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Methodologies of Reuse in the Media Arts: Exploring Black Boxes, Tactics and Archaeologies

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ABSTRACT

This paper discusses three methodological themes that contemporary media artists employ while reusing obsolete information technology hardware as materials in their work. Methodologies include the exploration of the hidden “blackboxed” layer of technology by circuit bending artists like Reed Ghazala, the tactical use of technologies to bring social change by artists like Natalie Jeremijenko, and the archaeological use of outdated technologies to intervene in history by artists like Tom Jennings. These themes are presented as useful tools to construct a language of reuse which serves a valuable function in a culture increasingly confronted by electronic waste, and assists in critiquing assumptions of new media, obsolescence, and technological progress.

Categories and Subject Descriptors

J.5 [Arts and Humanities]: Fine Arts, Performing Arts; H.5.m [Information Interfaces and Presentation]: Miscellaneous.

General Terms

Design, Experimentation, Human Factors, Theory.

Keywords

Media arts, electronic waste, reuse, DIY, circuit bending, tactical media, appropriation, media archaeology.

1. INTRODUCTION

The ubiquity of computing and the rapidly increasing capabilities of microprocessors and consumer electronics have created an explosion of obsolete media technologies in contemporary culture. In the United States, about 400 million units of consumer electronics are discarded every year. Electronic waste, like obsolete cellular telephones, computers, monitors, and televisions, compose the fastest growing and most toxic portion of waste in American society. As a result of rapid technology change, low initial cost and planned obsolescence, the federal Environmental Protection Agency (EPA) estimates that two-thirds of all discarded consumer electronics still work – approximately 250 million functioning computers, televisions, VCRs and cell phones are discarded each year in the United States.

This paper takes these millions of discarded yet functioning media technologies as a starting point, and proposes that study of the intelligent repurposing and reuse of these devices is an important research task.

Three themes will be introduced to help describe differences in how contemporary media artists reuse obsolete or trailing-edge hardware: 1. use for the sake of exploring and unravelling the “blackboxed” technological layer of the device that is usually concealed, 2. tactical reuse aimed at a social institution for the purposes of bringing forward social change, and 3. archaeological reuse for rewiring and intervening in history or historiography.

These categories and examples are not intended as an exhaustive categorization of how obsolete information technologies are repurposed, but are constructed to help bring articulation, understanding and discussion to a diverse, dynamic and growing field of practice.

2. HISTORICAL CONTEXTS

Repurposing objects can be thought of within the earliest frameworks of human tool-building and creative production, an activity that humans have engaged in since the stone age [18]. Repurposing, reusing and modifying objects is a natural part of the evolution of human culture, with social practices evolving in collaboration with continually reinvented objects around us. As Marshall McLuhan stated in 1964, “we shape our tools, and thereafter our tools shape us” [19].

2.1 Readymades and Assemblage

The topic of reuse in art history tends to focus on the reuse of consumer commodities, usually starting with twentieth century examples in contemporary art. Reuse emerges within the narrative of the readymade and collage, with Pablo Picasso and Georges Braque’s work with found newspapers in 1912 playing a pivotal role alongside Marcel Duchamp’s Bicycle Wheel of 1913 or inverted Bedfordshire urinal “fountain” of 1917 [26].

In 1961, the New York Museum of Modern Art featured the exhibition “The Art of Assemblage” that brought together the work of European artists of the early twentieth century like Pablo Picasso, Georges Braque, Marcel Duchamp, Jean Dubuffet and Kurt Schwitters parallel to Americans including Man Ray, Robert Rauschenberg and Joseph Cornell. The curator of the show,

William Seitz, clearly positioned the work as being made up of manufactured or natural objects that were not initially intended as art materials [23].

In the publication accompanying the exhibition, the English critic Lawrence Alloway is quoted to establish a context for the mindset of collage, the contemporary city and the obsolescence caused by mass consumerism:

"Its source is obsolescence, the throwaway material of cities, as it collects in drawers, cupboards attics, dustbins, gutters, waste lots, and city dumps. Objects have a history: first they are brand new goods; then they are possessions, accessible to few, subjected, often, to intimate and repeated use; then, as waste, they are scarred by use but available again ... Assemblages of such material come at the spectator as bits of life, bits of the environment." [2]

Since that time, art history has continued to slowly carve out languages of found art, collage, readymades and assemblage to describe the dynamics of this work which has become a key theme in contemporary art practice [15].

the institution of art, but also is part of a "junk culture" of repurposing simple everyday objects [2].

