

One common style of remakes emphasizes the fidelity of the re-creation – developers will go to great pains to extract the original, pixel-accurate sprites and other graphics from the source game. Certain secondary details, like the unique behavior of a high score list, might be singled out for criticism by both the game's creator and audience. These remakes become an unusual reverse engineering challenge. Though replication of program functionality has a long history in software development, the highly interactive (often real-time) nature of games, coupled with the requirement of visual consistency sets the intent of the activity apart. At heart, the game has to look right and more importantly

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[25] Zimmerman, "Independent Games" 125.

[26] Most of these websites are semi-specialized with regard to content. Prominent loci include the Killer List of Videogames (focused on the arcade), MobyGames ("a game documentation and review project," including dedicated consoles but skewing towards computer games), and Home of the Underdogs (intended to showcase past and present "underappreciated" games, again mostly for the PC).

feel right, an intuitive tactile achievement that can't be faked. The master games these "faithful" remakes seek to model are by technical necessity for older machines, particularly early home computer systems like the Commodore 64, Atari ST, and Sinclair ZX Spectrum. Their graphics, like the Game & Watch, are more than a step down from the GBA's native capacity, and their screen resolution similarly close. But they also provide an ideal source material for homebrewers: both feasible to copy and, central to the gaming childhood of many GBA coders. Notable examples from several genres are pictured below.
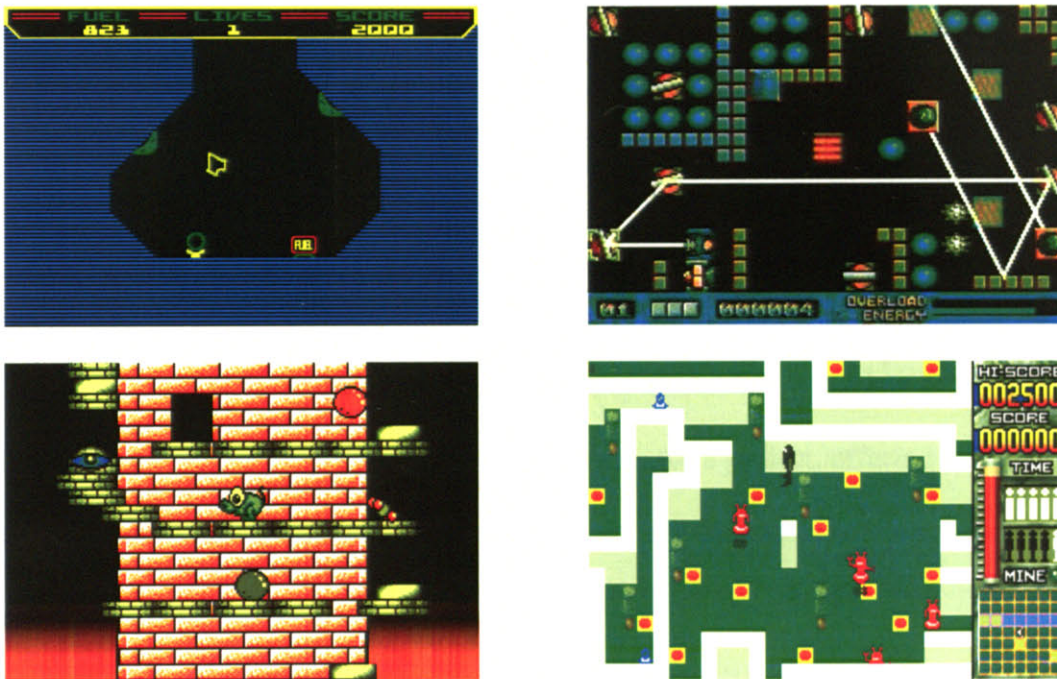
Fig. 17: High accuracy remakes of classic computer games. Clockwise from top-left: Thrust, Deflektor, Nebulus *(all Atari ST), and* Android 2 *(ZX Spectrum).*

These exacting remakes raise fundamental questions about originality and autonomy in acts of media replication. They do not seem impressive when judged on their contribution of "new" features, the traditional concept of innovation. However, we must recognize that the game industry as a whole has always been openly based on free

borrowing and repetition. The first "amateur" computer-based game *Spacewar* became

the first commercial arcade game, *Computer Space*. The scene itself grapples with these

questions of value:

> *Matto154*: "What is up with people wanting to make ports or remakes? It seems as though everyone who wants to make a game is just copying other games. What is wrong with people? It is not that hard to think of something original."[27]

One answer is that remakes can be fan games, too. Like playing in a cover band, or using

the family camcorder to re-enact a scene from a favorite movie, creating a remake is an

act of self-identification with a slice of our media sphere:

> *Gopher*: "I never understand people who say they can't come up with any ideas.... However, there is another reason people like to port games. When you find a game you really love, you want to be a part of it, and porting it to another platform gives you a sense of that."[28]

Another explanation returns to the technological privileging, or at least convenience, that

is evident from tech demos onwards:

> *SmileyDude*: "It really depends on what you are trying to accomplish -- if programming is what turns you on... porting an existing game is a great idea."[29]

A remake can focus technical interest and enthusiasm for a project, offering a highly

structured framework and goal. *Mike Hawkins* describes the process of re-creating

Android 2:

> "To ach[ie]ve this I had to reverse engineer the orig[i]nal Speccy [e.g. Spectrum ZX] version, mainly to rip the map data and initial bot positions. The maze map turned out to be just 60 blocks wide and about 240 blocks high. The maze is wrap-around so appears much bigger than it actually is. The initial bot positions were a bit more difficult to find since they are not stored as a single table nor sequentially in RAM."[30]

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[27] "Flashback,"gbadev.org.
[28] "Flashback,"gbadev.org.
[29] "Flashback,"gbadev.org.
[30] Game manual, *Android 2 Advance*.

To return to the issue of originality, however: what, if anything, does a developer who remakes a game *add* to its creativity, or intellectual property if you prefer, beyond the ability to play that game on an additional, previously unavailable platform? Another major style of remakes I refer to as reinterpretations. Instead of seeking to perfectly re-implement game graphics and features, these remakes purposefully alter them. *Orn*, for instance, is "based on" the first level of the classic NES game *Metroid*. But while its graphics are clearly inspired by the original, they are not copied (or ripped) from the *Metroid* ROM but built from scratch. And, instead of being limited to a handful of colors (as on the NES), *Orn*'s graphics take full advantage of the GBA hardware. They were first created as full 3D models and then rendered as 2D sequences, unlike the traditional hand-drawn animation cells of the original game. *Orn*'s developer states that this decision was a conscious choice, a chance to learn the skills necessary for this type of animation. Similar modifications were made to aspects of gameplay.
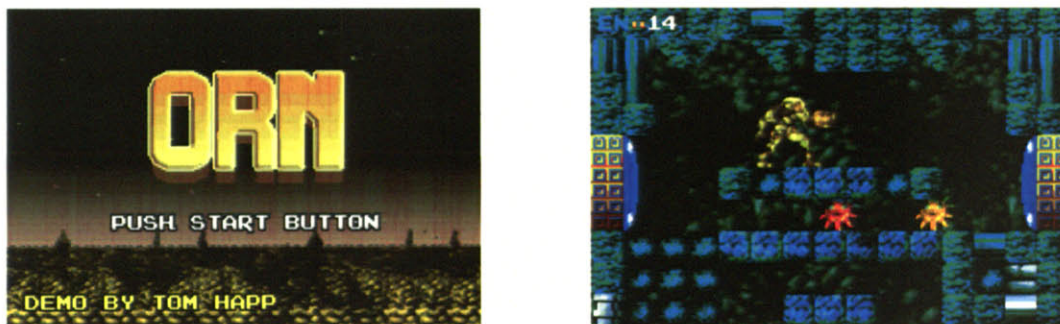

Fig. 18: Orn*'s visuals and gameplay are instantly recognizable to any* Metroid *fan, but it is not an exact remake: its graphics originated as 3D models, and several behavioral tweaks to the gameplay are noticeable as well.*

An even more ambitious homebrew remake is *Metal Gear Solid 2D: Sensible* (*MGS2D*), a conversion of the PlayStation 2 game *Metal Gear Solid 2* (*MGS2*). As one of the highest profile mainstream commercial games of the past few years, *MGS2* was on the cutting edge of 3D graphics and game artificial intelligence when it was released in

2001. But the creators of the GBA-based *MGS2D* felt that the heart of the gameplay was not necessarily its graphics but rather its "stealth" evasion tactics and computer opponent behavior. They set out to perform an experiment in transposition, re-imagining the mechanics of the 3D title as 2D interactions. While their flatly colored character and environmental images are radically different from the commercial game's photorealistic mode, simple decisions like retaining the spatial map design and a similar overall color palette triggers a sense of a shared look and feel between the two titles. Such a homebrew project ultimately could not hope to fully replicate the gameplay and AI complexity of Konami's blockbuster title. But it is an interesting use of the remake trope to undertake a gameplay challenge that might have been more difficult to conceive of had the developers started "from scratch."
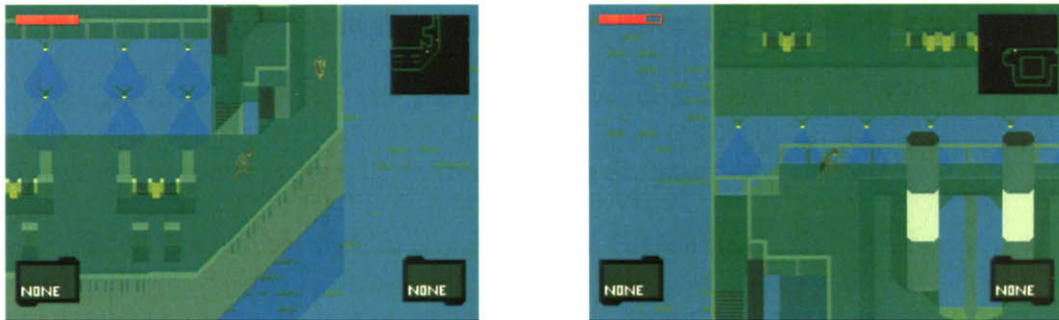

Fig. 19: Metal Gear Solid 2D *is an experiment in converting a game between 3D and 2D modes of representation.*

Remaking is not unique to amateur developers. The game industry has long realized the commercial sales potential of remakes, of both the "exact" (often labeled as "retro") and the "updated" ("all new graphics!" – for marketers nervous about depending too heavily on the nostalgia segment.

On the other end of the spectrum is *Mystery House Taken Over*, a project that reverse engineers the well-known early graphic adventure *Mystery House*, released in

1980 by Sierra.[31] But *Taken Over* is explicitly billed as a commissioned net art project, not as an opportunity for technical learning. It provides a set of newly created software tools allowing typical players "to hack at and reshape *Mystery House*.... to undertake more substantial renovations, engaging with, commenting on, and transforming an important interactive program from decades past."[32] As discussed, GBA homebrew projects do also interact with gaming's past, through parody for instance, but rarely as the stated "mission." This intent is rather always an underlying current, shaping the flow of development without flying the flag.

