

Aesthetics, Interaction and Artificial Intelligence: contextualising first generation Media Arts

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Keywords: interaction, embodiment, improvisation, aesthetics, spectator.

List of 8 suitable images (none are likely to incur a fee)

Petit Mal (2 images, supplied by author)

Traces (2 images, supplied by author)

Bal de Fanalet (supplied by artist)

Portrait One (supplied by artist)

Legible City (supplied by artist)

Senster, Edward Ihnatowicz (supplied by estate of artist)

This paper is a reflection on thirty years of continuous involvement in the world of ‘new media art’ as an artist, technologist, theorist and commentator. It lays out a specific practitioner’s perspective on the development of media arts as a field. In what follows, I discuss the motivations and concerns of my own practice - the development of aesthetic, technical, critical and theoretical ideas - against a backdrop of a rapidly changing techno-cultural context and equally rapid commodification of digital technologies. My focus is on the first two decades of digital media art, and particularly on the 90s. This was a complex formative period of mutual adaptation in which the technologies were shaped by cultural practices and new cultural practices developed. The process of negotiation by practitioners is elided in many reports. I therefore offer this first-person account, in order to portray the working context of a period, that is poorly understood by a younger generation of artists, theorists and historians. There is, regrettably, insufficient space here to delve into details of the development of specific works, nor to delve deeply into more theoretical or philosophical concerns. (This essay is written in parallel with my contribution to EMNA volume II. That essay: *Designing behavior: interaction, cognition, biology and AI* addresses theoretical issues arising from my practice in a more academic way).

Background

I came into *new media art* around what by most accounts was the beginning, in the late 1980s. From the outset I worked simultaneously as artist, writer, organizer, curator and editor. For much of the previous decade I’d been making increasingly technically complex interactive sculptures and installations employing (primitive) sensors and custom process-control electronics and I was co-originator of the Sydney art and technology group *Virtual Object*. I published my first paper on the subject in 1987. (Penny 1987). In 1988, I attended the first meeting of what was to become ISEA – the *International Symposium on Electronic Art*, and I was active in its development over the ensuing decade. I curated and produced the first international exhibition of interactive installation art *Machine Culture* 1993 (Penny 1993) and I edited an early critical anthology:

Critical Issues in Electronic Media (Penny 1995). By 1989, I'd embarked upon the building of an autonomous robotic artwork *Petit mal*, a project that would take several years to complete, due in part to the need to develop technologies from the ground up (first exhibited in 1995).

Liveliness and the *aesthetics of behavior*

My preoccupation as an artist was with the phenomenon of real-time computing as a new technological context facilitating a new kind of aesthetic engagement. What was immediately apparent was the fundamentally novel capacity of real-time computing to permit building systems that *reacted in real time*. When integrated with appropriate sensors and effectors, this permitted the creation of *behavior*, in the sense of 'action modulated by external events'. I understood *interactivity* as a subset of such behavior and saw the potential for developing what I called an *aesthetics of behavior*. Trained in sculpture, it was clear to me that this constituted an entirely new realm of aesthetics (in the plastic arts) as paintings and sculptures typically do not move about and certainly did not *respond*. Experience of the work became a conversation rather than contemplation at a distance. I wanted to make that capacity for behavior the focus of the experience of the work. I took designing interaction as my primary focus. I came to understand the building of artifacts that had the capacity for dynamic, responsive aesthetic behavior as an *automation of improvisation*.

In my experience with interactive applications and environments of all sorts, I saw two clear modalities. Commercial software, some media art works (and HTML when it arose) deployed interaction in an entirely pragmatic and instrumental way – *navigation* was the key analogy. Interaction served as connections between blocks of content and was expected to be intuitive, user friendly and ready-to-hand. Contrarily, I wanted the quality of the interaction (between the *spectator* (Boal 1979) and the *artwork as agent*) to be the content. In other cases (often in artworks where the makers control of their tools appeared dubious) purported *interaction* was just baffling. It seemed self-evident to me that, in general, confusing the user was counter-productive. Between these extremes of instrumental predictability and chaos lay a zone of *poetics of interaction*. In this zone one could exploit visual analogies, synaesthetic cross-modal associations, and proprioceptive/kinesthetic sense-making in iterative enactive interaction that had the quality of an unfolding conversation.