Much less lofty than exploring "the nature of reality and the nature of painting itself," [23] the history of repurposing can be seen as an outgrowth of the debris of consumerism: "the detritus of capital and commodity serve the dual purpose of announcing their own historicity and residing as a standing reserve, as Heidegger might have put it, for conversion into subsequent artifacts, memories, and stories" [1].

The mass production of consumer commodities has shifted significantly since Braque, Picasso and Duchamp's readymade work in the 1910s. In addition to the newspapers and bicycles, the fastest growing "readymade" portion of trash in American society is electronic waste: obsolete cellular telephones, computers, televisions, and household gadgets. The proliferation of computing and electronic technologies – along with the rapidly increasing capabilities of microprocessors and consumer electronics – has created an explosion of obsolete media technologies in contemporary culture.

3. EXPLORING THE BLACK BOX

"technological information ... rests on a substratum of machinery that is becoming concealed from the understanding of those who operate on its surface. The blackboxing that is the consequence of progress in information technology encloses ever larger spaces of hardware and software. It is an unavoidable development. The larger black boxes support more powerful tools." [4]

The inner workings of consumer electronics and information technologies are increasingly concealed as a result of the development of newer generations of technologies. Once developed and deployed widely, technical components are understood by users as objects that serve a particular function: an electronic toy makes a sound when a button is pressed, a computer printer prints a document when it is requested. The inner workings of the device are unknown to the user, with the circuitry of the device like a mysterious "black box" that is largely irrelevant to using it. From a design perspective, the technology is intentionally designed to render the mechanism invisible and usable as a single *punctualized* object [17].

Blackboxing, or the development of technological objects to a point where they are simply used and not understood as technical objects, is a requirement of infrastructure and technological development. A computer system, for example, is almost incomprehensible if thought of in terms of its millions of transistors, circuits, mathematical calculations, and technical components. Black boxes are the punctualized building blocks from which new technologies and infrastructures are built out of.

A black box, however, is a system that is not technically understood or accessed, and as a result obsolete or broken technologies are often unusable. Once the input/output or desired functionality of the device stops working it is often unfixable and inaccessible for modification for most individuals. Unlike a household lamp, many consumer

Figure 1. Pablo Picasso, *Guitar, Sheet Music, and Glass (Guitar and Wine Glass)*. After November 18, 1912. Pasted paper, gouache, and charcoal, 18 $\frac{1}{8}$ x 14 $\frac{1}{4}$ inches.

Apart from the direct issue of non-art materials being used to dispel the aura of authority and the sanctity of art, readymades and assemblage can be viewed as a straightforward use of the inexpensive and available. Pablo Picasso's *Guitar, Sheet Music, and Glass* of 1912 (Figure 1) is an intervention into

electronic devices have no user-serviceable parts, and the technology is discarded after it breaks. The depunctualization, or breaking apart the device into its components, is difficult due to the highly specialized engineering and manufacturing processes used in the design of the artifact: contemporary electronic devices are intentionally built to be discarded, their obsolescence is clearly planned.

Despite a planned obsolescence, the probing, exploring and manipulating of consumer electronics outside of their standard lifespan or use is a key tactic of reuse for individuals and media artists. This process traverses through the hidden content inside of a technological system for the joy of entering its concealed underlayer, often breaking apart and reverse engineering without formal expertise, manuals, or defined endpoint.

Reed Ghazala, a Cincinnati-based American artist born in the 1950s, is a pivotal figure in the development of what is termed “circuit bending”: the creative short-circuiting of consumer electronics primarily for the purpose of generating novel sound or visual output. Spelunking in circuitry, the technique of circuit bending takes found objects like battery-powered children’s toys and inexpensive synthesizers and modifies them into do-it-yourself musical instruments and home-made audio generators.