The appropriation of commercial graphics and sound in both remixes and remakes is a potential source of legal dispute.[33] But given their non-commercial status and extremely limited distribution, it is unlikely that use of franchise characters in homebrew remixes or fan games will draw the attention of corporate game publishers. Similar personal uses in other media have traditionally gone unnoticed or un-prosecuted given their lack of economic impact. (This has not been the case when fans have created "unacceptable" variations, such as erotica, but the GBA homebrew scene has not yet shown any comparable generation of controversy). Straight, exacting remakes might be viewed as more threatening, if they were seen as closing off an unrealized commercial market. Yet here too I know of no cases in which this has become an issue. In fact, in two recent instances amateur developers of GBA remakes (of the Amiga games *Atomix*, 1990, and *Another World*, 1991) have secured permission from the original rights holders to release their versions in an official capacity. In a similar case a remake of the Atari 2600

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[31] Sierra was known as On-Line Systems during this early period.

[32] "Mystery House Taken Over – About."

[33] Game mechanics or rules, on the other hand, have not generally been legally protected. The U.S. Copyright Office has even made a public statement of this exclusion (at least at the present time). See "U.S. Copyright Office – Games."

classic *Yar's Revenge* for the Game Boy Color that started as a hobbyist endeavor was picked up by an established commercial publisher. And *Orn* and *MGS2D*, discussed above, were both student projects awarded academic credit, an implicit approval of their legitimacy by an educational institution.

Considering the legality of homebrew development by virtue of content may be a red herring, in other words. If ripped graphics have yet to be the cause of an outright confrontation between commercial and amateur developers, this has not been true more generally. In fact, corporate game publishers and hardware manufacturers employ a variety of strategies to challenge homebrewers' basic rights of access. To understand this battle we must step back from individual game projects to the level of economic and legal institutions.

Level 3

Legal Wrangles and Technological Tangles

Industry Relations and Intellectual Property

In September 2002, the three largest corporations in the video game hardware

console market – Nintendo, Sony, and Microsoft – filed a lawsuit against popular website

Lik-Sang.com in Hong Kong court.[1] The plaintiffs sought, and obtained in a preliminary

injunction, Lik Sang's discontinuation of sale of unofficial third party hardware products

seen as contributing to video game piracy. Among these products were a group of devices

known as "flash linkers," intermediaries that allow for the transfer of game software

between the proprietary handheld Game Boy Advance (GBA) console made by Nintendo,

and an ordinary personal computer – a practice unsupported and fiercely contested by

Nintendo as a chief enabler of piracy of GBA games. Under immense legal and economic

pressure, Lik Sang removed the products in question, and, out of cash from the

skyrocketing costs of legal proceedings, transferred its business to a new owner just a

month later.[2] At first glance such a case is straightforward and uncontroversial: Nintendo

and the other plaintiffs acted within their corporate rights to cut off a devastating piracy

network that was already large-scale and growing with the emergence of new peer-to-

peer (P2P) file-sharing systems that were expanding their attention beyond their initial

focus on music to encompass digital videos and games.

But such a view reinforces inadequate dichotomies between producers and

consumers, legitimate software developers and pirates. In this chapter I will explore and

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[1] "Sony, Nintendo and Microsoft vs. Lik Sang," Lik-Sang.com.
[2] Becker, "Game site back, sans mod chips," "Mod chip seller gets new owner."

provide historical context for these divisions by examining how legal, discursive, and technological battles between dominant transnational game corporations (based in the U.S. and Japan), smaller foreign (usually Chinese) accessory manufacturers, and individual amateur producers constitute a symbiosis that cannot be satisfactorily understood as either a triumphant elimination of piracy or a top-down dominance of cultural gatekeepers. I will focus in particular on providing a context for understanding the rights of hobbyist, non-commercial developers who occupy a space that is by default legally uncertain. As the game industry marches down a path towards consolidation in the footsteps of its media siblings of film and music, historical comparisons to these industries help to illuminate the position of game hobbyists in a structure of intellectual property increasingly geared toward corporate, for-profit production.[3]

After outlining the position of GBA amateurs in the contemporary game industry, I will use 19th and early 20th century copyright disputes and tactics of commercial domination over phonographs and film to situate their activity in legal, economic, and discursive terms. While we must maintain an awareness of the medium specificities of video games, recorded sound, and motion pictures, it will nonetheless be clear that historical precedents are far more than legal parallels, but instead provide a greater strategic framework for understanding the precarious position of media amateurs today. Thomas Edison's corporate playbook provides an ample set of blueprints (coincidental or not) for the more recent actions of video game companies. While much of this comparison will look at the questions that might determine whether the practices of hobbyist GBA developers are legal, it is crucial to remember that this discussion always takes place in the context of whether they *should* be legal. In bringing to light the often

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[3] See Lessig, Litman, and Vaidhyanathan on the rise of intellectual property in media industries.

ignored community of the GBA homebrew scene, it is clear that my own answer is an emphatic yes; but it would be naïve to make such an endorsement without understanding the positions of the key players inside, outside, and between the commercial games industry.

Conflating Authorization and Criminality: Licensing and Piracy

Because the GBA is a closed, proprietary system to which Nintendo controls access and information, homebrew developers must acquire additional, unofficial hardware and software that enables the creation of their own games. Some of this supplemental "equipment" is manufactured in China and sold on a "gray market" in Hong Kong – such was the case with the flash linkers sold by Lik Sang and targeted for legal action by Nintendo and others. Other unofficial tools, such as software emulators that enable the playing of GBA games on a regular PC (by simulating the original hardware) are created by amateurs and distributed for free online.

By itself homebrew development is a minor threat to Nintendo, if it is a threat at all. If Nintendo is concerned about unofficial development, it is over the possibility of commercial GBA-compatible games being manufactured by an unlicensed third party for commercial purposes. To block just such a scenario, Nintendo strategically uses copyright, patent, and trademark law in an attempt to control access (both commercially and non-commercially) to their proprietary hardware. It is the legality of these tactics to which I will return more specifically later on, but for now it is sufficient to say that in 1992, Nintendo prevailed in a suit against Atari which blocked the sale of subsidiary Tengen's unlicensed games for the Nintendo Entertainment System (NES) on the basis of

copyright infringement.[4] However, under slightly different circumstances a ruling that followed in a similar case just a month later, between Sega (the manufacturer of the Genesis game system, then the major competitor to Nintendo's NES in the console market) and developer Accolade, found that the desire to avoid monopolization of the market for a particular game platform (in this case Sega's Genesis) granted Accolade a successful fair use defense despite the necessary infringement of Sega's copyright during the game development process.[5] Though third party game development had been accepted industry practice since a challenge from then-market-leader Atari to upstart Activision was settled out of court in 1982,[6] the *Sega v. Accolade* decision represented the first time such disputes in the games industry had been ruled on by a court of law, and has since been the accepted precedent of the legal system's preference for commercial competition over strict copyright protection in the case of game software unauthorized by the console hardware manufacturer.

Nintendo is not concerned that flash linkers and emulators are allowing GBA homebrew development to occur. They are concerned that these devices allow piracy of GBA games to flourish, and on this count they are entirely correct. Flash linkers are used to transfer copies of the latest GBA games onto a user's PC; these game files, known as ROMs, are then uploaded to P2P networks where they are easily downloaded by others. In the case of the GBA, the relatively small size of the game ROMs (a few megabytes) means that it is common to find massive collections of hundreds of ROMs compressed into a single file on P2P networks such as BitTorrent. Emulators can also facilitate piracy by allowing people to play GBA games directly on their PC, without the need for the

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[4] *Atari v. Nintendo*, 975 F.2d 832.
[5] *Sega. v. Accolade*, 977 F.2d 1510.
[6] Montfort, "Activision" 210; Gallagher and Park 9.

physical handheld GBA system. For instance, without an emulator, a person who downloads a game ROM still needs a flash linker to transfer that ROM to the GBA hardware in order to play it; with an emulator (a freely available piece of software), the same person can immediately play the copied ROM without the need for any additional physical hardware, thus avoiding a substantially higher barrier to playing pirated games. In this regard it is perfectly reasonable and expected that Nintendo would seek to block the distribution and sale of flash linkers and emulators.

The problem is that it is these same tools that make non-commercial hobbyist development possible, in addition to piracy. If we view the situation as a two-party dispute – Chinese flash linker manufacturers and Hong Kong distributors flouting copyright protection on the one hand, Nintendo combating piracy on the other – we ignore the activity of the homebrew scene entirely. When Nintendo shuts down Lik Sang, they remove one of the hobbyist community's central resources. Lik Sang and other gray market sellers sponsor homebrew development and depend on it for business. And hobbyists are not entirely useless to Nintendo and its affiliated developers either: As we saw in the previous chapters, some homebrew developers go on to work in the games industry, while others have found commercial backing to publish projects that began as hobbies. Rather than seeing the plight of amateurs solely as a struggle against Nintendo for recognition and legitimacy, or the battle over piracy as Nintendo versus shadowy Asian companies beyond the enforcement of U.S. intellectual property law, we must recognize that we are dealing with a set of distinct yet overlapping concerns, involving multiple parties. Each of these participant groups has its own goals, its own internal self-

interest and external public posturing; they cooperate, compete, and co-opt one another in ways that are non-exclusive and non-obvious.

Controlling Amateur Production: Early Film and Substandardization

In feeling out the potential "nooks and crannies" for independent games produced outside of the mainstream commercial industry, Eric Zimmerman notes that "[c]ompared to the more gradual development of other media, the commercialization of digital games has been blindingly rapid."[7] But while Zimmerman's critique of the monolithic nature of the games industry is accurate, he underestimates media history: strategies of commercial domination through consolidation emerged in the late 19th century, not the late 20th. Bolstered by a barrage of patents, Thomas Edison and a handful of other companies held a legal and commercial stranglehold over the markets for both recorded sound machines (e.g. phonographs and gramophones, among others) and film production and distribution from the very early years of those industries onward. For instance, by 1910, roughly fifteen years after the introduction of film stock for motion picture projection, Eastman Kodak already controlled 90 percent of the market.[8] Yet some of these early electronic media industries, particularly film and radio, also sustained substantial parallel markets for hobbyist equipment and production – sometimes under questionable legal circumstances that are echoed in the gray market for unofficial video game hardware accessories.

As an early example of an emerging medium of popular entertainment undergoing a process of consolidation, the structure of the hobbyist market for early film had some of

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[7] Zimmerman, "Independent Games" 122.
[8] Zimmermann, "Entrepreneurs" 165.

the hallmarks of the homebrew games market today: it addressed a relatively high barrier

to entry to production, in varying degrees economic, technological, and legal; it was

constituted by small entrepreneurs rather than large corporations; it was oriented towards

a "specialized readership" self-selected through hobbyist magazines and clubs then, and

websites and chat networks now; and it "represented a reinstitution of a residual myth of

the individual inventor" in a period of change for the definition of the term "amateur."[9]

As remains the case today, enforcement of intellectual property was the dominant legal

strategy employed by the larger, established corporations to overwhelm, dismantle, and

reconfigure the amateur market under their own monopoly. The legal tools of patent,

copyright and trademark were supplemented by the discursive positioning of amateur

activity as unprofessional and unserious, and intentional technological inferiority in

hobbyist equipment to distinguish it from the more "advanced" professional segment.

In the case of film, this was most explicitly accomplished through the formation

in 1908 of the Motion Picture Patents Company (MPPC). The MPPC consisted of all the

major players in commercial film, including Edison, Vitagraph, Biograph, and Eastman

Kodak. By pooling all of their patents into a single company, the MPPC was established

to control all aspects of film production and distribution, including the manufacturing of

film stock, the standard perforation style on film that made it compatible with projectors,

and the projectors themselves; the MPPC used its legal hold over these technologies to

enforce exclusive licensing agreements with distributors, seeking to ensure that theaters,

who depended on MPPC-made projection equipment, would only show MPPC-approved

films.[10] The MPPC represented a new industry tactic in which the largest players banded

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[9] Zimmermann, "Entrepreneurs" 163-6.
[10] Zimmermann, "Entrepreneurs" 167-8.

together to create a de facto divide between MPPC-sponsored "professional" and (by

their own self-styling) legal production, and the rest of the smaller entrepreneurial

manufacturers, characterized as a motley assortment of patent-infringing outlaws.

