

A CRITICAL EXAMINATION OF "COMPUTER ART": ITS HISTORY AND APPLICATION

1. HYPOTHESIS

This thesis proposes that art created through the agency of a computer may be termed "Computer Art" and distinguished from all other forms of visual art by its computational basis. Computer Art is a significant development in the visual arts because the computer operates simultaneously as medium, tool and context, in addition to its organisational and interactive elements. The image-space described using software frees artists from the restrictions of physical media by providing a dynamic non-material environment, whose potentials may be realised in the resulting artwork.

The digital basis of computer artwork raises questions about the uniqueness of an "original" in this branch of visual art. Similarly, the dynamic nature of this medium makes it difficult to realise the artwork as a purely physical, static object, and its lack of permanence challenges accepted ideas of the preservation and propagation of artwork. Because the computer provides the image-space and the tools for image-making, it can be seen as a platform for art in the same way it has become a platform for architecture, music and design. It has subsumed the physical act of drawing into the conventions of its graphical user interface; the movement of the mouse results in a series of computational processes rendering a line on the screen. This physical activity creates a digital image which may be manipulated and changed in ways previously inconceivable for physical media. Thus the computer extends the intellectual substrate of the creative act.

Computer Art is presented as a series of technological, artistic and theoretical developments that, taken together, comprise this new field of visual art. Previous investigations of Computer Art have sought to explain it as a more limited phenomenon, often identifying only one of its manifestations as "Computer Art" and disregarding others. The wider question of the computer's contribution to art has not been fully explored. This has resulted in definitions based on particular practices of using the computer, as if "Computer Art" were limited to one image-making technique. Such definitions are more concerned with the process of making Computer Art. By contrast, the definition put forward here attempts to account for the artist's

experience of using the computer, and the computer's own contribution to the artwork.

In the course of this study, I will consider how Computer Art has been approached over the past fifty years, which artists have utilised it most effectively, and how it is gradually distinguishing itself as an artform in its own right. Computer Art has always attracted great expectation, yet it still seems to be in a formative stage.

The period examined in this thesis runs from 1950 to 2000, with additional material from the early twentieth century. The year 1950 has been previously identified as the start of "Computer Art" proper, with Ben Laposky's use of an oscilloscope to create Lissajous figures. By dealing with pertinent examples of mechanised art from before 1950, I hope to show that Laposky, John Whitney and other early pioneers came to the computer with a sense of what machines could achieve in this field. The year 2000 has been adopted as a convenient break-off point, allowing for fifty years' development.

The 1960s witnessed a great florescence of computer-related artforms that subsequently declined in the 1970s. However, the progress of imaging technology in allied fields such as film special effects and animation, combined with the widespread availability of personal computers from the mid-1980s, ensured that artists once again took an interest in the computer. Thus the period from the late 1970s onwards is, in many respects, a very different "Computer Art", but both periods are united by certain shared concerns centring on the computer.

Jasia Reichardt noted in 1971 that great works of Computer Art have yet to appear and this artform's principal interest lies in the opening of new frontiers.¹ Some may believe this is still the case, but I contend that so long as Computer Art is valued only for its potentials, its full realisation will never take place and it is doomed to remain embryonic. Computer artworks should instead develop alongside long-term artistic attempts to investigate the computer as a platform for art. The most successful computer artists have followed this approach.

¹ Reichardt, Jasia *The Computer in Art* (Studio Vista/Van Nostrand Reinhold, London, 1971), p7

2. DEFINITIONS

Why use the term “Computer Art”?

The term “Computer Art” means very little. It is almost as imprecise as referring to “drawings on paper”. One could talk of “digital art”, but that would exclude all the early computer artists such as John Whitney and Ben Laposky who worked with analogue computers. Indeed, if one stretched the definition of “digital”, it could refer to any medium where the image was contained within a discrete sequence of instructions.