Critical of both 'hard AI' and 'hard Alife' rhetorics, I was under no misapprehension that the work was intelligent or alive. I was motivated to explore the potential of creating something that had some of the qualities we ascribe to living things - not necessarily *lifelike* in a biomorphic way, but '*lively*'. My pursuit of this novel technological capability that permitted a sense of liveliness necessarily demanded the development of technological vehicles for exploring its potential, and the development of an aesthetic approach to real-time interaction. This notion of *liveliness* provided a perspective from which to critique discourses of Artificial Intelligence and led to a reflexive inquiry regarding the nature of our human perception and cognition. Never concerned with narrative, characters, or dialogue, my focus was on embodied awareness, materiality, spatiality, temporality: these terms capture the nature of what it is to be an intelligent creature in the world, and they capture key qualities of experiencing art.

The kind of *liveliness* that I and other artists pursued as early as the late 80s was a precursor of the chatbots, 'AIs' and Non-Player Characters (NPCs) that now populate social media, internet and games. David Rokeby's *Very Nervous System* (1982-1991) and Luc Courchesne's *Portrait One* (1990) come to mind, as do early works of Masaki Fujihata, Christa Sommerer and Laurent Mignonneau, Rafael Lozano Hemmer, and particularly, the remarkable *Lightpools/Bal de Falanet* (date) by Pares, Pares and Hoberman. Jeffrey Shaw's *Legible City* (1989) must also be numbered among the pioneering works of embodied interaction. This work cleverly reduced the complexities of (sensing) human movement by the using a bicycle as input device. This had the dual advantage of being a well understood interface, and the mechanism had already reduced the range of human action to two one-dimensional variables – pedaling speed and turning angle.

Shaw's avowed research project, at least in his ZKM years, was to explore the 'modalities of the virtual'. This led him to emphasise the VR experience. My agenda, in comparison, was to explore modalities of embodied interaction. In retrospect, both Shaw's and my agendas were formalist – in the art historical sense – they were concerned with exploring and identifying the formal dimensions and parameters of the new systems and environments. I attempted to create an historical marker of this new class of work in the exhibition that I curated for SIGGRAPH'93 in Anaheim, California. *Machine Culture* was an exhibition of interactive installation, which was at the time a novel genre. It included 29 works from around the worlds, along with a collection of invited essays. Many of the artists and authors became major figures in the ensuing decade. (Penny 1993).

Because the relevant technologies barely existed at the time, any new project included the development of new technologies. Coding, electronics, computer engineering, were part of the art-making process. This demanded a deep technical engagement with the technology and – increasingly, a critical engagement with the value system that informed it. It became clear to me that I was doing computing *against the grain*, because I was centrally concerned with creating immediate sensorial experiences - the mainstream of computer science research was concerned with processing disembodied abstract information. I willingly stepped into an odd genre of interdisciplinary arts practice that has come to be known in some quarters a 'research-driven practice' or by the Canadian-originated moniker 'research-creation'. This genre was substantially a creation of the media arts. Pioneers like Gordon Pask, Edward Ihnatowicz, Woody Vasulka, Dan Sandin, or in audio, Don Buchla, were little-known outside their communities. Those who took on such practices inhabited niches between 'the arts' and 'engineering' in its various forms, and were often outcasts in both contexts – seldom funded or celebrated, at least until the world caught up.

I recognized fairly quickly that in formal ways, my work moved beyond standard paradigms of art: it challenged fundamental precepts of the aesthetics of the plastic arts, blurred the distinction between plastic and performing arts, and extended the discourse of robotics and AI into cultural territory (Penny 1997). To the extent that, traditionally, artifacts in the plastic arts (paintings and sculptures) are entirely static, my explorations did not fit in to existing genres of art. In this, I was part of a dispersed international community of fellow travelers that included David

Rokeby, Luc Courchesne, Raphael Lozano-Hemmer, Roc and Narcis Pares, Perry Hoberman, Masaki Fujihata, and Graham Harwood, among others. Luckily for me, the avocation 'artist', in our culture, is a remarkably flexible and tolerant social category, within which I found I could pursue my eccentric pursuits. 'Art' itself is a constantly changing category, things that were not regarded as art in some historical are later recognized, and vice versa. Nor was I particularly bothered by the idea that my work did not qualify as 'art' by some definitions. Pragmatically, 'art' provided a convenient cover that permitted me to pursue my eccentric projects, and most of the time I was somehow able to leverage my purported position as an artist, in institutional settings, to put food on the table (not without exacting its pound of flesh, of course). From the outset, I had minimal interest in becoming a creator of 'precious objects', destined for the gallery-museum-dealer-collector system. I recall explicitly announcing, as a student: *'I don't want to make cultural widgets for the gentry'*. As a result, I've never had a long-term affiliation with a gallery or dealer, and was never motivated to do so. This stance can be quite successful in a country with a socialized approach to art. Sadly, in the USA, where I've now spent the bulk of my professional career, this has not been the case.

