THE TROPE TANK: A LABORATORY WITH MATERIAL RESOURCES FOR CREATIVE COMPUTING

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ABSTRACT: Principles for organizing and making use of a laboratory with material computing resources are articulated. This laboratory, the Trope Tank, is a facility for teaching, research, and creative collaboration and offers hardware (in working condition and set up for use) from the 1970s, 1980s, and 1990s, including videogame systems, home computers, and an arcade cabinet. To aid in investigating the material history of texts, the lab has a small 19th century letterpress, a typewriter, a print terminal, and dot-matrix printers. Other resources include controllers, peripherals, manuals, books, and software on physical media. These resources are used for teaching, loaned for local exhibitions and presentations, and accessed by researchers and artists. The space is primarily a laboratory (rather than a library, studio, or museum), so materials are organized by platform and intended use. Textual information about the historical contexts of the available systems, and resources are set up to allow easy operation, and even casual use, by researchers, teachers, students, and artists.

KEYWORDS: Computing laboratory. Computing resources. History of material texts. Digital and analogical literature.

Nature and Purposes of the Lab

The Trope Tank is a laboratory for creative computing. (The name for this activity is taken from the magazine *Creative Computing,* which was originally edited by David Ahl and ran from 1974-1985.) A particular focus of the lab is on language and poetics, but resources of many sorts are available – including material computing systems, technologies that are precursors to computational ones, software on physical media, controllers, peripherals, manuals, and books. Many computer systems are set up, plugged in, and ready for use, in some cases with updated storage media systems that allow easier loading of programs – alongside the original storage media systems, which are also still available. The laboratory

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aims to provide the easiest and best access to material computing resources for digital media researchers, students, teachers, and those working on creative projects. Our collection of working systems includes Apple IIe and IIc, Commodore 64, and Atari 400 computers, alongside Atari VCS, Intellivision, Playstation, and other game consoles and more recent computing platforms such as a Mac SE and a later G4 Mac running System 9. A variety of other devices including a TRS-80 Model 100, a Commodore VIC-20, a NeXT workstation, and several revisions of Commodore 64 are also available for use. The Trope Tank's mission is "To develop new poetic practices and new understandings of digital media by focusing on the material, formal, and historical aspects of computation and language."

Fig. 1 - A view of the Trope Tank. A high-resolution version of this image and many other photos are available in (WASSERMAN, 2014).

The Trope Tank serves four main functions: Teaching, research, collaboration on creative projects, and engaging with the community.

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Teaching

The resources of The Trope Tank can help visitors understand more about the material nature of home computing and videogaming by providing access to the physical means by which software was run, along with manuals, boxes, and books, and by contextualizing a particular platform of interest by offering access to other systems from the same era and from times slightly before and after the platform was prevalent. While software can be run in emulation (a practice we undertake, and one which is extremely useful in teaching and research) and while many manuals and books have been scanned, the Trope Tank provides access to qualities of these materials that are not carried over, even in the best emulations or digitizations of material.

Students can experience how systems are powered up; what happens upon startup; what standard displays of previous decades look like and how text and graphics appear on them; how programs are loaded from cartridge, tape, disk or how they are typed in; and how keyboards and controllers work and feel to the user. Knowledge gained from practical experience and interaction with systems is often more profound, more memorable, and more enjoyable. As Ernst writes, "Media theories work only when being tested against hard(ware) evidence" (ERNST, 2011).

A carefully designed class session that allows students to work with machines from different eras, or different sorts of systems that were contemporary with each other, can provide a unique historical or media archaeological perspective. Being able to look at numerous games for a many-decades-old game console – including launch titles, ones developed a few years later, ones developed in the late commercial phase of that console, and recent hobbyist programs – can show the way in which the constraints and cultural context of particular platform can enable creativity. It can also reveal how the discovery of new techniques allows the same hardware to develop different uses over time, an idea realted to that of Zielinski's "variantology," although this consideration is deeply technically informed and occurs over shorter, but significant, time-scales. Zin this media-archeological

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view, the present, and even the future, is not necessarily the most radical direction of development of technology, but just one of the variants. Playing with the possible uses of a piece of technology reveals its possible genealogy and questions the notion of progress (ZEILINSKI, 2012).