As Patricia Zimmermann points out, a crucial way in which film hobbyists were

defined against industry professionals was through technological non-conformity.[11]

Because the major film companies held the patents over all of the established standards in

mainstream use, as well as physical control over the manufacturing of equipment,

producers of hobbyist devices were forced to find new engineering solutions that made

their film, cameras, and projectors incompatible not only with the "majors," but also with

each other. The patent pool had the effect of technologically fragmenting the hobbyist

market, ensuring that amateurs would never have access to public theaters – in other

words, because their equipment was technologically different, they could never become

"professionals" without seeking a path through one of the MPPC members (this would

have been true even before the creation of the MPPC, when the industry was already

controlled by an oligopoly, and only exaggerated after it).

The early film industry offers a useful starting point for thinking about the place

of the amateur in commercially-dominated electronic media; it also occupies, along with

its contemporaries of photography and radio, a moment of redefinition of the concept of

the amateur and of leisure within American culture. This shift can be characterized as one

from a norm of "two-way" technologies to those that are "one-way." Two-way

technologies allow for both the "reading" and "writing" of media content. In the most

basic sense, musical instruments such as the piano are media "technologies" that

inherently involve the user in media production – they allow the user to help write their

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[11] Zimmermann, "Entrepreneurs" 164.

own experience. In contrast, most of the electronic media that arose from the late 19th

through mid 20th centuries settled into a read-only logic of consumption. This is true of

the phonograph (and later standardizations of analog sound recording on vinyl), radio,

film, and television.

However, it is important to realize that in many of these cases, there was nothing

inherent in the technology that made them one-way devices. As we have already seen

was true with early film, it was a confluence of business decisions, manufacturing

techniques, legal maneuvers, and in some instances government regulation that generated

a social construction of these media as consumption-oriented. Even television, perhaps

the primary icon of read-only media in modern America, was initially imagined as a

personal, two-way communications device. As has been noted by media historians, the

original phonograph was not simply a machine for replaying recorded sound but also for

capturing it; practical considerations over manufacturing, motivated by marketing and

buttressed by patent protection, allowed it to become a playback-limited technology.[12]

Radio, after an initial bask in the public eye, fell by the wayside as entrepreneurs failed to

find a means of making it commercially viable, and remained a two-way personal

communication device dominated by amateurs until regulation in the 1910s and the rise

of the commercial advertising-based broadcasting model in the 20s.[13] Automated player

pianos offer the most uncanny externalization of this transition. Visually and tactilely

wresting away the need for a participant user, the player piano is a technology that recalls

the often supernatural language of Marx in his analysis of the fetishism of commodities –

objects of capitalist production take on lives of their own, imbued with "all the magic and

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[12] Kittler 33; Butsch, "Leisure" 15.
[13] Douglas, *Inventing*.

necromancy that surrounds the products of labour."[14] As a table "evolves out of its

wooden brain grotesque ideas, far more wonderful than 'table-turning' ever was," a

nearby piano realizes it might as well strike up a tune on its own.[15]

The socialization of one-way media technologies as a norm fits into the

emergence, outlined by Richard Butsch, of a wider dialectic between "leisure and

hegemony." Butsch describes how leisure practices in America came to be restricted by

various kinds of "standard equipment." He dates this move towards standardization to the

rise of American big business in the late 19th century.[16] In this regard, standardization in

leisure was not a conspiracy of big business so much as a logical side effect of it, as work

itself became increasingly subject to organizational and temporal standards, and social

"technologies" of work merged with the material factory in management regimes such as

Taylorism and Fordism.[17] Naturally, as techniques of mass reproduction were perfected,

individual instances of physical products became increasingly indistinguishable. Perhaps

less obvious, standards in physical equipment led to accompanying standardization of

social use – for instance, the establishment of rule books in sports.[18] Butsch's main

contention is that as the technologies of leisure become standard equipment, users

ultimately yield certain aspects of creative control: "hegemony in leisure may be assessed

by the degree to which practitioners of leisure… are constrained by the conventions of

the practice or limited by their access to the means of 'producing' that leisure activity."[19]

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[14] Marx, "Capital, Vol. 1" 324.
[15] Marx, "Capital, Vol. 1" 320.
[16] Butsch, "Leisure" 8, 14.
[17] Kern 115-6.
[18] Butsch, "Leisure" 15-6.
[19] Butsch, "Leisure" 8.

Clearly not all media become technologically or socially constructed as strictly one-way interactions. In fact, as industry standardization of 16mm film by Eastman Kodak in 1923 took over, amateur filmmaking became more, not less mainstream – but its social meaning changed profoundly from one of technical experimentation to one of domesticated use in the home as a means of capturing family memories.[20] This only repeated Kodak's own earlier anointing of the "snapshot" era of amateur still photography with the introduction of their handheld camera in 1888, an automated and completely closed system which replaced the need for detailed technical knowledge of film processing with a "democratic," "anyone can do it" sensibility. In a way, the Kodak camera didn't just introduce a new distinction between amateur and professional photographers, it created the possibility for conceiving of that bifurcation. With its famous slogan, "You push the button, we do the rest," the Kodak still camera established a new understanding of the amateur: no longer driven by "love" and technical competence, from then on in photography, "amateurism signified loss of control over the production process."[21] In other words, just because a technology retains a channel of two-way production does not mean it cannot exhibit Butsch's "hegemony" of standard equipment; Zimmermann calls the same effect the "substandardization" of the amateur.

Amateur substandardization is a fusion of technological, commercial and legal strategy. It works by establishing a technical equipment standard, protecting access to that standard through intellectual property law, and then marketing equipment that provides only a subset of the standard's full functionality. Substandardization does not

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[20] Zimmermann, "Entrepreneurs" 183.
[21] Zimmermann, *Reel Families* 32.

preclude amateur media production, but it enacts a social construction of amateurism as restricted in quality and scope.

Controlling the Game Boy Advance

My intention in discussing amateurism in the era of early film was to provide a context for understanding the possible legal and commercial futures facing the homebrew GBA scene today. Amateur GBA development has not become institutionally substandardized in the way film did; rather, in its current state it is closer to the pre-standards period of uncertainty Zimmermann describes, during which technical and entrepreneurial experimentation flourished, and hobbyist filmmaking was still seen as "a technical oddity for hobbyists to follow, rather than a large social practice or art involving great numbers of people."[22] In addition to the interrelated aspects of technological and legal control that resonate between the MPPC in early film and Nintendo's strategies for the video game market today, GBA hobbyists are involved in another area of historical similarity: that of discursive framing. Although they may not have asked for it, amateurs are implicitly involved in a battle for legitimacy and distinction, as their non-commercial status often runs, if not at odds, then at least off-axis in relation to corporate strategies.

Earlier, I described the two kinds of "unofficial" activity that threaten Nintendo's business – unlicensed third party commercial games, and piracy. While most piracy is unambiguously illegal,[23] providing Nintendo with a solid legal footing for counter-

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[22] Zimmermann, "Entrepreneurs" 170; Douglas, *Inventing*.

[23] Certainly direct piracy of GBA games is illegal. There are, however, some areas of potential dispute over unsanctioned distribution of games that may or may not be labeled as "piracy." The first has to do with older, "abandoned" game systems which are no longer commercially for sale or supported by their

actions of suppression, unlicensed games (those produced to be compatible with the GBA, but without Nintendo's consent) are perfectly legal. The historical legality of unlicensed game development lies in the emergence of mass manufacturing in the 19th century, and within media the phonograph offers the best comparison. Several industries developed the practice of "tying" accessories to primary products to create single brand monopolies, "requiring distributors and consumers of a patented article to use only the patent holder's subsidiary products and supplies;" in media, tying was applied to mimeographs, cameras, and phonographs.[24] It took the courts some time to decide on the illegality of tying. Lisa Gitelman describes, for example, how in a 1909 Supreme Court case the Victor Talking Machine Company succeeded in gaining the right to block the sale of records that were playable on its phonograph, but had been manufactured by a competitor.[25] It wasn't until 1917 that the Supreme Court made tying illegal, ruling on two cases, one involving Victor again and the other the MPPC.[26] As we all know, today audio (facilitated by the cheap technology of cassettes and now digital recording) and video (from Super-8 to camcorder to cell phone) production is easily within reach of the everyday non-professional. The legacy of these established legal precedents is that the descendent media production of games is similarly protected as a "free right" outside of control by an equipment manufacturer.

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corporate owners. While offering copies of games for such "obsolete" or "inactive" systems is clearly a violation of copyright, it does not threaten commercial sales in the same way and therefore deserve special consideration. On this topic in the context of music file-sharing, see Lessig's *Free Culture*. A second area of potential confusion is over the importation of, and/or technical circumvention of measures designed to prevent the use of, games from overseas markets. While many game companies have sought to bar the selling and playing of games released in the Japanese market on U.S. game consoles (and vise versa), the legality of their strategies remains unsettled, as reflected in various court challenges over the past few years. Both issues are beyond the scope of this paper, but they are of keen interest to interpretations of copyright and to game history and culture, and deserve their own in-depth study elsewhere.

[24] Gitelman, *Scripts* 114.

[25] Gitelman, *Scripts* 117.

[26] Gitelman, *Scripts* 117-8.

Nintendo has, however, worked quite hard (and creatively) to keep the practice of tying alive with regard to it game consoles. Why is Nintendo so concerned with unlicensed GBA games? Because the console games industry operates on a business model in which the console hardware is sold if not always at a loss, then at never more than a miniscule profit margin, while game software (of which there will of course be many more total units sold) generates the real profit.[27] To ensure that they receive a substantial portion of game software sales, Nintendo and other console manufacturers use a variety of technical and legal tactics to coerce game developers into seeking their official corporate approval as licensees. Through their license agreements, Nintendo is able to enforce broad control over its market, from the initial green-lighting of projects, to approval of artwork and packaging, to restrictions on the number of titles developed in any given year, and substantial royalty rates.[28] Because unlicensed development is legal but piracy is not, Nintendo has adopted a strategy of seeking to muddle the separation between the two, employing "anti-piracy" measures that also block non-licensees from development access, and employing a discursive framing that consistently labels activities that might fall on either side of the piracy-unlicensed divide as illegal.

Homebrew development actually *is* unlicensed development; it is just that it is non-commercial. Ironically, it is the very lack of a threat that amateurs pose to Nintendo's business – their own location outside of the professional industry – that ensures their irrelevance and omission in Nintendo's corporate strategy. While the line from piracy to unlicensed development plots along an axis of legality, amateur

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[27] It should be noted that while games are still extremely expensive to develop (though relatively cheap to manufacture), the reasonable expectation of a relatively steady buying market for game software – as consumers who have previously purchased expensive game consoles wish to extend their use of them and thus must buy more games – allows the model to succeed.
[28] Kline et al 112-4.

development occupies a tangent on an axis of commercialism that keeps them out of view, and keeps their concerns and rights unaddressed. In the end, there is no great conspiracy of Nintendo to prevent amateurs from developing for their systems. In fact, within the company there is likely the unofficial acknowledgment that homebrew development, while a very small proportion of its user base, provides pre-work training, at no cost, for potential future game developers – a rapidly growing segment of the entertainment industry and a profession in which good employees are always in demand. Certainly some of Nintendo's officially licensed developers know this, as evidenced by their occasional banner-ad presence on the major homebrew community websites. While some parties in the commercial game industry are keenly aware of this phenomenon and are turning it to their advantage, most notably through the practice of user-created "mods" (modifications), in the case of the GBA there is no recognition of it at the corporate level of Nintendo, where it matters (quite arguably a short-sighted decision in the long run). The problem is simply a narrow-minded focus on a very limited set of activities that are perceived to be relevant to commercial success.