What follows is a discussion of aspects of some of the projects I've pursued, their motivations, and the way they fit into the development of media technologies and media art, within a larger story of the flow of technologies in changing techno-social contexts, and changing ideas about intelligence and cognition. My purpose is to offer a practitioners' view which places the history of (some) media art practices in a larger interdisciplinary context at the nexus of performance and installation art, discourses of computing, AI, HCI and social media, as they've changed over three decades. This report emerges from an experiential perspective of hands-on experimental practice. My theoretical inquiries and critique of technoculture have always been grounded in such practice. I am persuaded that such a perspective provides an important balance to more abstract or scholarly commentaries (I return to this subject at the end of this paper).

Against Media Art

I am not a 'media artist', I detest the term and always have. I deploy *new media art* here grudgingly, given that it is the titular theme of these volumes. As I observed long ago, the term *media art* conflates concepts of traditional artists media (ie: material components of representational (pictorial) practices); media in the sense of electronic mass media (television, radio); and computer media (material substrates for data - discs and tapes); into a weirdly inconsistent conglomerate that still insists that computing, at least in its applications in the arts, is a *medium*, in the sense of a vehicle for reified creative expressions. This is clearly an anachronistic way to think of a technology which is inherently dynamic and processual. It is determined, at least in part, by conventions of art history - artists make (physical) artifacts. I've never seen the creative potential of computing in that way. Further, the term 'media-art' seems to suggest that the behavior or interaction between human and machine occurs only during the process of making, and is not present in the product, which is conceived as a static artifact. This always seem to me skeuomorphic – a matter of emulating predigital forms in this behaving technology.

We know what the 'new' in 'new media' refers to in this context - the use of digital computing technology. But the idea that working with computing is comparable to the pre-digital conception of a 'medium' is immediately problematic. Many of the new genres of new media art are, or originated as, emulations of existing pre-digital practices, as one would expect: digital photography, digital painting, digital graphic design and typography, digital animation, digital film and video, and various kind of digital sound work: they all emulated preceding modalities of practice. Even 'virtual reality' has its roots in stereoscopic cinema. Similar emulations happened in other fields, from CAD/CAM to artificial intelligence (as the automation of Boolean logic). Over ensuing decades, these emulatory practice became increasingly adapted to the new potentials of digital environments, as these environments have themselves developed. Animators and illustrators who are digital natives deploy dematerialized emulations - for instance of 'charcoal texture' without ever having held a piece of charcoal. As time has passed and environments have developed, new, thoroughly native cultural practices have emerged, such as online massively multi-player gaming, web design and 'social media'. This, of course, is what one would expect of such an historical process. Many, or most, practitioners in these genres have chosen to engage the technology in a vocational way, showing little interest in the underlying technology or the way it, and the discourses surrounding it, have developed, nor in critical analysis of the process of simulation of previously artisanal processes. An entirely different kind of practitioner (such as those mentioned above) took the technology as medium in a deeper way - they wrote code, designed and made tools and systems, and these novel systems constituted the work. In this paper I will concentrate on the work of this kind of 'system -builder'.

A company of misfits

Practitioners in new media arts came from diverse backgrounds, some from various image-related plastic arts – photography, video, film, where the image was already understood to be a technological conjuring trick. These image genres were already invested in notions of *representation*, making them compatible with a representational rhetoric of computing, although the concept 'representation' has varying meanings. The fact that these representations appeared on video monitors, electrically live and inherently transient, made its kinship with computing seem obvious - an assumption that was superficial and fundamentally wrong. Part of the community came from the technical side – engineers and computer scientists where mathematics and symbolic representation are central, who fancied themselves 'artists'. They had technical chops, but from the perspective of the art cognoscenti, their projects and understanding of contemporary art often seemed naïve or anachronistic. Conversely, many coming to the field from the more traditional arts exhibited a poverty of technical understanding and often lacked the perseverance, attention to detail and methodical process necessary for effective technical development. Those that did succeed in this wildly inerdisciplinary realm were often self-taught polymaths. It was an eccentric crowd. Like everyone else, I did not come to the field *tabula rasa*. My background was sculpture (in particular, kinetic sculpture), installation and performance. In these practices, movement, and the relation of the body to structures spaces is central. I'd been building increasingly technically sophisticated machine artworks for years. I had taught myself what was then called *process control electronics*. As such, I was used to messing with analog and digital electronics and electromechanics at a fairly elemental level – discrete transistors and

capacitors and resistors, and simple 'computational' functions on DIP chips – flip-flops, timers, BCD counters and the like.