For students taking a class on electronic literature, we have been able to use the hardware resources in the Trope Tank to show several different interactive fiction programs from different time periods, including Infocom parser-based IF running on an Apple II, and Storyspace hypertexts running on a later Power Mac, side-by-side. Students were able to interact with both and could examine how different interaction paradigms affect the user experience and the artistic possibilities of stories. While some of this software could be run in emulation, running it on the original hardware made clear the importance of the affordances of particular material properties, including screen resolution and character sets. The strictures of Apple II text presentation seem less arbitrary when programs are viewed on a contemporary monitor and situated next to other systems from the same time.

Additionally, thanks to having more than six working Commodore 64s in the Trope Tank, we have been able to run several Commodore 64 BASIC programming workshops in which both material affordances and historical context have proved important for students. Students sitting in front of a Commodore 64 can take advantage of the unique affordances of this unit's keyboard, including its ability to directly type symbols (which are conveniently pictured on the keys), change the text color, and perform other functions. Though Commodore 64 BASIC can be programmed in emulation, it is much more difficult to program using those symbols or colors as on the mapping of the Commodore 64 keyboard to today's standard keyboards is difficult and cumbersome for the user. Additionally, we were able to show the Commodore 64 next to systems that were on the market at the time same, such as the Atari 400 and Apple IIe, and to provide direct experience of how the Commodore 64 is particularly suited to creative BASIC programming even when compared with these other systems, which also featured built-in BASIC. Finally, people were able to experience the convenient of quick start-up (or restart) time and immediate access to BASIC which the Commodore 64 provides.

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While emulators are useful for playing Commodore 64 games, for listening to music composed for the SID sound chip, and for many other purposes, the experience of BASIC programming on the original hardware is powerful and can be transformative. Students can quickly realize that their encounter with a Commodore 64 is not quaint or limited, but is an experience of an excellently designed system that allows exploratory programming and the quick manipulation of text and graphics. Students learn about history and hobbyist programming in the home computer era, but also can realize a potential of today's computers that is not as easily seen.

Research

The Trope Tank is meant to help in the investigation of the material properties of computer systems, how they relate to computing in the corresponding era, and how they fill in the understanding of computing that can be gained from other methods.

Many centuries of textual studies have shown the importance of considering all available manuscripts and drafts to thoroughly trace the the genealogy of a particular published work and to understand the process by which it was published. Access to a prototype of a particular game, or other variant versions of a game, can in the same way provide information about a programmer or a development team's creative process. Being able to use the hardware employed by the author or by early users can also shed light on the production and the early aesthetic and material reception of a particular piece.

As a practical matter, there are cases in which it is not only closer to the original situation of programming and use, but also actually easier, to run early programs on the original hardware rather than in emulation or via some migrated version. Such cases particularly suggest the use of older systems in the Trope Tank.

At another level, it is worthwhile to be able to consider and use different forms of

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physical media, with their different capabilities for sequential or random access, for resisting or inviting modification, and for providing programs and data at different rates of speed. The example of the two-sided floppy disk is particularly important as a case for why to preserve this technology in a laboratory setting. The material affordances of the disk are not reproducible in emulation, which divorces the code from the object on which it was originally distributed and the drives through which it was originally loaded into a computer. In the lab, one can take a floppy disk from our collection, place it into a drive in either orientation, hear the noises from the drive, experience the read delay, and see the results. This is vital material-historical context for software such as Jordan Mechner's original *Karateka* video game, which was shipped on a floppy disk with the reverse side loaded with an altered version of the game, in which the game appears upside-down on the screen. Without experience loading programs from actual floppy disks, the significance of this computing joke may well be lost on the researcher.

Some disks (such as the one on which *Karateka* was delivered) are manufactured to be two-sided, while others have a similar magnetic disc medium but only a single write-enable hole on one side of the plastic sleeve that holds the disk. Furthermore, the almost-identical single-sided disks were less expensive than double-sided disks at this time. The budget-conscious computer user of the 1980s, noticing that the disk itself is identical in both cases, could punch or cut a hole on the opposite side and manufacture a home-made two-sided floppy disk, or "flippy disk." This material innovation, which shows the ingenuity of computer users and the gap in the pricing of essentially identical magnetic media, is meaningless to one using an emulator but immediately available to those in the Trope Tank.