Circuit bending, a term coined by Ghazala, is a methodology for modifying inexpensive second-hand circuits that he first explored in Ohio in the late 1960s. The origin of his method came as a result of a random malfunction while a high school student:

“In my drawer a small battery-powered amplifier's back had fallen off, exposing the circuit. It was shorting-out against something metal causing the circuit to act as an audio oscillator. In fact, the pitch was continuously sweeping upward to a peak, over and over again... I soon modified the amplifier in numerous ways. Placing the circuit within a larger housing, I added rotary switches to the short circuit paths so I could run the new circuits through various resistors, capacitors, diodes, photo cells, and any other electronic component I could find. Potentiometers and push-buttons were added. I discovered places on the circuit that, if touched, would make the circuit howl!” [12]

3.1 Ghazala, Incantor (1978)

Similar to the early twentieth century artists employing readymade materials, Ghazala sees the surplus of consumer devices as an “immediate canvas” that can be simply modified to discover a mysterious, surreal world of sound. Although the junk culture of reuse is consistent between early 20th century readymade artists and contemporary circuit benders, there is a distinct difference in present-day work: bending takes a unique pride in the folk process of reverse engineering without any formal expertise. The work is motivated by the unauthorized short circuiting of blackboxed technologies and of customizing devices that were engineered to be discarded.



Figure 2. The Incantor, a modified, or “circuit-bent” Speak & Spell, Reed Ghazala, First developed in 1978.



Figure 3. Back cover image from Derek Seibel’s DVD Documentary of Bent 2004, the first International Circuit Bending Festival (NTSC, 150 minutes).

Circuit bending, as promoted by Ghazala and others, has developed over the last decade into a diverse network of practitioners, with annual international festivals dedicated to the topic since 2004 [3]. The continued proliferation of consumer electronics has made the raw materials of circuit bending ubiquitous, with folk knowledge around circuit bending practices increasingly dispersed over the internet, in magazines and through local workshops [20]. Circuit bending takes the trash of electronic culture as a starting point, and its key tactic of reuse is driven by a

punk-like breaking apart and exploration of blackboxed consumer technologies. Hacking the circuits and changing the taken for granted function of the technology without formal training is part of its allure, and its trashy, folksy and low-tech methodologies serve as a useful counterpoint to envisioning digital culture only in terms of a high-tech “new media.”

4. TACTICAL REUSE

The second theme of reuse in the media arts will be referred to as *tactical reuse*. This method of reuse is focused on challenging institutional structures through the tactical repurposing of media technologies. Situationist *détournement*, tactical media and critical design are borrowed on to construct a type of reuse that is used to directly clash with social and institutional conventions, often targeting themes of social injustice, globalization, consumer culture, or the environment. Unlike circuit bending, this work is not primarily concerned with exploring the black box of technology: it is an artistic activism that reuses technologies in a directly political manner.

Tactical reuse can be seen as borrowing from the concept of *détournement*, a technique of appropriation outlined by the Situationists in the 1950s. In *détournement*, well-known objects and images are used and taken through a detour to create an alternate message, often in oppositional contrast to the original source. The original is directly sampled and turned on its head: unlike a satire or parody, *détournement* directly reuses large portions of the original work and hijacks and derails it. *Détournement* acknowledges the readymade artworks of Duchamp, for example, but sees that the “opposition to the bourgeois notion of art and genius has become pretty much old hat” [6]. Instead, everyday life needs to be liberated through subversive, targeted propaganda through extremist resampling and innovation. Tactical reuse is a style of subversive *détournement*, but uses discarded or obsolete media technology hardware as a starting point for political action.

Tactical reuse can also be seen as a subset of tactical media, an area of practice that pulls influence from the juxtapositions of Situationist *détournement* and the tactics of practice in de Certeau’s “The Practice of Everyday Life” [5]. Articulated by Geert Lovink and David Garcia in their 1997 essay “The ABC of Tactical Media,” this cluster of activities is described as:

“what happens when the cheap ‘do it yourself’ media, made possible by the revolution in consumer electronics and expanded forms of distribution (from public access cable to the internet) are exploited by groups and individuals who feel aggrieved by or excluded from the wider culture. Tactical media do not just report events, as they are never impartial they always participate and it is this that more than anything separates them from mainstream media ...Tactical media are media of crisis, criticism and opposition.” [11]

Tactical media and reuse are seen as being opposed to institutional strategies, which belong to the established powers of states, economies, corporations, and scientific bodies of knowledge [22]. Tactical reuse organizes in a guerilla fashion and attacks its target in a hit-and-run style. Like *détournement*, tactical media is deceptive, nomadic and

infiltrating: a tricksterism that appropriates for the purposes of pointing out the flaws in protological and proprietary command and control [10].