Contrary to genres of image-based practice preoccupied with issues of representation, the theories of sculpture and performance that I subscribed to maintained an iconoclastic fundamentalism: *it is what it is, and it's not trying to be something else*. There was a deep investment in materiality, in the is-ness of things. The physicality of the artifact, its texture, color, material, scale, ... smell, could never be taken as irrelevant. A sheet of steel was a sheet of steel, the specificity of its materiality was its asset, not something to be dressed up with paint or plating. A body in a performance was this person doing this thing right here, right now, as opposed to someone playing a role as a character in an illusionistic narrative. These qualities always contribute to the way the work has meaning for its audience. This phenomenalist fundamentalism – the concern with materiality and spatialised, experiential presence, of enactive sensorimotor immersion, provided for, me a position from which I could mount a critical interrogation of the values of computer culture.

The digital revolution, technological obsolescence and the erasure of New Media Art history

New media art has emerged within a period of profound technological change that has influenced diverse aspects of human culture and our daily lives. It is difficult to imagine another time of such rapid and all-encompassing technological change – at least in the West. You might, I suppose, say similar about painting in the wake of photography in the later C19th, or perhaps about electrification or the telegraph, or the cite to origins of Dada in the disillusionment about the first fully industrialised war. The effects 'digital revolution' have been felt across diverse aspects of our lives. Computers are now 'everywhere' as they say, and not so long ago, they weren't. It is easy to forget how rapidly our technological environment has changed. Barely thirty years ago, few humans had experienced screen-based interaction. Most of today's consumer digital technologies existed only in the sci-fi imaginary (The star-trek holodeck or Dick Tracy's wrist video-phone). Telephones were fixed to the wall and had rotary dials - you had to sit in a particular place to have a phone call. Cameras had film and you didn't get to see your pictures until they'd come back from the lab. I recall, in the late 60s, seeing the first 'portable' video cameras - they required a team of two men, tethered together by a thick cable - one to carry the camera (itself massive), the other to lug the 'portable' monochrome reel-to-reel video tape deck and belt-worn battery packs. Computers were the room-sized, required a dozen technicians to run, and existed only in military, corporate and academic settings.

Between the late 1980s and the end of the 2000s, the technological context changed so rapidly that it was a battle to maintain technological grounding, a kind of temporal vertigo I described at the time as being like trying to stand upright in a rushing river. In understanding the history of media art, comprehending the implications for practitioners of this rapid techno-historical change is crucial. In the arts, there is a general sense that a good artist has mastery of their tools. But, especially through the 90s, technological change was so fast, tools were obsolete by the time you'd learned them. One was on a constant treadmill of technical learning. One of the frustrations commonly expressed by practitioners at the time was that the tech changed too fast to

really learn it well. The learning curve was unrelentingly steep, one always felt one did not know enough to proceed. It still feels dizzying. It was perhaps foolhardy, certainly not for the faint-hearted. It was fatiguing and *burnout* was common.

Like most of my peers in the field, I regretted that my materials became so rapidly obsolete (this is a commonplace for users of software, the constant parade of updates, to apps and operating system, and the constant incompatibilities). In my work the underlying hardware also changed just as rapidly – from the level of discrete components and connectors to the level of processors, memory units and complete computer boards. I often reflected with some jealousy that had I chosen to be a painter, the skills I learned in my youth would have sufficed my whole career – brushes and paint just don't change that much. For jewelers or metalsmiths, manipulating the material in an especially skilled way is often confused with aesthetic achievement, or, to put it more fairly, there is substantial overlap between aesthetic achievement and achievements of artisanal skill. The same was true in media art research, but while copper has been copper for millennia, the technological substrates of media art research changed blindingly rapidly, due to the external realities of Moores law and the enormous profitability of the tech industry. (Then, as now, there was always the newest thing, some new widget on the market, often becoming obsolete and forgotten in weeks, and there were regular reports of ground-breaking research at MIT or some corporate research campus that would, in the not-too-distant future, change everything. All this, in retrospect, is the predictable churning of a rapidly growing and increasingly wildly profitable industry, or ecology of industries, that depend for its success on keeping the public in a constantly hyperexcited state.)

Because these works were realized in a rapidly changing technological environment and in many cases were 'kluged' together, they were difficult to exhibit and almost all are lost to history because they ran on quickly obsolete hardware using long forgotten operating systems and programming environments. For instance, Luc Courchesne's pioneering work of interactive cinema *Portrait One* (1988-90) ran Apple's Hypercard (the revolutionary interactive multimedia authoring environment that presaged HTML) on a Macintosh SE/30 that accessed video from a 12" laserdisc player (the last time I saw one of those, it was in a pile of obsolete hifi equipment in a goodwill store, and that was a decade ago). Video-art installations required banks of professional video-tape decks, each (U-matic) video cassette was the size of a large book.