Perhaps a definition of Computer Art should only focus on artists who program the computer to produce their art. Yet such a narrow view would exclude the many artists who have extended their more traditional art practice by using commercial graphics software. Nor can a definition of “Computer Art” be tied to a specific aesthetic or visual form, because the computer does not proscribe the forms and appearance of the artwork. Moreover, the computer appeals both to artists who create ordered abstract and geometric forms, and to those who aim for chaotic and naturalistic forms. The proliferation of powerful desktop computers amongst artists also makes special characteristics of “Computer Art” hard to pin down, as they can develop very individual styles with little need to follow a specific approach.

In short, the phrase “Computer Art” only indicates that certain images originated on a computer. It gives no indication of style, aesthetic qualities or technique. If these are the best ways of classifying art, then “Computer Art” as a term is practically useless. As long ago as 1989, Richard Wright noted that “Computer Art” is being supplanted by phrases such as “computer-aided art” or “computers in art”: “[partly] because the computer is now used for so many different purposes that it can no longer form a basis for comparison by itself.”² Thus the blanket term “Computer Art” seemingly contributes little to an understanding of the image or the artist’s intentions.

Some confusion is caused by the way “the computer” is treated as an entity with certain fixed attributes, an assumption which stems from its physical presence as a piece of hardware. It is in fact a collection of processes running on that hardware that the artist may utilise in a variety of roles. As a consequence, the computer is often

² Wright, Richard “The Image in Art and ‘Computer Art’”, *Computer Art in Context*, p49.

used as a symbol or cipher for the modern technological society, giving it a presence quite unlike any other contemporary machine. Its role in the modern imagination is comparable to that of the steam engine in the 19th century: it summarises the achievements and consequences of technology and is variously perceived as highly beneficial or insidious. Unlike the steam engine, however, the computer is not a physical vehicle but acts as an extension of mental capabilities. Its multiplicity makes it hard to grasp, so it is conveniently regarded as a unitary device and any artwork produced through the agency of software is similarly made “with” or “by” a computer.

This corralling of computer artwork into a single category may have contributed to its sidelining by the mainstream art world. The involvement of mechanical and computational devices in art has often provoked controversy, and rarely proved to be of more than passing interest to galleries and curators. Moreover, Computer Art is itself a subset of an even broader category: “Art and Technology”, which encompasses everything from holographic art to sculptures in exotic artificial materials. Just as the “computer” is a convenient overall term, so with “Art and Technology”.

Observing this tendency toward overarching categories, Pierre Francastel claimed that “abstractions like Art, Society, Machine and Technology [are treated] as attributes of man in the absolute.”³ The computer joins this list of abstractions which streamline the understanding of more complex phenomena. Due to this tendency, “Computer Art” became more than an observation on the art’s means of production: it was used as a convenient catch-all for many unrelated artworks. Thus museums have tended to relegate Computer Art and similar technological artforms to the periphery.

The abstract animator Larry Cuba laments this homogenising tendency. He is often seen as a practitioner of “Computer Art” but his work has a greater degree of continuity with the pre-computer Abstract Animators, even though it incorporates computational processes into its aesthetic and execution. But categories in art tend to rest on visual or polemical connections, so by calling his animations “Computer Art”, certain visual expectations are evoked. Cuba uses the computer as a vehicle for his art and it annoys him to be thrown into a group defined for curatorial convenience. He claims that despite this perception of an over-arching genre of technological art, “[there] is nothing about using tools which unites you with others using this

³ Pierre Francastel, *Art & Technology in the Nineteenth and Twentieth Centuries* (New York 2000; published in French in 1956), p85

technology.” Rather, he points to the “visual kinship” of abstract animators, which is more important than differentiating which of them used computers.⁴

Cuba is reluctant to be forced into a category of “Computer Art”, in which the specifics of his artistic practice are subsumed by the technology. Also, the issue of “kinship” suggests that visual links might be established between computer artists and pre-computer genres. In such cases the computer provides a new way of realising an existing artistic approach and may be seen as an extension of the older form rather than a new artistic undertaking.