Lastly, tactical reuse also resonates with the concept of critical design, a term first used in Anthony Dunne’s book *Hertzian Tales* (1999) and later in *Design Noir* (2001) [8] [9]. Critical design, as opposed to tactical media, is targeted at bringing a change in the mind of the viewer or consumer, not the institution. Critical design is involved in creating speculative design proposals to challenge narrow assumptions, preconceptions and givens about the role products play in everyday life. Individuals, not institutions, are targeted through the creation of sarcastic and disturbing industrial product designs that are intended to put the viewer in a dilemma: “is it serious or not? Real or not?” The intended effect is to question the limited range of psychological and emotional experiences that contemporary products usually promote: critical design embraces the dark complexity of human nature, and rejects design as an affirmative discipline. Tactical reuse, especially when presented from the perspective of a plausible product or a fictitious institution, carries forward many of the objectives of critical design.

4.1 Jeremijenko, Feral Robotic Dogs (2002)

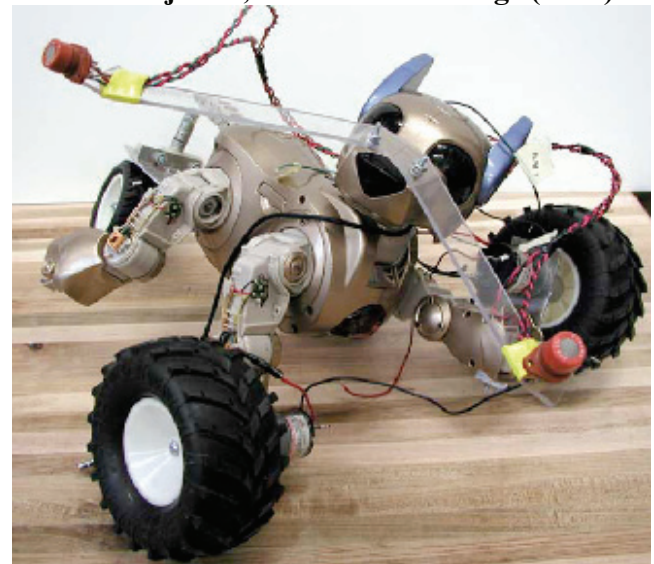


Figure 4. Feral Robotic Dog, reverse engineered by Mike Kai following instructions by Natalie Jeremijenko and equipped with volatile organic compound pollution sensors mounted on a beam connected to the nose of the toy.

A clear example of the tactical reuse of obsolete consumer electronics is Natalie Jeremijenko’s Feral Robotic Dogs project, initially built in collaboration with students at Yale and through public workshops since 2002. The project reuses inexpensive and discarded children’s robotic dog toys as a platform to detect pollution in public parks, schoolyards and local communities.

Jeremijenko’s project is more a methodology than an artifact, and information on the technique of constructing feral robotic dogs is outlined online through do-it-yourself instructions and in community workshops organized by Jeremijenko.

The method of taking domestic robots and turning them into tactical and feral devices goes roughly as follows: toy dogs, like the Sony Aibo, are initially amputated and equipped with wheels to better navigate rough outdoor terrain and configured with pollution sensors. The logic of the system is then upgraded to smell out environmental contaminants and move toward it. Optionally, the devices can be configured to communicate with other dogs, record pollution levels, or perform special behaviors when they find highly polluted sites: barking, playing the American national anthem, or rolling over and playing dead.

Combining the “hardware hack” mentality of circuit bending with a tactical sense of environmental activism, the project leverages the economies of scale in mass consumerism to highlight its environmental downside: toxic benzene, radioactive materials, and other harmful pollutants generated by industry. The results, a pack of robotic dogs sniffing for environmental contaminants is also legible to a wide audience: a moving physical device in actual space is much easier to comprehend than a table of statistics or a bar graph. “The value of this project comes from who is doing the interpretation, who is doing the monitoring and who cares,” says Jeremijenko, “and when you release a pack of hot-rodded robotic dogs on a contaminated site it becomes newsworthy” [21].



Figure 5. Students with Feral Robotic Dogs explore former gas plant locations for contaminants in January 2003 on the Bronx River in New York, NY.

In the process, Feral Robotic Dogs hijack and detour children’s toys into a powerful and localized social intervention. Entertainment electronics are subverted as a situated détournement to create, in the style of tactical media, a guerilla attack on the institutions, powers of state and corporations that

have, for the most part, ignored public health concerns. Lastly, as a packaged methodology, the Feral Robotic Dog project reminds us of critical design: its design does not affirm us, but challenges us to deal with the uncomfortable reality of our immediate environments.