When I came to prepare *Petit Mal* (my autonomous robotic artwork) in 2005 for exhibition at Berlin Transmediale 2006, 10 years after its debut, I sourced the last two RAM chips of their kind available anywhere. The compiler for the very early microcontroller (GCB11) was originally distributed on a 5 ¼" floppy disc, but no 5 ¼ floppy disk drive could be found. Happily, we found a version in some ancient online archive, and had to emulate DOS under LINUX to run it. War stories like these are common, and youngsters roll their eyes as if they are cautionary tales of the 'you youngsters don't know how lucky you are' variety. The point here to emphasise the custom engineering and technical kluges that were part of the work. It explains why the vast majority of these works are lost, and to emphasise the importance, for the historical record, of capturing the realities of working in that period, through documentation and recollection (Penny 2011). An historically and theoretically crucial aspect of this period of work - which is not easy to comprehend

for a contemporary population surrounded by a plethora of sophisticated digital appliances - is that the special purpose technologies artists wanted *did not exist*, and so the creative process necessarily involved imagining and designing new high-tech tools as an integral aspect of the process or realization of the work. Artists in the field therefore had to undertake deep technological R+D involving electronic and computer engineering and coding. But the advantage was that projects were not constrained by available commodities - I would argue that the media art in the 90s was creatively and conceptually far more diverse than later contexts precisely because the modalities and milieux had not been commodified.

For media artists, a peculiar effect of this technological churn was that techno-aesthetic achievements that were significant in one generation of the technology (a year or two) were subsumed and rendered invisible in the next as systems 'chunked up'. This term 'chunked up' may itself be, at this point, anachronistic: at the time, it was a useful way of describing the way explicit technological functionalities became subsumed and inaccessible as the scale of systems rapidly expanded. One could enumerate thousands of such technologically situated creative hacks that were celebrated, then rendered invisible or irrelevant overnight. To give a simple example, in the early days of digital encoding of video, an image had to be scanned in vertical bars and processors were so slow that it took a significant time - a few seconds - to scan a frame from right to left. I, and others, found that by moving the camera as it scanned, or moving in front of the camera, you could generate interesting images, a kind of slit-scan effect. In the next generation of computers, the processors were fast enough that this practice was no longer possible. This reality has subtle aesthetic ramifications - the way one conceptualises possible techno-aesthetic invention is conditioned by the capabilities of the technology of the day itself. An interdisciplinary, long-historical study of creative invention in the context of emerging technologies reveals a general pattern - the kinds of things that were imagined (or perhaps could be imagined) were conditioned by the available technology and technological imaginary that surrounded it. The technological imaginary is contingent on the state of the technology itself. Indeed, artist-researchers contributed substantially to the technological imaginary, as they simultaneously contributed to the development of technological capabilities themselves.

A second, separate problem of historical research is that, without comprehending the technological context of the day, we cannot comprehend the work in terms of the technological constraint the researchers worked within (and pushed the envelope of). To illustrate with a counter example - art and media history students understand the technological limitations of, for instance, the chronophotographic experiments of Marey and Muybridge, because they've been interpreted for us by scholars. Whether we see such work in an a-posteriori teleological prehistory of cinema or not, we understand that the rate of multiple exposures was constrained by available lighting technologies, high speed (clockwork) mechanisms and the sophistication of chemical engineering of the day. We have not developed similar perspectives on 90s computing technology - we find the low-resolution pixelated graphics garish. Nostalgia though, is a powerful force, viz the rapid increase in value of mid-century modern design, or even the fashionability of galvanized iron, and similarly the growing technological nostalgia for, for instance, audio cassettes, 8bit games, Amiga graphics or Minitel. Perhaps historical contextualisation is itself an historical process.

Building out my knowledge of the history of technological innovation, I learned that my approach fit into a long tradition of visionary outsider technical tinkerers that stretches back into the nineteenth century and before, from von Kempelen and Erasmus Darwin to Charles Wheatstone, Daguerre, Morse, Helmholtz, Jules Etienne Marey, Edison and Tesla to mid-century artists like Edward Inhatowicz, Gordon Pask, and Woody Vasulka (esteemed company I would be honored to be counted among). Some are identified by history as scientists, some as artists, some as peculiar eccentrics. Some achieved recognition, even fame, many, simply forgotten.