Discursive and Legal Maneuvers: Emulators

Nintendo's two-pronged use of intellectual property and discursive framing is nicely illustrated by its position(s) regarding software emulators. As I discussed previously, emulators of Nintendo consoles do pose a serious threat to the company's business by facilitating piracy. At the same time, a substantial argument can be made that such emulators, which allow for a game to be played on a platform (such as a PC) different from the one the game was originally intended for (e.g. a GBA), have legitimate

and legally defensible fair uses as well. On the legal section of its official website, Nintendo forcefully states its opinion as to the legality of emulators: "A Nintendo emulator allows for Nintendo console based or arcade games to be played on unauthorized hardware. The video games are obtained by downloading illegally copied software, i.e. Nintendo ROMs, from Internet distributors."[29] There are multiple points of interest in these two short sentences. First of all, Nintendo equates all ROMs with illegal copies; there is no acknowledgement even of the possibility of a "legal" ROM, such as an original homebrew game that was not copied from a commercial source. Secondly, the statement asserts that *any* ROMs one is in possession of must have been acquired via illegal downloading, again precluding other legitimate means. And thirdly, they equate "unauthorized" hardware platforms (that is, unauthorized by Nintendo, not by any legal system) with the "illegal" – something they cannot come right out and say, but which they want to imply.

What is crucial in these examples is that many of these claims and implications are unlitigated. In point of fact, the most detailed emulation case decided so far – involving a computer emulator of Sony's PlayStation console created by small company Connectix – was decided against Sony, providing an important precedent for establishing the legality of emulators.[30] Nintendo wants to install its legal opinions as de facto law by stating them as if they were established facts with legal precedent, when as of this writing the opposite appears more likely. This elision is repeated later when the company states that an "emulator promotes the play of illegal ROMs, NOT authentic games;" similarly, under the question "How Come Nintendo Does Not Take Steps Towards Legitimizing

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[29] "Legal Information," Nintendo of America Inc.
[30] *Sony v. Connectix* 203 F.3d 596.

Nintendo Emulators?" they respond "Emulators developed to play illegally copied Nintendo software promote piracy. That's like asking why doesn't Nintendo legitimize piracy." [31] Several times elsewhere in this same document, the distinction is repeated between the physical, "authentic" version of a game, and the "illegal" (and therefore inauthentic) version of the ROM stored on a PC's hard drive. The rhetorical definition of "authenticity" is particularly interesting within a context of content (e.g. game software) shifting across media channels; in this case, from the embedded hardware chip on a physical game cartridge, to a more portable file containing the same information. In both instances, the game remains in a digital form. The only thing that changes is the "housing" around the game, its particular physical encoding. Additionally, this linguistic sleight of hand appears to contradict Nintendo's own commercial products of the past and present.[32]

Such confusion recalls the early 20th century battles over the legal differences between *performing* and *recording* sound on the phonograph. Phonograph manufacturers initially pushed the position that sound recordings were not violations of copyright, because intellectual property rights at the time (prior to the Copyright Act of 1909) extended only to the musical composition itself, not to its performance; and since sheet music included with its purchase "permission to perform the work before an audience," companies wishing to record the work interpreted this as allowing them to vicariously

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[31] "Legal Information," Nintendo of America Inc.

[32] The company's Famicom Disk System, for instance, an add-on product to its mid-80s Famicom machine (the original name in the Japanese market for the Nintendo Entertainment System) used rewriteable magnetic disks instead of write-once game cartridges. These disks could be "re-filled" by exchanging their game software content via vending machine-style kiosks in select retail locations. More recently, Nintendo released the Play-Yan adapter for the GBA in 2005, a device which accepts open standard SD memory cards; predominantly for supporting playback of MP3 and video content, Nintendo also offered Play-Yan owners the ability to download exclusive GBA-based minigames from its website, which can then be transferred to the GBA via the SD card.

"perform" it through their recording equipment. When they were selling records, they were selling "performances," not "copies."[33] In the case of games, the law already recognizes ROMs as tangible media, and more recently the WIPO (World Intellectual Property Organization) Copyright Treaty (approved in 1996) makes more ephemeral RAM (random-access memory) copies potentially open to copyright protection as well.[34] Thus the "authenticity" of game ROMs in any form is well established; moreover, protection for ROM (and RAM) copies in any form actually aids Nintendo's copyright enforcement efforts. Though phonograph companies and Nintendo were seeking opposite goals (less protection vs. more), there is a similar strategic conflation of terms that seeks to define certain media forms as legal/illegal in the public discourse, prior to court precedent.

Though they do not address it directly on their corporate legal website, it is almost assured that Nintendo's lawyers consider homebrew development illegal; thus, they would never acknowledge that there is such as thing as a digital ROM that is legal. In fact, the legality of homebrew ROMs, the digital copying of ROMs in general (commercial or homebrew), and the use of emulators can and should be considered as separate questions. But the company's non-negotiable denial of the legality of emulators obscures the presence of other legitimate legal questions. Needless to say, this obstinance makes it extremely difficult for an organization such as PD ROMs, which seeks to make available for download ROMs that are "FREEWARE, PUBLIC DOMAIN, or have been legalized for free and unrestricted use by the respective authors of each work."[35] While sites such as PD ROMs are contributing to an increasing awareness of the breadth of uses for

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[33] Gitelman, *Scripts* 130-2, 144-6.
[34] Vaidhyanathan, *Copyrights* 161-2, 171.
[35] "Disclaimer," PD ROMs.

emulators, unfortunately even some academic researchers of game culture and the games industry contribute to a framing of emulators as illegal; Kline et al, for instance, who present an otherwise detailed, nuanced and critical (in both senses of the word) account of commercial game development, refer to emulators as a technology of piracy.[36]

Nintendo's discursive maneuvers are by themselves unsurprising. The real kicker is that while Nintendo implies on its website that there is no legal context for emulation, they have simultaneously received a U.S. patent on emulation. They have used this patent, which covers a "software emulator for emulating a handheld video game platform such as GAME BOY.RTM., GAME BOY COLOR.RTM. and/or GAME BOY ADVANCE.RTM. on a low-capability target platform,"[37] to block the release of at least one third party emulator of Game Boy systems, and to threaten others.[38] Copyrights, patents, and legal definitions in general are of course nothing more than an official discourse. Patenting emulation allows Nintendo to actually enact the illegality of activity that was previously only "unauthorized." But while Nintendo is certainly free to seek a patent for any technology they choose, there is reasonable concern over both the patent's overall legality, and its potential application to the kinds of emulators used by homebrew developers. For instance, the Electronic Frontier Foundation (EFF), a techno-libertarian group known as a watchdog of electronic law and sometimes collaborator with the Berkman Center for Internet and Society at Harvard Law School, as well as prominent legal scholars at Stanford Law School and other major universities, has included the patent on its "most wanted" list of targets for its "Patent Busting" program; the EFF claims that Nintendo's patent fosters "crimes against the public domain" including threats

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[36] Kline et al 210.
[37] "Software implementation of a handheld video game hardware platform," U.S. patent no. 6,672,963.
[38] "Burned by Nintendo," Crimson Fire Entertainment; "Welcome to Gambit Studios," Gambit Studios.

to the right of "reverse engineering of videogames to promote interoperability and emulation by hobbyists and entrepreneurs."[39]

There are general questions as to the appropriateness of Nintendo's patent. For instance, it seems to cover certain basic principles of computer science, such as the ability to simulate the functionality of one machine on any other, familiar since mathematician Alan Turing's introduction of the "universal Turing machine" in 1947. No doubt partially to combat this broadness, Nintendo's patent applies specifically to emulation "on a low-capability target platform (e.g., a seat-back display for airline or train use, a personal digital assistant, a cell phone)."[40] Note that this applies to emulation *on* a low-capability platform, not emulation *of* one. It is almost solely the converse situation in which homebrew developers are engaged: They employ programs which simulate the (computationally) lowly Game Boy Advance on much more powerful PC systems. In addition, even in cases described by Nintendo's patent, such as a small entrepreneurial product made by Gambit Studios that emulates the Game Boy system on handheld Palm systems, there are suggestions that this much smaller company possesses "prior art" – a term used in patent law to designate technology that pre-existed that of the patent applicant's, and thus renders their claims invalid.[41]

The real problem with such a patent, however, is not even its potential legality. Rather, it is the practical consequences of the patent's initial granting by the U.S. Patent Office. And that effect, given the inherent disparities in size and resources between Nintendo and hobbyist or small startup developers, is to cut off even the possibility of legal challenge. As one member of the discussion forum on Crimson Fire Entertainment's

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[39] "EFF: Patent Busting's Most Wanted," Electronic Frontier Foundation.
[40] Software implementation of a handheld video game hardware platform," U.S. patent no. 6,672,963.
[41] "GBA Ever?" Crimson Fire Entertainment.

website astutely points out in response to the question "Can't Gambit Studios just submit the prior art that they have?": "Sure. If it ever went to court. If this thing could actually go through the courts Nintendo would lose, no question, because they're wrong. The problem is that Crimson Fire wouldn't be able to afford the legal costs to do that."[42] This imbalance is certainly not unique to this particular situation. It is simply reflective of a much wider structural problem in our legal system. Thankfully a growing number of reformist minded legal scholars are aware of it. Jessica Litman, for instance, worries the fair use exemption for copyright is "not much help, because one needs a hideously expensive trial to prove that one's actions come within the fair use shelter."[43] Lawrence Lessig concurs that "fair use in America simply means the right to hire a lawyer to defend your right to create."[44]

Such an imbalance is also not a new problem. Nintendo's discursive and legal attempts to ensure that "unlicensed" development can be defined as "illegal" or "pirate" echoes the MPPC's attempt to use patents and license agreements to label non-MPPC members as "outlaws." Unsurprisingly, these outsiders saw themselves not as criminals but as "independents." Because legitimate independents co-existed with blatant film bootleggers, these filmmakers faced a situation not unlike that of homebrew developers. The MPPC's patent pool pushed independents closer to outlaws, both physically and metaphorically: MPPC's strict license agreements meant equipment suppliers had to refuse service to those using "nonstandard" (i.e. non-MPPC) technology or risk being ostracized themselves; to alleviate this problem many independents relocated to

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[42] "GBA Ever?" Crimson Fire Entertainment.
[43] Litman 138.
[44] Lessig, *Free Culture* 187.

California and other effectively distant locales to minimize the chance of prosecution.[45]

But these historical precursors notwithstanding, today's increased economic legal barrier

does appear to have noticeably shifted the balance even further in favor of corporate

patent holders. Zimmermann notes, for example, that "obscure inventors" were granted

over 150 patents for amateur film-related equipment from the 1890s through the 1920s.[46]

True, they were eventually overtaken by Eastman Kodak's own broad, "systematic"

patents on 16mm equipment and film processing. Still, the fact that patents actually

represented a potential incentive to enter the amateur film market pre-1923 (e.g. before

the 16mm Cine-Kodak) seems almost unthinkable for today's amateurs.