5. ARCHAEOLOGICAL REUSE

“An artwork can function as a site for re-enacting and unraveling discursive constellations of media-cultural relevance. Situated at the present, it may become an observation post and conceptual laboratory to access the cultural landscape ... art has certain advantages, including its freedom to travel freely back and forth in time, drawing together seemingly discrepant elements from various discourses.” [13]

The third and final theme of reuse in the media arts will be referred to as *archaeological reuse*. This archaeology pulls its influence from media archaeology, an approach to media studies and history that has emerged over the last two decades characterized by a desire to uncover and circulate repressed or neglected media approaches and technologies. The lost traces of media technologies are deemed as important topics to be excavated and studied: “dead” media technologies and idiosyncratic developments reveal important themes, structures and links in the history of communication that would normally be occluded by more obvious narratives. Media archaeology is a multilayered approach that includes tracing irregular developments and unconventional genealogies of present-day communication technologies and suggests that the most interesting social and technological developments often happen in the neglected margins of history.

These themes from media archaeology also inspire artists to use obsolete media technologies as materials in their work. Like a time machine, artifacts from a different era summon up a discarded mode of thought and bring forward its lost conceptual nuances. The purpose of invoking the past is to bend and short circuit the marginal past with the present: media archaeology remixes and challenges our memories of the past, the historically marginal and our experience in the present.

5.1 Jennings, Story Teller (1999)

A useful example of archaeological reuse is *Story Teller*, a project initially exhibited in 1999 built by American artist Tom Jennings (born 1955, Boston). Using the obsolete telecommunications storage medium of perforated tape, the project narrates its stories through a custom-built system of forgotten technologies ranging from the cold war to the 1980s: a teletype machine, a paper tape reader, and a phoneme-speech processing system. These technologies have been reengineered and reworked to deliver a strange proto-multimedia performance and multilayered narrative that functions as a rethinking of history as narrative, the process of mediation and the origins of digital computing [14].

In public exhibitions between 1999 and 2007, Jennings’ system has been used to audibly recite an eight hour narrative

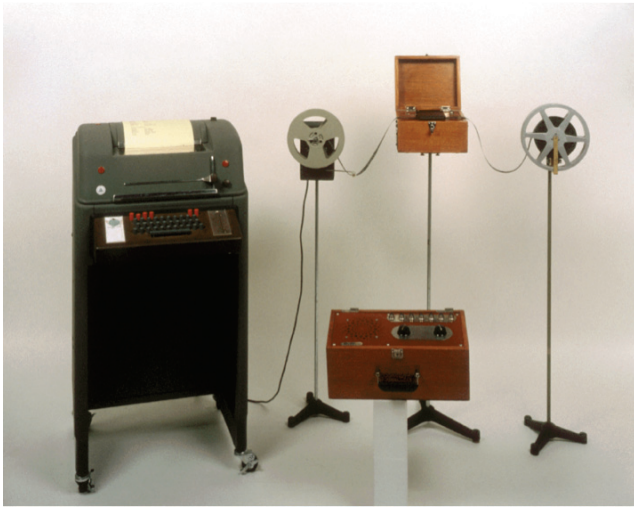


Figure 6. Tom Jennings, *Story Teller* (1999). Mixed media installation of freestanding pieces, 40 inches high, 72 inches wide, 36 inches deep, approximately 350 pounds in weight.

of the British mathematician and founder of the discipline of computer science, Alan Turing. Turing (1912-1954) is credited as being one of the first individuals to envision a calculating machine that could process more than just numerical data, envisioning a machine that read and punched paper tape to modify its own programs [25]. Jennings' work revisits the foreign mindset of early computing through a careful revival of archaic media technologies: a bulky teletype machine recalls the era of the telegram, and spools of punched paper recollect binary data in the middle of the Twentieth Century. These technologies reconstruct a blend of dead media from the past that are not replicas of an exact time and location, but a speculative conglomeration of lost forms of communication from the history of computing. Jennings goes to considerable lengths to present artifacts that appear that they came from the past, including the functionality of paper tape and teletype, the careful use of historical materials like Bakelite, Micarta and brass, and building of handcrafted enclosures from oak. Together, the *Story Teller* system is a hybrid blend of obsolescence where unfamiliar time periods are layered into a functional system that is almost impossible to differentiate from an actual historical artifact from the 1950s.

This is Jennings' point, though. By rewinding, reviving and revising media history, he highlights unique and multilayered threads through the conceptual nuances wrapped up in communication technologies from the era of Turing. Jennings terms his work as an "obsolete forgery" of history, a communication technology that might have impossibly existed, which brings us closer to the original context of Turing in the process.