To complicate matters, images generated with the computer may be incorporated into other artforms. For instance, John Whitney’s animation *Permutations*, 1968, was generated on an IBM 2250 computer, recorded with a film camera pointed at the screen, and processed using film production techniques. It was presented as “animation” or “experimental film” rather than “Computer Art”; Whitney himself is more often considered an “experimental film-maker” rather than a “computer artist”, again showing the power of categorisation. Whitney’s work illustrates how a work’s computational origins may be disregarded in its presentation and categorisation. [Plate I]

In addition, some artists who have developed innovative uses for the computer bridle at the suggestion that they also belong within a broadly-defined grouping called “Computer Art”. Harold Cohen, for instance, has created a program called AARON that acts as a semi-independent extension of his artistic understanding: it constructs pictures according to programmed routines based on Cohen’s encoding of the decisions taken in drawing a picture. AARON’s pictures seem subjectively freehand; they resemble neither stereotypical “computer graphics”, nor earlier examples of abstract “Computer Art” from the 1960s. In addition, Cohen perceives the computer artworld as insular and introverted, and for this reason he actively avoids any association with it:

Do I call [my art] Computer Art? No, I say, I do not call it Computer Art. I don’t want anything to do with Computer Art. [...] Computer Art seems very reactionary to me [...] it hasn’t changed in any fundamental way in twenty years and that seems to me a sure sign of infertility.⁵

⁴ From my interview notes, “Interview with Larry Cuba and Robert Darroll.” Based on partial transcript.

Cohen's hostility was provoked by what he regards as the simplistic content and approach of early Computer Art, and the unfulfilled expectations surrounding it. This underpins his stance against an identifiable genre called "Computer Art" which encompasses every aspect of computer-mediated art. Cohen places AARON outside such definitions because it is a form of collaborative art which employs Artificial Intelligence, not a straightforward act of art-making with a computer. AARON uses computational processes in a more fundamental way than simply drawing or painting with a mouse.

It is interesting that Cohen, himself a practitioner of a computer-based artform, has a fixed image of what Computer Art is, or is supposed to look like. Even in dismissing it as a type of art, he assumes its partisans represent it to some degree. The "Computer Art" to which he refers is exemplified by the first generation of computer artists which culminated in the exhibition *Cybernetic Serendipity* in 1968. This was influential in forming perceptions of the computer's visual potential until the early 1980s, when computer graphics became typified by photorealistic 3D animations. However, the very fact that the stereotypical concept of "computer graphics" has changed over time suggests that any attempt to define Computer Art using a specific visual aesthetic is futile.

⁵ Harold Cohen "Off the shelf", *The Visual Computer* (1986) 2 : 191 - 194c Springer – Verlag 1986

Metaphors as a basis for understanding technology

Defining Computer Art is not simply a matter of declaring it to be “art produced on the computer”. Apart from the intractable question “what is art?” one must consider *how* art is made on the computer, *why* the artist turns to the computer, and the nature of the computer’s impact on their work. How else can it be differentiated from preceding artforms?

No technological process has a straightforward effect on the art produced through it. Some technologies, such as photography and film, are more easily characterised than others. Moreover, they have gone on to influence the perception of their successors in those crucial intermediate stages where a new technology is ousting an older one. To complicate the issue, the computer interface has taken metaphors from previous settings – the desktop, files, folders, drawing tools and the canvas – and recreated them to allow wider access to the computer. This has led to important discussions on the topic of Human-Computer Interfaces (HCI) as to what effect such metaphors have on the development and comprehension of the interface.

William J. Mitchell considers that our fondness for metaphors such as “electronic photography” and “digital camera” makes it harder to understand their underlying differences from previous photographic techniques.⁶ They are obscured by resemblances rather than illuminated by analogies. Earlier, Edgar Wind had noted the capacity for newer media to begin by imitating the conventions of their immediate predecessors.

At its first appearance a newly mechanized art always looks like a fake, because it models itself on an unmechanized or less mechanized kind of art.⁷

Thus in Wind’s example, film began by borrowing theatrical conventions and looking like “degraded” theatre; television was doing the same to film at the time Wind was writing. Computer software often borrows metaphors and effects from physical art media, making it a “degraded” darkroom, studio, etc. Such metaphors ease the comprehension and operation of the computer by non-technical users. The metaphors reduce complex conceptual operations to concrete tool-functions, associated with specific graphical effects. Yet this veneer of familiarity must give way to some inherent

⁶ Mitchell, William J. *The Reconfigured Eye*, (Cambridge, Mass., MIT Press 1992), p4

“computer factor” which might be discovered in the *material* of the computer image itself.