The materials used in the case of a computer, console, or other piece of hardware are significant, too, as direct observation of and experience of hardware can reveal. A portable print terminal's resemblance to a typewriter suggested the desk as a place where it should sit in the house, while the Atari VCS with its faux-wood-grain case decoration suggested that it would be right at home near the stereo and TV set, in the living room. The lab materials are situated to enhance one's sense and understanding of history, and allow for historically driven research. A

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researcher looking at interactive fiction can examine the typewriter and print terminal as precursors to the screen-character layout, and multi-sequential novels as precursors to (and influenced by) that category of digital media work. A researcher studying textual poetics can examine some examples of print concrete poetry alongside programming books and copies of computer enthusiast magazines, which often includes programs or "games" with great similarity to works of concrete poetry.

One example of research facilitated by (although not conducted exclusively in) the Trope Tank is the book *10 PRINT CHR$(205.5+RND(1)); : GOTO 10*, published by The MIT Press in November 2012 (MONTFORT et al., 2012). Ten authors from around the United States, including three from MIT, collaborated to write this book, which is about a one-line Commodore 64 BASIC program of the sort developed and disseminated by hobbyists (frequently in print, in magazines and books) in the 1980s. Three of these authors (including Nick Montfort, the organizer) were local to MIT and worked at times in the Trope Tank, using the Commodore 64 with Commodore 1702 monitor, software, and peripherals as well as books and magazines that pertained to BASIC and the Commodore 64. The books and magazines about BASIC, which are not of the sort usually collected or kept in the collection by libraries, were useful to consult and to compare; they give a sense of the many uses to which BASIC was put. Having several Commodore 64s set up in the lab allowed the authors to easily program, modify programs, and explore. Authors could also work on contemporary platforms and see how the material nature of systems, along with the formal functioning of the computer and the particular BASIC interpreter, facilitated such activities. The authors conducted explorations of these sorts via emulator as well, and such work had certain advantages – it was easier to save and share a visual result by taking a screen capture, for instance. But access to the material systems of the time very effectively supplemented this use of recent computers.

The systems available in the lab have also been part of a number of technical reports, made available in Creative Commons licensed format as the Trope Reports series on the Trope Tank's website. Borrowing from the traditions of 20th

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century industrial reports or white papers, these reports represent an outlet for research work that may not easily find a home in existing journals, and form an important part of the research practice in the Trope Tank (MONTFORT, 2011).

Collaboration on Creative Projects

Creating a new work of digital writing or art often requires an understanding of the nature of the platform and the way in which it supports, shapes and constraints new work. (Writers and artists using digital media skillfully usually develop a strong awareness of platform, but are not always able to articulate and share their insights, or their sense for the relevant properties of a platform, which can make collaboration difficult). Looking at older creative projects, which can be seen as innovative from a historical perspective and can be clearer in exposing the relationship between work and platform, is often productive for contemporary creators.

The Trope Tank laboratory can inspire and help with the development of translations and remixes of old works. It can also aid in creating new works that play with traditional associations that have been built up over the decades. The materials there helped to make possible "Programs at an Exhibition," an exhibit of one-line Commodore 64 BASIC programs and Perl programs at the Boston Cyberarts Gallery. The Commodore 64 programs, including "After Jasper Johns" and "Zen for Commodore 64" are based on famous art works – in this case, Johns's flag paintings and Nam June Paik's "Zen for Film".