The lost mode of Turing's thought as presented by Jennings in *Story Teller* acts as groundwork to the contemporary computing era; they are discarded artifacts of the past that in a contemporary context seem curious, uncanny or even absurd. However, as Kuhn notes, the absurdities found in these

discarded modes of thought can be used as tools to change the meaning of how we understand the present [16]. In this case, the strangeness of *Story Teller* shifts our perceptions of contemporary computing.

Story Teller transports us into a time when data and computing had a tactile, mechanical quality that is almost completely foreign to contemporary sensibilities: the system is visceral and mechanical with large spools of punched paper data being fed, crunched and spit out of the tape reader. Jennings' work doesn't explore the black box of current technologies, it transports us away to a foreign mindset where information was simultaneously digital, tactile *and* visual. In comparison, a contemporary computer retrieves data in almost a completely automated manner, and requires no physical exertion beyond a mouse click. The read information is transferred from its sealed hard drive through an invisible process only hinted at with faint mechanical sounds. Jennings' visceral tape-driven data system provides a pause to rethink the process of mediation: *Story Teller* highlights, even in our posthuman era, that information still requires a carrier, even if it is magnetic, etched with lasers, or transmitted through the air. Information and technology can be more usefully considered as mutually constitutive and ultimately indissoluble, like light and illumination, a dancer and dance, or rivers and banks [7].

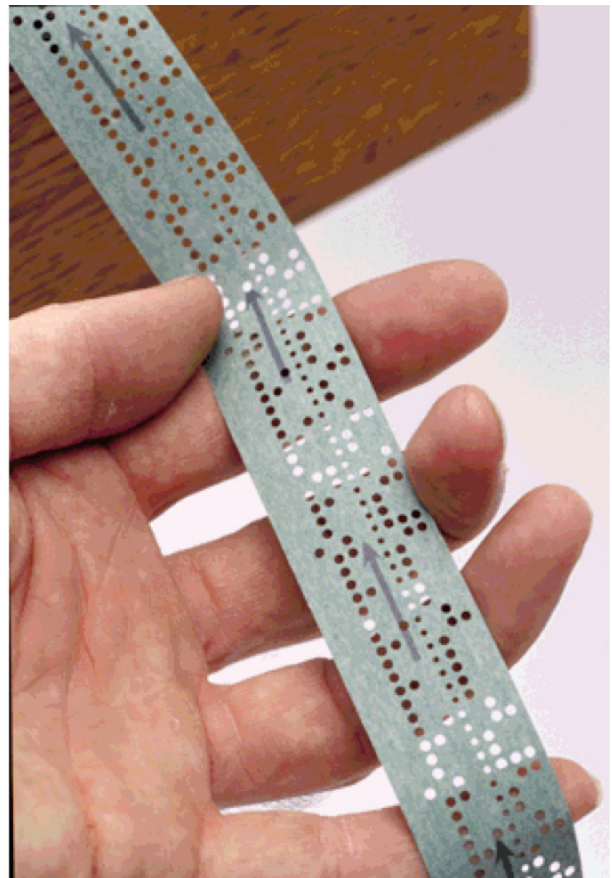


Figure 7. Perforated paper tape, as used in the *Story Teller* system (1999) by Tom Jennings.

6. CONCLUSIONS

"The goal is not to destroy technology in some neo-Luddite delusion, but to push it into a state of hypertrophy, further than it is meant to go. Then, in its injured, sore, and unguarded condition, technology may be sculpted anew into something better, something in closer agreement with the real wants and desires of its users" [8].

Obsolete information technologies are used by media artists as materials in their work for a number of different reasons, including explorations inside the black box of technology, to tactically target institutions for the purposes of social change, and to short circuit and rewire the historical past with the present. Innovators – like Reed Ghazala, Natalie Jeremijenko and Tom Jennings – sculpt technological devices to their desires as creative musicians, activists and historiographers and in the process help clarify how discarded media technologies serve variegated and engaging roles in contemporary culture.

Together, these tactics of reuse are useful in rethinking the role of technology in the media arts and critically challenging wider cultural concepts of progress and planned obsolescence. Although the social problem of electronic waste is an issue that cannot be solved solely through creative repurposing, articulating and exploring the topic of reuse is essential in shifting assumptions of technological advancement, what it means to be innovative, and how to conceptualize electronic surplus as a rich platform for creative development.

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