Perhaps just as important, patent law, unlike copyright, has no fair use provision,

and patents are rarely overturned once granted (while copyright fair use trials are

expensive but not entirely rare). The 9th Circuit Court of Appeals said as much in the

Sony v. Connectix case when they commented that, had Sony obtained a patent on the

technology for which they were then claiming copyright infringement, they would have

held a "lawful monopoly"; instead, Sony's suit was rejected on the basis of fair use.[47]

Nintendo's emulation patent was filed in November 2000, just nine months *after* the

decision against Sony. While they probably did not need the courts to give them the idea

to file their own emulation patent, they had surely been keeping a keen eye on the case.

The move to protect emulation on a basis of patent is also an example of what

Vaidhyanathan warns is the continuing collapse of copyright with patents, particularly as

[45] Zimmermann, "Entrepreneurs" 168-9.
[46] Zimmermann, "Entrepreneurs" 166.
[47] *Sony v. Connectix*, 203 F.3d at 605.

software algorithms have come under the aegis of patent law in only the past twenty years.[48]

In this regard patents represent a relatively new and potentially even stronger legal tool for wielding corporate power over software. Apparently under-versed in the process of software development, the U.S. Patent Office has granted a number of highly questionable protections of seemingly "obvious" algorithms, perhaps the most publicized and ridiculed being Amazon's "1-Click" method of purchase – to some programmers, akin to granting exclusivity on the concept of trusted credit underlying the entire financial industries of bank loans and credit cards. Patents have become a standard bargaining chip for corporations in their negotiations with one another. Average, non-technical internet users often do not notice or understand the effect of numerous licensing fees and agreements to satisfy patents on common technologies such as image compression in GIFs or music in MP3s. But the breadth of their applicability also creates another unnecessary legal gap between commercial and amateur producers.

Technological Tactics: Copyright and Trademark in GBA ROMs

Beyond the discursive and legal realms, Nintendo also uses explicitly technological tactics for regulating development of GBA game software. At the start of any game ROM is a section of data known as a "header," a standard part of most files in modern operating systems. Headers are highly structured and consist of data describing certain properties of the file rather than code that is executed to produce some computational result. In GBA ROMs, the header specifies common details such as the game title and the name of the developer. It also includes something more curious, a 156-

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[48] Vaidhyanathan, *Copyrights* 153.

byte block containing a compressed version of the Nintendo logo image that displays when the GBA is powered on. Why did Nintendo put a data variant of its logo in a ROM header that is usually intended to provide functional information for decoding the file? Quite simply, to prevent unlicensed development and piracy of games by requiring anyone who creates a GBA ROM to digitally copy their logo – their intellectual property – without the company's permission, and thus open themselves up to potential suit for copyright infringement and false display of trademark. The compressed logo image is a necessary part of any working ROM. When the GBA boots up, it compares the area in the ROM header where the image is expected to its own internal copy stored in hardware; if the logo does not match byte for byte, the machine fails to authenticate the ROM and locks up.

As I mentioned earlier, Nintendo has by and large been successful in controlling the market conditions (and the distribution of profits) of games for its systems through licensing agreements that leave developers little room for negotiation. Because "tying" game ROMs to GBA hardware is officially illegal, Nintendo must ask each developer who wishes to create software for the GBA to sign its license agreement. But because the licenses are often seen as unfairly biased, game developers do not always receive them gladly. When Nintendo initiated its licensing program for the NES console, the harsh restrictions included exclusivity (licensees could not release games for a competitor's system), royalties in the neighborhood of twenty-percent, and perhaps most outrageously, the requirement that the game developer take on Nintendo's cost of manufacturing, paying Nintendo for minimum game orders of ten-thousand copies – costs they would be

required to bear the burden of even if the games never sold.[49] Facing stiff resistance and

threats of legal action, the company eventually was forced to loosen its contracts for the

NES and later systems. But denied an explicit monopoly of its market, Nintendo has over

time shifted strategy, today using a technical perversion of copyright law to give

uncertain developers the extra "convincing" they need. By requiring its copyrighted logo

to appear in each and every game ROM, Nintendo is essentially daring a disgruntled

developer to create unlicensed works. Calling that bluff would be exorbitantly expensive,

thus the company is able to create a de facto monopoly of its development market.

In fact, Nintendo's strategy is similar to the one used by Sega for its Genesis

console – the one that was rejected in the landmark *Sega v. Accolade* case that legalized

unlicensed development and reverse engineering of computer code. In that situation, the

Genesis would similarly look for a certain configuration of data within the game ROM,

this time for the characters "S-E-G-A," in order to verify the game's official status.

Accolade, a game developer and publisher who had figured out this scheme, created and

marketed unofficial Genesis-compatible games without Sega's permission. Sega sued

alleging two violations: copyright infringement by Accolade engineers, who copied and

examined sections of the BIOS code on the Genesis console hardware in order to discern

its behavior, and false trademark attribution caused by the display of the message

"Produced by or Under License from Sega Enterprises Ltd," which was shown each and

every time the Genesis successfully loaded a game ROM – even when the game was

clearly not authorized by Sega. While the court found that Sega's claims of

"infringement" were true (e.g. copying of Sega's code and misleading display of its

trademark did occur), they nevertheless rejected both counts on the basis of fair use. The

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[49] Sheff 60-71; Gallagher and Park 11.

court recognized that Sega was using technological measures designed to control outside access to their system, essentially creating "a de facto monopoly over the functional aspects of [its] work – aspects that were expressly denied copyright protection by Congress."[50]

Nintendo's technique is a very clever variation on the one used by Sega, and in fact it appears that it may have predated it – a similar requirement for an embedded logo image in a ROM header was used by Nintendo on their original Game Boy handheld console, released in 1989, while the *Sega v. Accolade* proceedings show that Sega only instituted its requirement in 1991. In the Sega case, the game console looked at the header for only a short string of characters, spelling the company's name. But because short phrases are exempted from copyright, the company could not sue for infringement in the header of Accolade-produced ROMs; instead, they sued over the disassembly of code contained within the Genesis hardware itself, rather than in a game cartridge. Nintendo's image-based system is unusual in that it blends the usual distinctions between visuals and data. The string of bytes in a GBA ROM is still quite short – just 156 (earlier incarnations of the Game Boy even used remarkably shorter variants, at 48 bytes). With one byte generally corresponding to one character of plain-English text, it is unclear if such a span would be subject to copyright protection as a literary work. Yet the data in this case also encodes a visual image of Nintendo's copyrighted (and trademarked) logo. In essence, Nintendo is able to potentially pursue "double" protection under two different standards, depending on how one interprets the case. More generally, it represents a potential ontological breakdown in the way copyright protects computer software and video games in particular.

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[50] *Sega v. Accolade*, 977 F.2d at 1526.

At first glance, the Nintendo logo image appears to be a radically new configuration of intellectual property made possible by the technological specificity of computer code and its manifestation in audiovisual interfaces. And this is likely true particularly in the case of the data/image distinction, which seems dependent on the properties of translation inherent to digital media. Yet the general technique has its germination (whether Nintendo is aware of it or not) in the practice of "internal labeling" pioneered by Edison with the emergence of the need to protect phonographs and film from duplication. Lisa Gitelman describes these "internal labels" as the result of a new potential self-referential property of these inscriptive media: "recordings could label recordings; films could label films."[51] On records, this consisted of the phonograph's own concept of a "header," with the recording company, the composition, and the name of the performer spoken before the music began. Early film studios like Pathé placed visual likenesses of their trademarked company logos on the sets of film shots (in Pathé's case, it was an image of a rooster), using a "nested" set of legal guards similar to that of the digital/graphical GBA logo to prevent duplication by a competitor or pirate – even if the film content itself was not legally protected at the time, the company trademark was.[52] Given that such similar arguments seeking de facto copyright and trademark protection were rejected in the more recent Sega case, it is encouraging that some courts have recognized the difference between enforcing the word "copy" to the letter, and the limitations on access implicit in such technological means.

Though *Sega v. Accolade* did not directly address the infringement of a digital image as a technological barrier to compatibility, the philosophy of the decision would

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[51] Gitelman, *Scripts* 156.
[52] For visual examples of this technique in action in Pathé films, see Abel 174, 242, 276.

likely hold if Nintendo was challenged in court. But again, given the economics of litigation, this is not a problem that Nintendo must largely concern itself with. Halpern, in acknowledging that the historical emendation of copyright law has been permeated by special interests, comes to the conclusion that while it may be "messy" and at times unclear, this system founded on continual compromise is likely the best alternative we have for adequately addressing technical specificities and changing ethical contexts of developing media forms.[53] While this is a well meaning vision with the intention of pragmatism, it has fundamental flaws in its ability to address non-commercial interests. It is unreasonable to expect that amateurs will ever have the resources or cohesion to be a meaningful "special interest" in Washington, D.C. The Digital Millennium Copyright Act (DMCA) was, as Halpern notes with approval, "the product of intense negotiations and compromise among various interested groups."[54] But amateurs are virtually guaranteed to be perpetually excluded from the current framework of negotiation, based as it is on blunt lobbying. It is then perhaps unsurprising that the DMCA has been the subject of sustained criticism over its lack of consideration for the public interest.[55] While Halpern is concerned about the potential for unethical conduct in digital copying, I would argue that Nintendo, by forcing amateur developers to infringe their copyrighted logo image for the purpose of creating original software that is entirely unrelated to pirating, prevents the homebrew community from operating on satisfactory ethical terms.

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[53] Halpern 146-7.
[54] Halpern 150.
[55] Vaidhyanathan; Thierer and Crews, Jr.

The Hobbyist Hardware Gray Market: Flash Linkers

Another negotiation of legitimacy waged by terminological proxy exists in the case of the flash linker hardware sold by retailers such as Lik Sang and others. In varying contexts, these devices are known by at least three different labels: in some cases they are called "back-up" units, in others "game copiers," and finally others refer to them as "development" tools. Each of these terms is discursively strategic in that it describes a single function of flash linker hardware to the exclusion of others. Potentially clunky as it is, I prefer "flash linker" for its legal neutrality and functional breadth: Flash linkers are devices which provide a physical link between the hardware of the GBA and that of a PC, by reading and writing data to special GBA game cartridges known as "flash carts." For homebrew developers, their primary function is to transfer a non-commercial game ROM file from the developer's PC to the flash cart, enabling its play on the GBA. (Amateurs can and do play their own games on the PC through emulators, but of course access to the "real," physical handheld hardware of the GBA is preferred.) Because (the vast majority of) flash linkers provide not only "write" but also "read" functions, they make piracy of commercial games quite easy as well.