The Trope Tank has also been the site of the creation of "Waves 3 Ways," a demoscene production created during @party 2014 in the lab itself by collaborators who wrote a visual bytebeat program and, using the lab space, devised a way for the audio to drive a home-built Tesla coil. The Trope Tank environment also facilitated the programming and other collaboration that produced Nanowatt, a text generator written in Commodore BASIC for the VIC-20 that reproduces text from Samuel Beckett's *Watt* in English and French. *Nanowatt* was exhibited at Récursion, a demoparty in Montréal, and presented at the

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Electronic Literature Organization conference in 2014. Its development would not have been possible without the Trope Tank's VIC-20. The Trope Tank also supplied that VIC-20 for showings of the piece. Even when older or unusual hardware is not involved, the Trope Tank has facilitated creative work, as when it hosted the wiki and the one in-person meeting of collaborators on *The Deletionist,* a Web project to automatically create erasure poetry.

Engaging with the Community

Most of the computers in the lab are no longer in general use, and new generations of people are growing up without the reference points of older technologies and their technical and artistic capabilities. It has been our experience that not only students, but members of the public of all ages are interested in engaging with these devices. In part to this end, we have hardware on hand for use in local exhibits and loans. We have run Commodore 64 BASIC programming workshops for the MIT community. We have put on exhibits at the Boston Cyberarts Gallery and the earlier Cyberarts Festival, as well as at the Unbound Symposium.

In February 2014, the Trope Tank presented at the MIT Museum for an event called "How People Connect." As part of the museum's playful demo evening on human connection, we brought in two Commodore 64 computers from the Trope Tank's collection along with two Commodore 1702 monitors, the original CRT displays sold with the computer system. We asked visitors to sit down with the machines and showed them how to creatively engage with the computer by making simple changes to one-line C64 BASIC programs. While some visitors were perplexed by what the exhibition had to do with connection, more got the point we hoped they would: in a time period where we have persistent access to mobile devices, and largely engage with computer technology through systems that hide the code from us, the Commdore 64 invites us to return to a time when computing involved closer involvement with computer code. Visitors of all ages enjoyed sitting down in front of these machines, being immersed in the glow of an old CRT monitor, and examining how human-computer connections have changed

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since the early 1980s. While for some the experience brought up feelings of nostalgia, others who were not alive when the system was released pulled out their smartphones to compare the system to the Commodore 64 emulators they had installed. Some visitors seemed to gain a perspective on how computing, and our relationships with computers, has changed significantly in just a few decades.

We have also loaned computers and material for the Boston Festival of Indie Games, for a table that exhibited both interactive fiction and print-based non-sequential novels, and have brought the technology for presentations at the Electronic Literature Organization conference in Milwaukee, Microsoft Research in Seattle, and the University of Maine.

Organization of the Lab

We have developed and been guided by three principles related to this facility and its arrangement, which we elaborate below.

The Trope Tank is mainly a laboratory, not mainly a library or studio.

There is a collection of materials that include books and software in the Trope Tank, similar to what one can find in libraries, but the Trope Tank is not meant mainly to serve as a library. Is primary purpose is not to hold a collection of printed or similar materials for reading and consultation. Also, the facility is used for creative work and digital media production, but it is not fully devoted to such work as a studio would be. In some ways, it is more library-like than a studio and more studio-like than a library, but the best characterization of the space is as a laboratory.

The distinction between a library and a laboratory bears on the approach to classifying, storing, and providing access to materials. The quality of a library is often judged on the variety, depth, and appropriateness of its resources; it serves as a way to store and study these resources. As the word "library" itself attests, these resources have historically been books and other materials like them:

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journals, magazines, reports, and so on. A laboratory, associated with scientific research and production but applicable to the humanities as well, can provide a unique, site-specific experience based in practice and experimentation. This does not mean that the Trope Tank's collection is irrelevant or that the library concept is not helpful in understanding the nature of the facility and its use. It highlights, rather, that being able to work with and experiment with systems is important and that computers and videogame systems are not just there to view data, as if they were microfiche viewers. Teachers and researchers should be able to run software on them, but also program on them, sector-edit disks to see the results, and even improperly insert cartridges to see the patterns that appear on screen.