I/O and the Spectator

Implicit in the conception of the modern art exhibition, museum or gallery is that prior (explicit, specific, technical) learning is not required when you engage an artwork. These norms collided with cultures of computer use, where tutorial and manuals were required. This created truly awkward scenarios – visitors to artworks became *users*, and users were often expected to undertake training – they were, after all, learning to use a machine. Trainers, training sessions, demonstrators and technical manuals became fixtures at media art museums and festivals. I set myself a goal that a person should be able to interact with my works without learning a set of codified procedures or using any kind of device. Explicitly rejecting the conventions of business computer use and alphanumeric data entry, I never made a work with a keyboard and monitor. A person, I was convinced, must be able to walk in and conduct themselves as they do in the outside world, using modalities of (inter)action they might employ with other people or with pets, in normal human activities. My general task was, therefore, to create technological scenarios in which this kind of behavior could occur. But conventional computers did not afford such interaction or i/o (most could not even input a microphone signal) so the development of custom sensing systems, electronics and code was unavoidable. In pursuing these projects, we were pushing the available computing technology *against the grain*.

This kind of from-the-ground-up technical R+D was necessary – off-the-shelf products simply didn't exist. By predilection, by budgetary constrain and by the simple absence of useful and relevant products, I designed and built much of my hardware myself. This was double edged – it took me six months to design and build my ultrasonic sensor board, but this meant that I had a very good understanding of ultrasonic sensing when I was done. Did that work feel like I was doing art? No, not at all. But the design was determined by my aesthetic specification, and thus I could be sure the finished product conformed to that specification. *Petit Mal* (completed in 1995 after five years of development), employed the first commercially available embedded microcontroller, the Co-active Aesthetics GCB11. It had 68HC11 microprocessor that ran at a blitzing 2 megahertz and had 128K of external RAM. All the sensor and other circuitry was bespoke. These included entirely custom ultrasonic sensor circuitry, handcrafted PIR sensors and optical encoders that uses the teeth of the cog of the drive chain as an opto-interrupter, as well as motor and power systems.

I was trying to make systems whose 'knowledge' was derived from the current state of the world. This meant conceiving and building sensor systems that collected relevant and useful data

about the world, and interpreting it correctly. In the case of *Petit Mal*, what it could know about the world was very basic, about the level of a nematode. We might paraphrase the ‘knowledge’ of *Petit Mal* in (pseudocode), first: *am I moving, if so, how fast (forwards, backwards or turning)?* Second: *is the object (at such and such a distance on my left, right or straight ahead) a person or a part of the architecture?* If ‘architecture’, one kind of behavior ensued – avoid/explore; if person, engage/follow/interact. Its ‘awareness’ was never formally described in the code in such terms, there were simply ‘influences’ of certain ‘strengths’ that summed in each moment to an action, and that action resulted in a new ‘situation’ in which new influences of varying strengths exerted themselves. *Petit Mal* contained no representation of the world. In Brooskian terms, no model of the world was required because the world was right there. *Petit Mal* is an entirely situated and reactive robot. In this limited way, *Petit Mal* had a world, and interacted with it, and ‘people’, as if it had knowledge of its world.

In the case of *Traces* (1997), a virtual reality work built for the CAVE at Ars Electronica, the goal was to provide the system with knowledge of the embodied dynamics of the user. This was motivated in part by a critique of the rhetoric of (90s) virtual reality (VR) as an ‘embodied’ technology. The conventional argument was that VR was special because it was *immersive* – you were ‘there’ in some virtual environment. But to the system, what were ‘you’? In most cases, the richness of human embodiment was reduced to the position and direction of a viewpoint. The user was reduced to a pair of eyes, a gaze. As I said at the time, ‘in VR you check your body at the door’ - contemporary VR is no different, except it is cheaper and slightly higher resolution. It is an elaboration of cinema, but instead of looking at a screen, you get two screens, one for each eye, that create an illusion of 3D (stereoscopy). That stereoscopic image is dynamic, in the sense that is mapped, moment by moment onto a position and angle of view in a computational environment. This is all very wonderful, but it is not ‘reality’. Andre Bernhardt and I built a sensing system that captured a volumetric representation of the full body of the user in real time. The system could identify not only where the user was (roughly) looking, but how and how fast the hands and feet were moving, and go on to make reasonable assumptions about levels of physical excitation and interpret those as indicators of ‘mood’, etc. The system knew something about its world and about the affect of the user. All the behavior of the system was informed by the bodily dynamics of the user as interpreted by the machine vision system. For me, projects like *Petit Mal* and *Traces* always worked on two levels. They provided a novel kind of aesthetic experience for *spectators*, and they functioned as a critical interventions into discourses of computing – working as a proof of concept. The fact that these works were all experiential and performative was consistent with the critical argument I was making in each one.