Especially in the early to mid-1990s, when similar flash linkers existed for previous Nintendo game consoles such as the Super Nintendo Entertainment System (SNES), these accessories acquired the unfortunate name of "back-up" units.[56] The term became popular as an interpretation of the "archival" exception in U.S. copyright law which allows individuals to make an archival copy of software programs they own, to

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[56] Technologically, these earlier devices often transferred game ROMs to and from standard floppy disks rather than proprietary flash carts. Functionally, however, they were identical.

guard against loss in the case of destruction.[57] The legality of archiving one's game

software is uncertain. On one hand, the law does appear to recognize an owner's right to

protect his or her digital property through limited duplication; on the other hand, both

Congress and industry are keenly aware that such a provision is also a potential invitation

to rampant piracy and have codified responses to this threat into the law. Varying levels

of perceived susceptibility to piracy is one reason you can rent console video games but

not computer games for PCs.[58] The latter have been traditionally easy to copy using

standard PC software, while the former is explicitly exempted by copyright law because

it "cannot be copied during the ordinary operation or use of the machine" and is

"embodied in or used in conjunction with a limited purpose computer that is designed for

playing video games."[59] As differences between console and computer-based game

media continue to erode, however, this argument remains alive and well, for instance in

debate over the recent release of commercial PC software designed to help consumers

copy their games.[60]

The problem with the "back-up" label, however, is not so much its potential

legality as its inapplicability to the homebrew development scene. The term back-up

implies that the purpose of the device is, explicitly and solely, to make archival copies of

game ROMs. It does not recognize the possibility of legal use in the context of homebrew

ROMs created from scratch. Unfortunately, for several years members of homebrew

communities based around several video game consoles themselves adopted the "back-

up" terminology, playing into Nintendo's discursive preference of seeing any unapproved

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[57] "Limitations on exclusive rights: Computer programs," 17 U.S.C. § 117.
[58] Halpern; Charne.
[59] "Limitations on exclusive rights: Effect of transfer of particular copy or phonorecord," 17 U.S.C. § 109(b)(1)(B).
[60] Saltzman, "Game-copying software reignites piracy debate."

activity as piracy. At best, calling flash linkers "back-up" units is an uncertain defense of game copying. At worst, it is a euphemistic acknowledgement of piracy. Furthermore, anecdotal evidence at least suggests that few consumers buy them predominantly for such an archival purpose. Rather, flash linkers are in the vast majority of cases purchased for one of two reasons: legitimate homebrew development, or outright piracy. Thankfully, in recent years and in the GBA homebrew scene particularly, "back-up" has receded from popularity, perhaps suggesting that amateurs are becoming more aware of the rhetorical terrain on which they are situated – a reasonable assumption as cease and desist letters and prosecution of businesses friendly to homebrew developers becomes more visible, with the Lik Sang case providing only one example.[61]

If "back-up" is a red herring for amateurs, the other two terms, "copier" and "development tool," more correctly capture the ideological opposition reflected in the battle over the use of emulators. Unsurprisingly, Nintendo exclusively uses the term "copier," particularly as a means of maintaining their illegality. They note, accurately, that such devices "enable the user to make, play and distribute illegal copies of video game software... Based upon the functions of these devices, they are illegal."[62] Putting aside the question of whether such copying is legal, either as an archival copy or other fair use, this argument is deceptively reasonable: It makes perfect sense in that it simply states an opposition to illegal piracy. Yet it presupposes that the only (or at the least primary) functional mode of the device is duplication rather than creation. It renders the very existence and rights of the homebrew scene invisible. Again, it is unlikely this is

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[61] Whether the total number of such cases has risen I do not know (though I suspect it has). Nonetheless, it is at least certain that the vastly increased interconnectedness of online communities today, as opposed to the smaller BBS networks and not-yet-mainstream internet of 10-15 years ago ensures that news of these cases spreads much more quickly and awareness and discussion is wider.

[62] "Legal Information," Nintendo of America Inc.

intentional on the part of Nintendo; rather, it is a side effect of the company's desire to exclude (illegal) piracy as well as (legal) unlicensed commercial development. Technology is seen through a lens colored by capitalism.

Within the homebrew scene, flash linkers are most likely to be known either by that same neutral term (and variations such as "flash kits"), or by the more proactive label of a "development" tool. The latter is the only name which makes explicit the legitimate non-copying uses of these devices. While individual developers have generally adopted this terminology, it is also regularly employed by retailers selling flash equipment. From the perspective of discursive framing, one may view this hopefully as an overdue recognition of the non-pirate market for such devices, or cynically as a simple awareness of the need to avoid admitting the possibility of self-incrimination. In this regard, the claims of flash linker retailers are as trustworthy (or not) as Nintendo's: underpinning both is a business concern. While they may say that "we provide these flash kits only for home development and for use with public domain gba games, demos and other software. We do not support any kind of illegal use of the EFA [Extreme Flash Advance] flash kits," they are surely aware of the potentially large market of hardware to would-be pirates.[63]

Yet such retailers are also perhaps in a better position to see the bleed between the homebrew scene and professional developers licensed by Nintendo. In deciding to fight the lawsuit against his company, for instance, Lik Sang founder Alex Kampl claimed that "the very same hardware under attack is used by thousands of hobbyist users and even professional developers for legitimate purpose. Very embarrassing for Nintendo."[64] As

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[63] "Total GBA," Total GBA.
[64] "Nintendo vs. Lik-Sang," gbadev.org.

affordable, if unofficial, development equipment, flash linkers and emulators may provide an important common ground for amateurs and their professional counterparts. Nintendo operates according to a strategy that Kline et al call "enclosure" – as a closed system, access of all types, from developing, to marketing, to selling, to playing GBA games is filtered through the company's policy. Famous for its restrictive licensing agreements (which many believe contributed to the rise of its competitor, Sega's Genesis, following the initial dominance of Nintendo's NES system), the company's manufactured economy of scarcity breeds dissent. Kampl insists that a large game publisher whose game appeared in court proceedings against him (coincidentally, not intentionally) "bought hundreds and hundreds of Flash Cartridges from my company for beta testing. And so did numerous other top 10 publishers listed in the stock market."[65]

Cooperation and Co-option

In an environment in which the official GBA development kits cost thousands of dollars, it is little surprise that professional developers might seek cheaper alternatives. One cannot verify Kampl's statement, but one can easily construct an argument to support it. In the case of emulators, one professional GBA programmer who is friendly to the homebrew scene even admits that "[f]or every day use, I personally use No$GBA [an unofficial emulator] as it's [sic] debugging features are superior and it's much more responsive" than the officially licensed development kits.[66] Symbiosis between homebrew and official developers occasionally goes even further. In 2004, recognizing the substantial nostalgia-driven market for some of its older titles, Nintendo released a

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[65] "Nintendo vs. Lik-Sang," gbadev.org.
[66] "Getting Published," gbadev.org.

series of "classic" NES games, emulated (or ported) to the GBA. Following suit,

Japanese game publisher Jaleco reissued some of its own NES games. Jaleco, however,

rather than writing their own emulator to play NES games on the GBA, "quietly

borrowed the source code" for PocketNES, a well known – and technologically proven

by its wide fan base of users – homebrew emulator.[67] One may see this as blatant

commercial exploitation, as many in the emulator scene initially did. Some called for

legal action.[68] But they soon realized to their frustration that the emulator's author,

known as *Loopy*, had explicitly released the PocketNES source code into the public

domain, rather than under a more restrictive open source license that would have

prohibited commercial use (or required Jaleco to publicly release their own code in turn –

enough to dissuade almost any commercial publisher). Then a funny thing happened –

Loopy posted his own opinion on the matter:

> Yes, PocketNES is public domain... I wanted it to be public domain. This "Jaleco
> incident", in fact, is the very reason I wanted to make it FREE (as in public
> domain) rather than "GPL [General Public License] free" (strings attached). I'm
> not a fan of the GPL, I think it's selfish. Let someone take an idea, do something
> cool with it, and not have to hesitate because of legal nitpickings. If a company
> can take something that I made, and turn it into a product that other people enjoy,
> I'm all the happier for it. Why should I care if someone else profits off of
> something I made? It's already free. Demanding that someone pay homage to my
> work is just ego-stroking, and I'm not into that. Sure, as a courtesy it would have
> been nice for Jaleco to tell me "hey, thanks for the source", and they didn't, but
> I'm not going to lose sleep over it, because I didn't write PocketNES so people
> would pat me on the back. I wrote it so people could have fun playing old games.
> And that's exactly what's happening here. Mission accomplished.[69]

With such free and sanctioned exchange between hobbyist homebrew

programmers and officially licensed professionals, it becomes increasingly difficult to

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[67] "Jaleco Borrows PocketNES Emulator Source Code," Waxy.org.
[68] "PocketNES abused?" Pocket Heaven.
[69] "PocketNES abused?" Pocket Heaven; "GNU General Public License," Free Software Foundation.

maintain a good-and-evil narrative of publishers vs. pirates. *Loopy*'s position is unusual in that it avoids a dichotomy between the theoretical worlds of commercial exploitation and enthusiast labors of love, a basic separation that many open source adherents embrace. That is, rather than seeing open source licenses and their guaranteed transparency of source code as a kind of pseudo-utopian alternative to the commercial world (albeit one that very cleverly turns copyright and contract law back in on itself as a way of legally ensuring free and open access, as Chris Kelty describes[70]), *Loopy* explicitly renounces any consideration with capitalist structures of software development, and posits no inherent difference between amateur and commercial parties. Certainly his own view contains its fair share of utopianism – perhaps more so, some would argue, given its total lack of cynicism. On one hand, this paper has also tried to show the ways in which such divisions are socially constructed and porous. On the other, that such a division reflects real differentials in power relations, that uncovering or erasing discursively will not favorably alter.

Kline et al describe video game "piracy" (and other under-litigated semi-legal activities such as emulators) as the manifestation of a contradiction between "enclosure" and "access" inherent to the structure of the game industry. Nintendo and other corporations seek to control the technologies of game development and distribution legally, technologically, physically, and discursively; they keep the system "closed." Yet "digital technologies are also subversive of commercial ownership and control… With one hand," the game industry "pushes to expand access to digital machines on which its market empires depend. With the other, it strives equally hard to police, contain, and constrain the use of such machines to keep it within the boundaries of commercial

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[70] Kelty.

profit."[71] The wider technology is disseminated, the harder it is to enclose. In their view,

piracy represents a "leakage" of the new forms of "surplus capacities for reproduction

and circulation" created by the technology of digital games.[72] I would suggest that the

motivation for homebrew GBA game production may represent a benign counterpart to

piracy.

It is also unclear just how "new" the contradiction of access and enclosure posited

by Kline et al is. Particularly by looking at past examples of emerging configurations of

corporate media, my own feeling is that while digital technologies surely change the

character of the (im)balance, its overall structure can be seen in the earlier struggles over

amateur film and radio, and the extension of copyright to new media such as

phonographs. Such past battles have seen qualitative successes, such as the eventual

dissolve of the MPPC after a barrage of legal pressure sustained over several years, as

well as relatively undesirable outcomes like the re-monopolization and

substandardization of the equipment markets for mainstream amateur photography and

film, and the marginalization of amateur radio in favor of oligopolistic broadcasting with

government regulation in the 1910s and 20s. The digital character of software coupled

with its dissemination via the internet make technological "enclosure" more difficult than

ever. Yet the ingenuity of the most hardcore homebrew enthusiasts – reverse engineering

the GBA hardware, building their own flash linkers and nonstandard devices with off-

the-shelf electronics components – has its roots in the scavenging of young amateur radio

hobbyists at the turn of the century, "converting a motley assortment of electrical and

metal castoffs into working radio sets;" most people fail to realize how in many ways

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[71] Kline et al 281-2.
[72] Kline et al 282.

such tinkering has advanced little in a hundred years: the attachment of a Quaker Oats

container to boost the signal range on crystal radio sets then is replicated in the well-

known use of a Pringles can to do the same for wireless computing networks today.[73]

Beside the first-world "knowledge economy" of game design and development is

juxtaposed the industry's dark underbelly, cheap manufacturing labor in Southeast Asia

and Mexico.[74] And as Kline et al note, activities of all sorts undesired and "unauthorized"

by the industry have globalized along with the work force. These illicit locations may

have shifted from California to China, but it is clear that despite the rise of digital

networking, geography plays as much a role today in defining the industry's sphere of

influence as it did in the time of the MPPC.