For instance, the library concept highlights the importance of software on physical media. The Trope Tank's Atari VCS cartridges, and other game cartridges and CD-ROMs have been cataloged. This catalog has been made available online, and it can aid remote users in determining whether they should visit and in orienting them to the available materials. While this catalog has its uses, there are limitations to it as well, including:

- Researchers are unlikely to travel (even across campus or within the Boston area) to access one specific cartridge.
- Almost any particular cartridge in the Trope Tank can already be played by anyone with a computer and Internet access using an emulator. Using such a software edition of the Atari VCS, a researcher can see how a game functions and may even be able to enjoy it.
- A particular cartridge in the collection may be present but may fail due to problems with the printed circuit board. A book shown in the catalog as present can also be damaged or missing, but problems with cartridges are likely to be more frequent. Problems with magnetic media are likely to be even more frequent.
- If a particular cartridge is not in the Trope Tank collection, it is often (although not always) fairly easy to buy one online. That is, the collection of cartridges is not the most important element of the lab; the presence of systems and associated materials, set up and ready for use, is what is of

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most value.

The catalog does reveal cases in which researchers should make arrangements for the purchase of cartridges before visiting. However, the Trope Tank is significant not because of its VCS cartridge collection alone. Even in considering the Atari VCS, it is important because it offering several different controllers, two models of the Atari VCS console, and several CRT displays which can be connected to the Atari VCS systems. Having two Atari VCS consoles that can be set up for use allows different games to be compared simultaneously on two CRT displays. Having one set up and ready for causal use can improve conversations about the history of computing and videogaming. Having other consoles of the era available as well allows for comparisons across platforms. For this reason, we focused on setting up systems for easy use and on providing contextual information and good organization of materials relevant to those systems. Our cataloging project is ongoing: the games in the lab have been cataloged, as has some other software, but books and the full collection of floppy disks are currently not cataloged.

The Trope Tank is in some ways like a studio, but this is also not the primary way that the facility is to be understood. Meeting with collaborators and having access to laboratory resources during these meetings is a more typical use related to creative practice than is the sort of production usually associated with an artist's workroom. Even when creative work is being undertaken, the main uses of the facility are generally laboratory-like and the ways in which systems are used are generally similar to the ways that teachers and researchers use these systems in Trope Tank.

Well-known methods used in libraries can be employed to good effect in the Trope Tank, and some have been. Cataloging is a well-understood activity in library and information science. Questions of what to note and how to present that information are of particular importance at our current point in cataloging. A single Web page, generated from the collections management system, suffices at present, but at some point we may need a more complicated interface.

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When listing the game cartridges, we took note of whether labels, manuals and overlays were present or missing, and noted serial numbers and manufacturing codes on the cartridges. As we move on to cataloging floppy disks, however, it is not immediately obvious how to record floppy disks that are unlabeled and for which particular sides or sectors may be non-working.

Humanists are familiar with libraries and their uses, artists know what studios are and some of the ways in which they are used, but a laboratory is not as familiar in the arts and humanities. Outside of the arts, a laboratory is a place of experimentation, including the necessary equipment, whether that means computers and software, chemicals, experimental apparatus, books, chalkboards, or some combination of these resources. It is often also a co-working space, in which multiple researchers share tasks and ideas. The laboratory emphasis is on creative and scholarly effort toward understanding of a problem or achievement of a goal. But in most of the humanities, specialized equipment is not a traditional part of productive practice, nor is collaboration in a laboratory-like setting a common component of valued professional effort. There is a tendency among humanists to treat the space as if it were a library or preservation space, and to be unsure of how to interact with the hardware systems. Such researchers are often reluctant to turn machines on, to turn them off, to interrupt running programs or make changes. Some of this is unfamiliarity with the technology, but part of it can be attributed to a concern about disturbing systems or breaking them. Though we wish to take good care of the technology, it is there first and foremost to be used and experimented with. The laboratory ethos of the technology as an experimental tool, rather than an artifact of preservation, does not come naturally to many scholars in the humanities. Additionally, since much of the traditionally valued work in the humanities consists of solitary reading and writing within archives and libraries, or the practices of drawing, filming or editing, a collaborative environment full of unfamiliar devices presents challenges.

These difficulties can, ultimately, only be addressed by doing laboratory-based work that leads to new humanistic insights and significant new artistic

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developments.

Materials associated with a particular platform are best kept near that platform, either within reach or at least in the same room.