The end of the beginning

The 1990, as I’ve noted here and discussed elsewhere (Penny 2011), were a chaotic and generative *temporary autonomous zone* for media arts. (Bey 1991). Technological contexts were changing with dizzying rapidity, and people with all kinds of backgrounds and expertise were flowing in and around, and conversations were fueled by diverse perspectives. By the end of the 1990s, online gaming and HTML-based world-wide-web were beginning to fill out a range of new networked digital cultural niches and practices. These had become viable due to a rapid

commercialisation and commodification of hardware. Real time graphical capabilities that a few years before had been the territory of high-end Silicon Graphics 'reality engines' that required full time Unix technicians, could now be realised on desktop PCs for pennies on the previous dollar. At the same time, practices began to gel into genres that developed their own subcultures.

At the point when media arts got commercial potential, products began to appear that were conceived to fulfill a market. Some people in some company or corporation somewhere had determined, by focus groups or whatever, that there was a market for a product that would do certain things – retouch photos for instance. Such products drove a shift in media arts practices and quickly came to define the kinds of practices that were possible in 'media arts'. Vocational educational programs formed around genres of product – classes on 'illustrator' or 'python', animation software packages and digital video tools like Final Cut: each defined (by) a range of practices and a kind of output. These genres of product conformed to a logic of mass markets and economies of scale: if you were doing media art, you were either doing digital painting or animation or digital video. The range of possible arts practices were rapidly constrained and defined by the capability of the available standard desktop hardware and the software tools compatible with it, and those tools were the product of companies whose success depended on selling lots of the same thing – a logic of marketing inherited from the automobile, appliance and fashion industries that seeks to persuade potential customers that they can express their individuality by buying the same product everyone else has. The fact that this strategy demonstrably works is baffling, and leads one to conclude that either customers are easily hoodwinked or that individuality is really not that important.

As this shift occurred, I began to lose interest in the field. It seemed to me that among the pioneer generation I had been part of, there had been a drive to realise often eccentric visions of what the technology could be. One began from the position "*this is what I want to do, now how can I construct a technological assemblage to realise it?*". This attitude appeared to me to have been replaced with a more impoverished consumerist attitude – "*look at this cool product, what happens where I press this button?*". That is a little derisive, and not always warranted, there is a small community pushing the envelope at the intersection of computing and art (see for instance Audry 2021). Some drifted off into more edgy practices – in the 2000s, bioart appeared as though it might take up the mantle of experimental technoarts. Maybe Good Old-Fashioned Media Art - riffing on Haugeland's GOFAI (Good Old Fashioned Artificial Intelligence) - as a phenomenon that was necessarily historically located at a particular nexus of technological development, commodity capitalism and geopolitics.

On writing the history of GOFMA (Good Old Fashioned Media Art)

Ezra Pound remarked that *artists are the antennae of the race* (and continued: *but the bullet-headed many will never learn to trust their great artists.*) (Pound 1954). Artist-researchers of the ilk I have been discussing comprise an avant-garde of technocultural research, and always have – Daguerre, let's not forget, was a scene painter for the Paris Opera and invented the diorama before his work on photography. As someone who had been immersed in the community of media arts more or less since its inception (in the mid 1980s), I have seen almost every aspect of media

technology trumpeted as 'new' in the popular technology press, prototyped in the media arts community in the previous decade. In some cases, those ideas had been reinvented in corporate and academic research labs a decade later – testifying to the profound separation of the culture of arts and of academic and corporate computer engineering. For relatively short periods, visionary research centres like the Banff New Media Institute run by the remarkable Sarah Diamond (a location as unlikely as the previously generative Black Mountain College) were hotbeds of interdisciplinary international research and development. Occasionally, in corporate contexts like the Xerox Parc or the short-lived 'Interval Research', collaboration between artists and engineers was encouraged. In other cases, more insidiously, artists' research was simply 'borrowed' with no credit accorded (to enumerate and historically validate such claims would be a substantial and important research project of its own). There is a history that remains largely unwritten, of artworks that model future technologies. This has been particularly true in the digital period. One could fill a book, no doubt, with examples of contemporary digital technologies first modelled in media artworks. The history of the paths of such ideas from self-funded eccentric projects to multi-million-dollar digital commodities is often obscure(d).

In the 90s, it was evident to anyone in the New Media Art world that art theorists and art historians were almost entirely absent from the scene, most hewing to a technophobic line that anything done with computers simply couldn't be art (notable exceptions were rare, such as the illustrious Anne-Marie Duguet). Sadly, when the poor sods tried to write about media art, the result was often less than insightful, sometimes laughably ignorant. Their educational trajectory simply did not equip them for the task. They usually exhibited an almost total lack of understanding of the technology or the working processes involved, and this led to critiques that sadly missed the point, for instance: discussing a screen image in the critical language pertinent to painting, ignoring the inherently processual nature of the technology, or entirely missing the aesthetic, theoretical and cognitive significance of choice-making enabled by utilisation of interactivity.