The homebrew GBA scene, then, may ultimately fit rather comfortably into a

hegemonic model of non-total but lasting industry dominance. On one hand Nintendo

appears punctured by pockets of, if not active resistance, then at least quiet subversion.

On the other is the inescapability of participation in that same structure. While amateur

developers, gray market entrepreneurs, and official developers using unofficial products

may exploit weaknesses in Nintendo's technical, legal, and discursive regime of control,

they all remain parasitic to it. They purchase and, in the end fundamentally promote,

Nintendo products. They explicitly choose to develop using such a closed system rather

than directing their creative energy towards more open systems like the PC. Surely there

is not a top-down, one-way flow of control from Nintendo to licensed developers,

Chinese equipment makers, amateur programmers, and consumers. Hobbyists and their

allies create their own unanticipated value chains, both cultural and economic. On

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[73] Douglas, *Inventing* 197.
[74] Kline et al 205-9.

balance, the angle of Nintendo's strategy is skewed with regard to amateurs, but the

tactics of the homebrew scene have yielded a protest that is, perhaps surprisingly,

anything but apolitical. If one believes the arguments of Lawrence Lessig, Jessica Litman,

Siva Vaidhyanathan and others, that intellectual property is among the most crucial of

battlegrounds in our digital society, and that IP laws have become dangerously

unbalanced in handing control over to corporate producers at the expense of the

traditional and moral legal obligation towards the public good, then the GBA amateurs

comprise a peaceful, non-pirate, non-infringing movement to equalize media production

that is indeed at the heart of American political debate.

End

The Future(s) of Amateur Game Development

Turning Over: The Longevity of Homebrew Communities

In November of 2004, just in time for the Christmas season, Nintendo released its

next handheld gaming system following the GBA, the DS (an acronym referring to the

machine's dual screens). The DS was exceptionally well received by consumers out of

the gate, selling 500,000 machines in its first week in Japan, and with projected sales of

six million units by the end of March 2005, only four months after its debut.[1] The system

was also popular with the homebrew community – within days of the announcement of

its brand name, the proprietor of gbadev.org registered the internet domain name

dsdev.org. More tellingly, when a section of the gbadev.org discussion forum was set

aside for topics relating to the DS, it was flooded by hackers and coders frantically racing

to decipher Nintendo's newest security mechanism and encryption algorithms; soon the

sole DS discussion area became the busiest forum on a website ostensibly for GBA

homebrew enthusiasts. The competition in the handheld game space shows no signs of

letting up as Sony, the leader for several years running of the home console market,

brings its own new portable system (the first for the company), the PSP (PlayStation

Portable), to the U.S. in the weeks preceding this writing.

The video game console market has since its inception been driven by cyclical

generations, often accompanied by a turnover of dominant systems and companies. That

turnover is now on the horizon for the GBA, despite its current success and ubiquity. But

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[1] "Nintendo DS Sales Set to Hit Six-Million," The Armchair Empire.

what does this commercial intervention mean for the amateur-driven homebrew GBA community? So far in this project, I have treated the scene as a largely static entity, strongly influenced by the aesthetics of game history and present industry, but also a stable practice on which I could depend for continuity and coherence from week to week. This has been a conscious choice, to take a snapshot of the community. As the "external" market conditions of the game industry change, there are questions to be asked about the potential long-term viability of the GBA homebrew scene, and of amateur development more generally.

When the GBA arrived in 2001, the once vibrant Game Boy Color homebrew scene began to decline. Today very few releases are made for that system. Some of those coders moved to the GBA scene, while others who perhaps preferred the earlier machine's specific restrictions[2] simply abandoned the hobby as the community atrophied. A similar transition seems inevitable now: underneath the hood, the DS is in fact not a radical departure from the GBA but rather an extension of its architecture, a superset adding support for 3D graphics, wireless networking, and a second display with touchscreen capability. The same qualities designed to facilitate easy commercial adoption of the new platform apply equally well to amateur development. *Lord Graga* echoes this prediction: "I can't imagine the GBA and the DS scene as two sep[a]rate scenes.... I'm actually afraid of the future for the GBA scene."[3] With homebrew communities so closely self-associated with the particular brand of hardware on which they develop, the larger question this raises is over the basic identity of the machine itself.

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[2] The GBC featured a well-known Z80 processor, which demanded very low-level assembly coding. The GBA supports (though does not require) higher-level C or C++ programming. Personal taste determines such shifts as a draw for some, and a disappointment for others.

[3] Lord Graga, Email Interview.

Will the GBA ever acquire the kind of fierce amateur loyalty the Atari 2600 enjoys,

twenty years after its heyday? Or even a much more modest popularity as a homebrew

system of choice in five years? Does the power of the technology, the brand, hold or fade?

Commercially, of course, all such platforms fade if only in a matter of time. But if

we look back through the history of homebrew console development, resilience in

homebrew does not map evenly to market success. In addition to industry "winners" such

as the 2600 and NES, "losers" like Sega's Dreamcast and the obscure GamePark32 have

supported some of the most popular scenes. This is the result of an interacting set of

cultural and technological vectors, many of which I have looked at earlier in the context

of the GBA community's formation and game production. Currently successful

commercial brands will always generate at least a transient interest, by the simple rules of

volume and leading edge techno-appeal (the latter certainly a factor at this stage in the

lifespan of the DS). Hallmarks of market-winning consoles do not always apply, however.

For instance, the high switching costs between console systems crucial for commercial

success are deemphasized for homebrew developers, who do not depend as directly on

the retail software library for a particular hardware platform.[4]

Amateur scenes with a lasting cohesion can often be pinpointed to one or two dominant

features which vary qualitatively from case to case. For the 2600 it is nostalgia and sparse

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[4] See Gallagher and Park. Switching costs are (economic, and by implication psychological) barriers for consumers to change from one product brand or platform to another. For instance, since the overwhelming majority of video game console systems have been incompatible with one another, consumers have a disincentive to adopt a new technology and give up the utility of the products that they already own. Such costs are familiar in the music industry, in the movement from vinyl records to cassette tapes to CDs and, ongoing, to digital online music services. In recent years, some companies including Nintendo and Sony have sought to diminish switching costs between generations of their own brand. For instance, while Nintendo's Super NES system of the early 1990s was incompatible with its own NES predecessor, the GBA can play older Game Boy (Color) games, and Sony's PlayStation 2 can play earlier PlayStation games. In fact, backwards compatibility between a company's series of hardware generations appears to rapidly becoming a standard industry practice for stabilizing market positions, which in the past have often shifted radically every few years as new hardware systems invalidated past sales successes in software.

technical structure; for the Dreamcast, a cult status among gamers as an underappreciated and too-early-abandoned commercial product (in this case the product's commercial *failure* is actually beneficial to its amateur adoption); the Xbox's compatibility with most Windows programming gives it an undeniable ease of use; and the Korean GP32 similarly benefits as an explicitly open platform.

In truth, the GBA likely lacks the staying power necessary to survive in the long run. Broadly, homebrew developers are drawn to the GBA for its technical challenge. But in my earlier analysis, I found that what sets this machine apart from others is also its tight binding to the commercial industry: technical relevance providing professional potential to hobbyists, and a transgressive challenge of reverse engineering provided by Nintendo's decision to police the system's closed configuration. As the game industry transitions to new systems, the timeliness of this technological appeal cannot be sustained. Similarly, the intense interest induced by restrictive legal policies fades as corporate engagement drops and hobbyists exhaust the hidden information the platform has to offer, left with nothing to discover. Coupled with this, Nintendo's adoption of backwards compatibility for the DS dilutes the technical specificity of the GBA and prevents the latter from becoming cemented as meaningfully distinct. Again, commercial strategy is tangentially diminishing hobbyist longevity.

What this means is that this project captures the GBA scene at, perhaps, its height, and on the eve of its wane. Homebrew communities form, fluctuate, disperse, and re-group under different monikers. The trends and in many cases the individuals of this amateur collective will continue, but the particularities discussed here will move on and detour with the market. Why does this matter? As Alejandro Adams has warned in regard

to web-hosted digital video, analyses of often ephemeral online media risk the potential

that "their applicability will not endure beyond the abbreviated life span of their

antecedents."[5] It is undeniable that electronic forms such as streaming video and

homebrew games exhibit unstable distribution. Yet there is no finality of debate as to an

inherent transience of digital media, as emerging fields such as "computer forensics" re-

introduce physicality to our understanding of such communication.[6] We need only look

back to previous analog media such as early film to see the complications of future

comprehension that arise from a lack of archival and academic attention; and the effects

of abandonment in the silent cinema are only amplified considerably in the case of

amateur work outside of any formal distribution network.

This project is not one of preservation, or even of comprehensive documentation.

But it does aim to provide points of understanding that can best, and in some cases

perhaps only, come from a contemporaneous academic treatment. In this sense the

uncertain longevity of digital media, amateur media, and specifically hobbyist video

games reinforces my initial call for a sustained area of cultural game studies devoted to

amateur production.

Alternative Topologies of Amateur Game Production: Product vs. Production

In the analysis above and in this thesis more generally, I have often talked about

the specific context of amateur development for dedicated video game consoles, or what

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[5] Of course, the irony of Adams' analysis is that his own "web-hosted scholarship" possesses an identical instability.

[6] See Kirschenbaum, and discussion of at Montfort, "Trace On."

is vernacularly known as homebrew development.[7] I have shown the ways that

homebrew games are especially bound to commercial gaming, as historical precedent,

and as sources of inspiration, nostalgia, and anxiety. This has often made it difficult to

answer the question: what is it that the content of homebrew games offers aesthetically

and formally, that commercial games do not? In other words, while it is clear that

homebrew developers differ from professionals in terms of their production process, the

degree to which the products themselves – the games produced by the community – may

provide such an "alternative" is less so. GBA homebrew games do stake out a modest

space of aesthetic and formal difference, particularly as I have noted in parody, an

approach to games which, interestingly, has not yet been noticeably undertaken by

commercial developers. As parody is a "late stage" or mature form of self-consciousness

in expressive works, one speculation is that amateur designers repeating older,

commercially abandoned game forms (with which they may additionally have a nostalgic

association) are more likely to see this comedic mode as appropriate; today's (non-

commercial) interactive fiction authors have likewise adopted parody as a subgenre.[8]

Commercial publishers, accurately or not, may see no sustainable market for this kind of

work (at least not yet).

Another area common to amateur production both inside and outside the GBA

scene that I touched on was the concept of "small worlds," which can be considered a

game-analog of short form works in other media like poetry or short film that, as

Montfort notes, have similarly been considered commercial fringe works.[9] With rare

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[7] As opposed to amateur game development for non-proprietary systems, typically not given the
"homebrew" label.
[8] Montfort, *Twisty* 218.
[9] Montfort makes this point with regard to interactive fiction, in *Twisty* 193.

exceptions, however, homebrew games do not exhibit the kind of radical experimentation and challenge to content and form associated with avant-garde, alternative art and media movements. This suggests that we should look once again to the scene's use of technology as a site of creativity. Homebrewers, for instance, have spent a considerable amount of time figuring out how to create their own works for Nintendo's e-reader, a promotional device released for the GBA in 2003. The e-reader is a peripheral that attaches to the GBA, and takes cardboard inserts (such as trading cards) specially printed with a dot pattern as input (not unlike pre-magnetic computer punch cards from the days of mainframes). Through trial and error, homebrew developers created PC software for printing their own e-reader compatible programs onto standard paper stock.