The platform is chosen as a distinctive principle for organizing resources in the Trope Tank mainly for practical reasons. When a researcher or student is using a computer in the Apple II family, it is not particularly helpful to have Atari VCS cartridges or Mac CD-ROMs within reach. Instead, the 5.25" floppy discs that are formatted for the Apple II and contain Apple II programs are most relevant, along with the manuals for the system.

Organizing work in this way also has the benefit of encouraging those using the Trope Tank to consider the importance of platform. Some reasons for encouraging consideration of platform have been provided in the context of the Platform Studies book series at The MIT Press. Platforms operate at a level below code, which is implemented on and written for a particular platform. Platforms involve combinations of hardware and/or software that provide the basic functioning of a computing system (BOGOST and MONTFORT, 2008). This means that platforms structure the possibilities of a creative or productive medium: different platforms have different affordances, and these may be more or less obvious in the projects built on the platform. But in either case, particular features of code will not be properly recognized as significant unless the underlying platform and its characteristics are understood. Platforms connect new media work to their surrounding computing cultures and the complex systems on which those cultures are built (MONTFORT and BOGOST, 2009). Platforms, being a level below code, may too easily be overlooked unless they are focused on explicitly. And finally, from the perspective of political economy, platforms often involve large investments and assemblages of developers, engineers, managers, advertisers, and investors.

Researchers cognizant of the platforms they are using can better trace media-specific materiality, including digital typography, image and display characteristics,

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and the particular sound capabilities of particular videogame and home computer systems. Platform distinctions are important when it comes to particular input devices and methods, from videogame controllers to Commodore 64 and Apple IIc keyboards, which affect the works produced on these systems. And similarly, platform studies can lead to a more comprehensive picture of the milieu in which particular works are created, relating them not only to material affordances but to other works produced using the same tools and systems.

Now, there are crossplatform discs as well as crossplatform peripherals; displays typically work with many sorts of computers and videogame systems. On the software side, many CDs from the 1990s are usable on both Mac and Windows machines. Any joystick-style controller (including a trackball controller) that plugs into the Atari 2600 will also work on the Commodore 64. This means that attempts to cleanly divide resources and to associate each one uniquely with a computer or videogame system cannot succeed.

This adds an additional constraint to the organization of space, and suggests placing hardware systems affected by these issues in close proximity. In cases where this was not possible for reasons of space, resources can be grouped and placed resources near the system that is most fully set up and with which the resource would most likely be used. In our case crossplatform CD-ROMs are stored near a Mac running System 9, and have been grouped with Mac-only CD-ROMs for the convenience of researchers, who would be looking for anything that ran on that system. (The Windows machine we have ready for use with these is a notebook computer.) In cases where multiple systems and their compatible resources cannot all be located in a contained area, choices must be made, and materials should be arranged so as to facilitate the most productive or likely uses of the systems.

Sometimes the same device implements more than one platform. An Intel computer that dual boots into OS X and Windows is one such device, of course, but there are others that implement older platforms. The FC Twin is an 8 bit and 16 bit videogame console, implementing both the Nintendo Entertainment System

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(NES) and the Super Nintendo Entertainment System (SNES) in hardware and accepting cartridges from both systems while being switched to play one or the other. This is the complementary hardware issue to a cross-platform CD-ROM for Mac and Windows. While it does not hinder a reasonably well-ordered lab, it is a complication that prevents certain types of overly strict categorization methods from being used.

Platform-specific arrangement can be at odds with more traditional theme-based, genre-based, or author-based classification. Grouping work by platform suggests that one shelf should store interactive fiction, hypertext fiction, videogames, and hobbyist computing materials which might be sorted into different areas in some other labs and in some libraries. At the same time, works of the same author can end up stored on different shelves because they are created for different platforms and thus can be run on different machines.