For Mitchell, digital cameras and scanners do not work with images *per se* but rather produce a configuration of data that can be reconstructed to form an image. Although the digital camera borrows the metaphor of a traditional camera’s form and operation, this development cannot be ignored. The need for making the new device resemble the old reinforces the notion that the images it captures are analogous to those of the camera. Once the resemblance has been absorbed, the images transcribed by the digital camera are regarded in a similar way to those from its analogue predecessor.

Whereas images are integral to photography, which arose from a tradition of optical instruments and perspective machinery used since the Renaissance for the creation of art⁸, the computer has no such irreducible visual component. Because it treats images as sets of instructions, it prescribes no single way of creating or displaying them. Of course, the image data specifies the way the image will be displayed, but its subsequent modification and transmission may be carried out in a variety of ways, none of which is dictated by the visual or material structure of the image. To put it simply, an image constructed from strings of instructions is contingent on the *outcome* of these instructions, not their layout or appearance. Also, the image may be modified either at the visual level or by directly manipulating the instructions themselves, thereby changing their outcome. This is what differentiates Computer Art from all previous artforms.

For this reason, the computer is a powerful channel for creating imagery from many sources, some of which are internally generated or the results of equations. As Andries Van Dam states, computer graphics is “the pictorial synthesis of real or imaginary objects from their computer-based models [...] we can make pictures not only of concrete “real-world” objects but also of abstract, synthetic objects [and] of data that have no inherent geometry.”⁹ In this respect, there is no division between computer “graphics” and “art”: all images produced on the computer have such properties, regardless of intent.

Thus there is a twofold rupture between Computer Art and all traditional art because:

⁷ Art and Anarchy Edgar Wind (London 1963) “The Mechanization of Art”, p70

⁸ Kemp, Martin *The Science of Art*, 1992

⁹ Van Dam, *A Computer Graphics: Principles and Practice* (1997)pp2-3

- i) the artist manipulates information directly, without the limitations that are intrinsic to a physical medium;
- ii) the computer can respond to the artist during production and the viewer after production, or even act as a creative agent in its own right if programmed to do so.

I propose that artworks must satisfy both points in order to qualify as Computer Art, which is distinguished from other artforms because these two qualities occur in combination. Each in itself is an important departure, but taken together they provide the strongest argument for treating computer artforms as an entirely new field rather than (for instance) a new type of animation, or photography, or drawing.

If Computer Art qualifies as a separate field of art, one should be able to identify the processes, tools and qualities of this image space. Once Computer Art is demarked, artists will have a better sense of where their own art is located, which will prompt further developments of computer artwork. "Computer Art" will benefit from a constructive definition that draws together computer artists as a field, where they previously lacked a unifying principle beyond their technology.

Limitations of the term "Computer Art"

The broad term "Computer Art" might prove more useful than terms to delineate specific computer arts practices, which are necessarily limiting. The term does not exclude certain approaches to the computer on the basis of their putative relation to pre-computer artforms. In this sense, "Computer Art" may be considered suitable for the area of computer-based artforms, simply describing their provenance instead of judging their status.

However, "Computer Art" lacks the descriptive concision of other categorisations such as "photography" or "film", which sum up technology, technique, and expectations of output medium and image. That the mere mention of "photography" can do this is a result of acculturation: the name evokes a whole range of processes and images. But how could one phrase convey all the implications of computer images?

Computer-based art is far too disparate to be called a “movement”, though several have sprung up within the body of Computer Art in the past few decades. Rather, artists have adopted in different ways as the availability and power of the computer has increased. Naming and defining artistic movements usually conveys certain historical and stylistic information. By contrast, “Computer Art” carries with it no aesthetic expectations, nor does it proscribe certain techniques for producing the art.

Yet “Computer Art” may be invaluable for this very reason. Instead of focusing on certain artistic movements or approaches to the computer, “Computer Art” can encompass all of them. But it must be defined in different terms from previous definitions in order for it to be useful. Instead of focusing on the technique used to produce it, perhaps there are other criteria that can be applied.