As a result, demonstrably, virtually all critical and theoretical writing about the emerging genres was done by artists themselves. In addition, many stepped in as curators or editors or festival organisers, because simply, they were the only ones who were qualified and familiar with the territory (from the beginning of my career, I found myself in such roles). Through the 90s, it was media arts practitioners themselves who established venues, events, journals and online resources. In more socialised countries, some level of support came from the state, and these became internationally recognised centers of development: Canada, Netherlands, Germany, UK, Austria, Japan, Australia (but resoundingly, not the USA). As all new media forms have done (cinema, radio, television) the culture did not flourish in conventional settings (museums or theatres) but promulgated itself through novel venues, in this case, the new media festival - Ars Electronica and ISEA being perhaps best known. Loosely based on film festivals, these events, (and there were many, some one-offs, some in series) usually involved a heterogenous combination of exhibitions, performances, conference sessions and workshops in short term (often 3 day) international events. Notably, they were seldom affiliated with any major art museums, and were often sponsored by tech corporations and sometimes, local business councils. Less often, they were

sponsored by academic research organisations - art exhibitions associated with ACM SIGGRAPH and ACM SIGCHI are long running examples.

It was a good decade before a new generation of art history grad students emerged who had used computers as children and thus did not find the technology 'strange'. Those who began to do useful writing had often been students of first-generation media artists who had gone on to form, or find employment in, the first generation of dedicated interdisciplinary media arts programs in universities. Many emerged after the first decade of New Media Arts practices, during the dot-com boom, when educational institutions finally realised there might be money to be made in the increasingly profitable technological landscape (I established such a program at the University of California Irvine in 2003). In the recent decade, such programs have been in decline, not necessarily because they were unsuccessful, but because the rest of the world has 'caught-up' - everything is digital, so it would be like having a school of water for fish (but that does not mean that appropriate theory and critique of the digital is taught).

The same sad historical process occurred for the vast majority of art journals and art museums – they entirely missed the boat. That is not to say it was easy for art museums to embrace the new technological context. A staff trained to hang paintings and adjust lights could hardly be expected to boot (often custom) computer hardware, configure operating systems or calibrate projection systems, let alone troubleshoot when things went wrong. Especially in a context where the technology was obsolete by the time you'd taken delivery of it. The unfortunate result was that if a museum or venue took on such a task, visitors would as often as not find the exhibit 'dark' with an 'out of order' sign hanging across the entrance, or a forlorn media artist would be found hanging around waiting for something to break – or worse, in a dark corner or up a ladder with a flashlight in their mouth, attempting a jury-rigged fix with a pocketful of tools. As a result of the combination of factors outlined above and earlier in this paper, collections of first-generation New Media Art are almost non-existent. Most of the work is lost, the technologies on which they ran are long obsolete, and technicians who know how to work it increasingly rare. In many cases, documentation is poor or non-existent, or is currently turning from analog video tape to magnetic dust (this is the case with documentation of Penny 1993).

The period when media art was new has passed. Contemporary museum personnel are acclimated to media and computational technology. The presentation of, at least, linear video, now fully digital, is trivial and has become an unsurprising part of the museum and gallery experience. This has been facilitated by the same development of cheap, compact user-friendly technologies as discussed above. The *raspberrypi* embedded microcontroller - a pocket-sized computer costing a few dollars that has the computational capabilities of a multi-thousand-dollar high-end workstation of the late 90s - has now become the standard vehicle for exhibiting video. It is the direct descendent of the first-generation embedded microcontroller I deployed in *Petit Mal* (the GCB11), many orders of magnitude more powerful. It runs linux, a free operating system developed by a community of enthusiasts, over the internet. Their open-source ethos a product of anarchic techno-utopian hackers of the 90s - like the media arts, the internet and linux were largely developed by communities of (networked) amateurs.

Conclusion

What I hope to have conveyed here, via an historically contextualised account of my own practices and my technocultural critique, is a story about first generation media arts practices as radically interdisciplinary *critical technical practice* (Agre 1997). Artists, while inventing new aesthetic forms, interrogated emerging technosocial formations from an experiential perspective of hands-on experimental practice. Such artist-researchers were not users of technologies shoved at them by marketers, but were originators and developers of such technologies and their emerging technosocial niches. Marshall McLuhan observed: *Art at its most significant is a Distant Early Warning System that can always be relied on to tell the old culture what is beginning to happen to it.* (McLuhan 1964). (Note the deployment of cold-war terminology of the SAGE system – the “DEW line”). I see the media arts practices in this spirit – amateurs – in the etymologically correct sense doing blue-sky research that reliably pointed-up emerging forms in advance of corporate and academic research.

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