While dividing up different works by the same author is not ideal, this complication is otherwise a benefit from the perspective of the Trope Tank. The lab seeks to bring together different resources related to how people have been creative, expressive, conceptual, poetic, and aesthetic with computers. Videogames certainly provide strong examples, as do digital poems, hypertext fiction, interactive fiction, multimedia CD-ROMs that are not easily categorized, and the work of programmers who developed short programs, in BASIC and other languages, for fun. By organizing resources first by platform, materials that would otherwise be walled off in silos are brought together in productive ways. Through the association of works by platform, two pieces that on the surface seem quite dissimilar — Jordan Mechner's 1984 Apple II computer game *Karateka* and bpNichol's 1984 set of Applesoft BASIC computer poems, *First Screening* — are united by their creation for the Apple II family of personal computers (STAYTON and MONTFORT, 2014). This association was the basis of research on *reditions*, cross-platform re-creations of computational works, which followed the subsequent incarnations of these two digital works and evaluated how the work was reinterpreted on different platforms, making greater or lesser use of the features of the original work, the original platform, and the new platform.

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Awareness of historical, technical, market, and other contexts is important.

We labeled each console or main computer unit (sometimes called a "CPU" decades ago) and, in those situations when the display was not integrated with the system, also labeled the display. The point of this was not to provide complete instructions, or even any instructions, for the unassisted use of systems by those not familiar with them. Instead of offering instructions, we wanted to provide information to orient someone using, for instance, a Commodore 64 to its historical context. We hope that such a user would also read the label on the nearby Apple IIc (from a contemporary family of computers) and the nearby Macintosh SE (from a more expensive home computer of years later).

We included on each label the year (and month, if known) of the release of this model, the retail price (without adjusting for inflation), the main processor, the amount of RAM, the company that produced the system along with the years of operation of that company, the chronological place of this family of computers or this particular console in the lineage of that manufacturer, and information about what physical media this system can read. Three examples follow:

Commodore 64

August 1982 · $595 · MOS 6510 · 64 KB RAM

Commodore Business Machines, 1954–1994

PET ... VIC-20 ... [Commodore 64] ... Amiga

This system uses cartridges, cassettes, 5.25"

disks, and

(via the 1541 Ultimate II) Micro SD cards.

Apple IIc

April 1984 · $1295 · MOS 65c02 · 128 KB

RAM

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Apple Computer, 1976–

Apple ... [Apple II] ... Lisa ... Macintosh ...

iPhone & iPad

This system uses 5.25" disks.

Macintosh SE

March 1987 · $3900 · 68000 · 4 MB RAM

Apple Computer, 1976–

Apple ... Apple II ... Lisa ... [Macintosh] ...

iPhone & iPad

The system runs System 6, has a hard disk,

and uses 3.5"

floppy discs.

Context of this sort is provided not only by labeling, but also by placing materials (software with packaging as well as systems) on view near roughly contemporary materials. So, PC, Windows and Macintosh pre-OS X CD-ROMs have been placed in a smaller room with a PowerMac G4, while Apple II and Commodore 64 disks, along with cartridges for several early videogame systems, are placed in the main room.

We have also developed a web catalog of the hardware in the lab, both to inventory what we have and track its issues, and to provide basic instructions for how to set up platforms and run software (for the benefit of Trope Tank researchers as well as others). We still expect Trope Tank researchers to be on hand to assist when researchers and artists are using the systems there for the first time, but having basic info about functioning is useful regardless. The website also includes the information from the placards plus some additional fields such as relevant software, and is structured both by platform and by hardware item, allowing both an investigation of particular pieces of hardware, and a broader view that preserves some of the situatedness of the lab (around a particular platform).

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Though they are not gathered in a single location, the lab includes a number of early devices to help people understand the historical context of computing systems and the material history of texts, before and during the era of digital textuality. The lab has two dot matrix printers, an APL portable print terminal that uses dot-matrix printing on a roll of thermal paper, an Olympia SG-3 typewriter, and a Kelsey Excelsior letterpress. For researchers interested in examining, for example, the history of monospace or proportional fonts up through their use in digital systems, the Trope Tank offers the opportunity to actually work with these technologies, to produce and examine texts in order to understand how the devices operate.