At first glance homebrew e-reader programs appear to be the epitome of the scene's obsession with the intricacies of hardware – of technical exploitation and virtuosity for its own sake. Yet in actuality such achievements can be equally viewed as a strategy of practicality. Because it allows amateurs to print their own GBA software without additional gray market hardware, the e-reader can help the scene to circumvent legal threats and economic barriers of access. Not everyone can afford a flash linker, for example, particularly students and those living outside the United States.[10] The e-reader gives amateurs control over an entirely new and cheap distribution technology. This does not mean that the technical affordances of the e-reader do not influence content and aesthetics; indeed, the device supports only a very restricted set of the GBA's graphics and sound capability which necessarily shape work developed for it.[11] But what it does suggest is that the true radicalism of the GBA homebrew scene lies in the very fact of its

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[10] Lord Graga, Email interview.
[11] Specifically, the e-reader can be most easily used to run custom Z80 processor-based and NES-compatible games, with a limited audiovisual API, both via emulators embedded on the e-reader itself.

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existence, in its repurposing of game hardware intended for consumption into a platform for personal production. We should not treat a lack of alternative game content as an absence of noteworthy alternative activity. E-reader software exemplifies the manner in which technical production is here intertwined with legal and corporate policies. Homebrewers are often fixated on hardware, but their methods also firmly challenge the social construction of game consoles as one-way media technologies.

Not all amateur game development follows the aesthetic guidelines of commercial content, or distinguishes itself from the mainstream through such technological bootstrapping. These are features particular to the social make-up of the GBA scene, and its superset of homebrew development. If underlying the scene's close relationship to commercial gaming is a basic aesthetic mimicking, this is not an effect of the machine's technology but rather a parallel cultural trajectory. Outside of the tightly knit homebrew community, groups such as the BEIGE Collective and Radical Software Group (RSG) have created amateur programs for NES and Game Boy Color game consoles specifically framed not as games but as contemporary art. The work of both has been embraced by the high art world, displayed in museums such as SFMOMA.[12] RSG's *2x2*, for example, displays video clips from television "degraded to a resolution of two pixels tall by two pixels wide."[13] The program's purpose is not to create a game or demonstrate a technical skill, but to provoke theoretical thought about the ontology of visual perception and its relation to the digital coding of images. The "normal" or intended uses of game hardware are still being challenged, but for different reasons, not to promote amateur production but to make an artistic statement.

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[12] Olson.
[13] "2x2," Radical Software Group.

In amateur game communities beyond homebrew development, the social

construction of games is being reconfigured in other ways as well. If the intent of non-

commercial development for dedicated game consoles tends to be tied to its technical

base (whether we are talking about homebrew parodies or contemporary art), there are

independent game movements which *do* directly focus on alternative forms of content

and game mechanics. One such example is the loose alliance of projects and groups

known as "serious games." These can be generally defined as games with intended ends

other than entertainment – or more accurately, in which "fun" is not the primary objective.

Water Cooler Games, a blogging hub for serious games news, refers to this as "video

games with an agenda… [that] want to make a point, share knowledge, change

opinions."[14] These games, in other words, focus on the social construction of games as an

entertainment medium, with only an indirect concern for their modes of production. They

include games modeling political systems and current events; educational games that use

simulations to present physical and social processes in an interactive manner; and even

games advancing particular ideological perspectives, such as niche "Christian games," a

counterpart to the Christian alternative media subculture successful in music.[15]

Serious games have actually garnered more attention in the popular and academic

press, in noted publications including the New York Times and the Nation, than the kinds

of homebrew games I have focused on here.[16] Understanding the full extent of the formal

possibilities of games will certainly depend on such manifestations beyond entertainment;

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[14] "Water Cooler Games."

[15] For more information on serious games, also see the "Serious Games Initiative." Representative sources for serious game genres also include: for political games, "Persuasive Games," a small development company; for educational games, "The Education Arcade," a research group in the Comparative Media Studies program at MIT; on the small Christian games community, see the "Christian Game Developers Conference," and Dee, "PlayStations of the Cross."

[16] See Erard, "In These Games, the Points Are All Political," and vanden Heuvel, "Playstations for Peace."

serious games provide a fertile research ground for anyone interested in non-mainstream game production. At the same time, I have focused on "mundane," plain old "fun" amateur games here in part to show the way in which such a practice that seemingly reaffirms the commercial can still engage important societal and legal issues without an explicitly stated agenda towards that end.

Corporate Frameworks: Legal Recognition vs. Restriction from the Industry

In a similar vein, not all independent or amateur game developers face the high degree of corporate resistance – or perhaps more accurately, willful ignorance – that GBA homebrewers contend with from Nintendo. The GBA community is in need of particular attention precisely because of its own particularly difficult situation. It is important and hopefully helpful to note, however, that other, more hospitable arrangements between corporate and amateur producers do exist elsewhere. What might be considered the most "successful" relationships in this regard is the practice of "modding" commercial games. Mods (i.e. "modifications") refer broadly to player-created content for existing games, usually made under explicit encouragement and recognition by the commercial publisher, and using a combination of official tools provided by the professional developer and additional utilities created by members of the modding community. Modding is generally considered to have become a mainstream practice with the public release of file formats for id's *Doom* in the mid-1990s, and has been extremely popular in the decade since, with large amateur communities in games spanning genres from role-playing (*Neverwinter Nights*), to real-time strategy (*Warcraft 3*), to simulation (*The Sims*).

On the whole, modding represents a mutually beneficial balancing of interests between commercial and amateur producers, but as the case of GBA homebrew activity should make clear, it is only by virtue of a corporate calculation that these game systems have been opened to a wider field of developers. Freely downloadable mods, produced with little or no effort on the part of the initial commercial development company, extend the sales of products in an industry grappling with astonishingly brief retail shelf lives of often only a few weeks. The payoff for a game with a loyal mod community can be substantial – three years after its initial release, BioWare's *Neverwinter Nights* has demonstrated the kind of commercial longevity traditionally reserved for rare blockbuster titles with breakout potential beyond the gaming community, such as *Myst*. For players who aspire towards game-making but who may lack the intense technical interests of console homebrew coders, mods have proven to be a welcome means of lowering the barrier to entry for dabbling in game production. Mods are in many ways a kind of return to the inclusion of "level editors" in classic titles such as Broderbund's 1983 *Lode Runner*; in fact, there is nothing new about the realization that user-produced content can be harnessed for commercial gain: released one year after the original, *Championship Lode Runner* was a sequel featuring fifty of the most advanced levels created by players.

While the trend towards mods is encouraging overall, the practice is not free of controversy. Though mods can provide corporate legitimation and attention for amateurs, some scholars also worry about the degree to which mod creators can become a "free" labor pool for commercial companies, who reap large profits indirectly from the existence of mod content without any financial compensation in return.[17] Furthermore, most professional developers put restrictions on commercial usage in the end-user

[17] Postigo.

licensing agreements (EULAs) attached to game editing tools; these legal contracts, often referred to as "click-wrap,"[18] allow only limited use of the content mod authors produce, usually prohibiting sale, or offering right of first refusal to the "host" game's publishing company. Certainly the right to create without the threat of prosecution is an improvement over the predicament of homebrew console developers, but the potential loss of ownership over one's intellectual property should not be a necessary concession in exchange for this basic ability. One massively multiplayer online game, *Second Life*, which depends almost entirely on user content (e.g. there is essentially no "world" or gameplay goals built into the game other than the most elementary building blocks), has been lauded for explicitly altering its legal terms of service in 2003 such that players retain all copyrights to content (both audiovisual and code-based) created in game.[19] Such a close symbiotic relationship between amateur player-creators and a professional developer is the legally liberal exception rather than the standard, however.

Like serious games, mods are a kind of non-traditional game development which has arguably received more notice than homebrew scenes for dedicated game machines. That has been a major reason for my decision to focus on this particular practice. There is good reason to believe that homebrewers may not stay out of the spotlight forever, though. As the next generation of handheld gaming consoles – Nintendo's DS, and Sony's PSP – hits the market, the opposition between the corporate desire to keep these

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[18] The term is a spin on "shrink-wrap," and refers to legal licenses (EULAs) which computer users must agree to in order to use a particular program. The name comes from their usual manner of presentation, as a pop-up box containing the text of the license, which the user indicates his or her agreement to by clicking a button labeled "I Agree," or similarly. Some scholars have claimed that such licenses are dubious, arguing they do not make a good faith effort to educate the user as to the full extent of rights he or she may be waiving (mutual understanding being a requirement of U.S. contract law), instead burying such key points in extensive legal language and "fine print." Currently, however, such licenses stand legally, and the practice is widespread not just in games but in software more generally.
[19] Haughey.

technological systems closed and proprietary, and the "surplus capacities" for exploiting these methods of enclosure described by Kline et al has ratcheted up to a previously unseen level. With new technologies come new potentials for ad hoc repurposing by the amateur (what corporations would term abuses or misuses). Perhaps it is the networking technology of these machines which makes them inherent hotspots of attention from homebrewers. Both handhelds offer wireless networking (wi-fi) capabilities that bring not only intended commercial but also unintended tinkering opportunities: already, DS homebrewers have used this wi-fi channel to circumvent security features and potentially obviate unofficial physical hardware such as flash linkers. Likewise, PSP owners have discovered a backdoor web browser providing unrestricted access to the internet, a "hack" which along with others prompted an article on wire service Reuters (and carried on CNN) – the kind of journalistic human interest story which just may signal a significant shift in the visibility of homebrew practice.[20]

Homebrew Games as Indie Media

I began this thesis with the argument that amateur games were a neglected topic of study for academics. In closing, I would like to broaden the target audience of that sentiment to include all interested in independent media – not just scholars, but also journalists, zine and blog writers, copyright and censorship activists, filmmakers and punks. In short, anyone who cares about alternatives to and vernacular extensions of commercial offerings, no matter the medium they work in. Amateur game developers are caught in a delicate dilemma. They are in need of the kind of attention, education, and debate that more mature alternative media communities could provide. Yet too often they

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[20] Berkowitz.

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are overlooked by those same groups, who are prone to dismiss the entire medium of games out of hand as a hopelessly consolidated commercial industry with a narrow range of expression aimed at a subset of the male population. If only we raise the level of awareness for non-professional game development, I believe we can change this perception swiftly.

I have reason for optimism: When recently meeting with an editor for the magazine Punk Planet, I asked about the absence of game-related stories. "We have to do the independent thing," was the response, understandable for a publication focused on bringing together indie creators of music, zines, and comics and uninterested in anything distributed by a major media conglomerate. But when I explained the prevalence and vibrancy of communities like the GBA homebrew scene, especially the kinds of corporate legal policies threatening their right to create, she was not only attentive and engaging – she also asked me to write an article bringing this kind of concern to the magazine.

That the culture of video games already influences indie (and mainstream, for that matter) media does not come as a surprise anymore. The visual and musical aesthetics of games are popping up all over – in cover bands of 80s game songs such as The Minibosses and The Advantage, in the pixel art of design groups like eBoy, and in Raina Lee's "1-Up" zine. But the act of game development itself has as so far been largely off of the DIY radar. In an environment in which indie promoters and critics do not yet see the potential for amateur games, in which academics studying games remain focused on commercial production, in which gamers themselves are often disinterested in or even distrust both scholars and independent media activists, the ultimate goal of this thesis is

to stimulate awareness and communication between these groups. If the project succeeds, it will be as a facilitator of a meaningful recalibration of their attitudes, interests and activities.

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