Similar Facilities

While the Trope Tank is not the most standard laboratory, there are some other projects that have similar goals and offer resources that are similar in some ways. Among these, there are several projects in libraries, archives, and museums focused on the preservation of computing platforms and resources in some form. These are important efforts in their own ways, and they preserve many important computer systems, although they do not offer laboratory-like spaces for exploration, teaching, research, and creative work. The Computer History Museum in Mountain View does run exhibits on the history of computer technologies, but as its name suggests is a museum space as opposed to one oriented around productive use (COMPUTER, 2014). Other museums including the MIT Museum and MoMA also preserve or display computer technology in particular ways.

Other spaces exist where researchers can visit to play games on new and older hardware, some with very large software collections. The NYU Games Center hosts talks, outreach events, and playtests, but with an exclusive focus on video and computer games (NYU GAMES, 2014). The collection at MIT's Game Lab offices contains a number of game platforms and hundred of titles available to visiting researchers, including many more recent games, but does not focus on computing history more broadly, beyond game-specific systems. The Learning

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Games Initiative at the University of Arizona has an even larger collection in their research archive, including 12,000 games and over one hundred game systems, as well as various games-related publications, soundtracks, and documents. In this sense it is far more deeply involved in game history than the Trope Tank, but again eschews the focus on general-purpose computing, and operates as an archive for study rather than a place for creative experimentation (LEARNING, 2014).

Beyond these, few other spaces that provide parallel access to both games and other computing hardware and software, in a laboratory setting. The closest comparable lab to the Trope Tank is the Media Archaeology Lab, headed by Lori Emerson at University of Colorado, which has a collection of a large number of desktops, laptops and portable computers, and a wide variety of computer software, peripherals, and printed matter. As with the Trope Tank, much of this material is cataloged and listed online; indeed, the MAL's catalog predates the Trope Tank's. The program also has had an artist-in-residence program to involve the lab and its materials with the work of outside artists and researchers (MEDIA, 2014). While the MAL collection does include a small number of game consoles and games, it focuses more on home computing systems and less on the connection between game creativity and home computer creativity. However, it similarly stresses the importance of active engagement with the material history of computing through the use and exploration of hardware and software in a laboratory setting.

Conclusion

The Trope Tank, as a laboratory to study the engagement of language and computation, serves creative and academic work in several ways. The laboratory seeks to address the vital question of access to computational media of previous decades and attempts to answer questions about the nature of the corresponding systems and software. Continuing to answer these and other questions can be a challenging task for digital media researchers, programmers, artists and librarians. New creative projects and new emulators will help not only to provide broad

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access to older works, but also attract a more general public to questions of humanities and technology and help bridge the gap between the two. Material aspects of older systems will continue to be important, too.

Video game, IF, programming, and electronic literature design workshops have been organized in the Trope Tank for the MIT community and interested audiences from areas beyond. We also hope that by sharing what we have learned in working with and in this facility so far, we will continue to be of help to others who are developing labs with creative material computing resources.

THE TROPE TANK: UM LABORATÓRIO COM RECURSOS MATERIAIS PARA COMPUTAÇÃO CRIATIVA

RESUMO: Os princípios para organização e uso de um laboratório com recursos computacionais materiais se interconectam. Enquanto instalação, o *Trope Tank* funciona como um laboratório para o ensino, pesquisa e colaboração criativa que oferece hardwares das décadas de 1970, 1980 e 1990 (todos em funcionamento e configurados para uso), incluindo sistemas de videogame, computadores domésticos, e uma cabine de arcade. Para auxiliar na investigação da história material dos textos, o laboratório tem uma pequena tipografia do século XIX, uma máquina de escrever, um terminal de impressão e impressoras matriciais. Outros recursos incluem controles, periféricos, manuais, livros e software em mídia física. Tais recursos são utilizados para o ensino, emprestados para exposições e apresentações locais, sendo também acessíveis a pesquisadores e artistas. O espaço é essencialmente um laboratório (em vez de uma biblioteca, estúdio, ou um museu), dessa forma, os materiais são organizados pela plataforma e uso pretendido. As informações textuais acerca do contexto histórico dos sistemas disponíveis e recursos são configuradas para permitir a fácil operação, e até mesmo o uso ocasional, por pesquisadores, professores, estudantes e artistas.

PALAVRAS-CHAVE: Laboratório de computação. Recursos computacionais. História de textos materiais. Literatura digital e analógica.

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