# Co-Creativity in Interactive Digital Art

**Linda Candy**

*Creating interactive digital artworks involves the construction of complex computer systems. Artists working in this area have a choice of acquiring personal technical expertise or forming collaborative arrangements with technologists. Collaboration involves multi-disciplinary teamwork and this has implications for the creative process. Co-creativity in digital art has several dimensions: interaction between artist and digital technology, interaction between artist and audience and interaction between artist and technologist. The paper discussed these issues and provides examples of current research into the development of interactive digital art.*

*Key words: co–creativity, collaboration, interactive, art, digital technology*

## Introduction

This paper has two inter-related themes: first, the nature of interactive digital art and second, the role of collaboration in the creation of such artwork. The nature of the collaboration between artists and technologists influences the kind of interaction that is possible between artist and digital media. Interactive digital art involves the construction of complex computer systems including device and software technologies. The applications and programming languages available to build these systems are substantially more difficult to use than software that has been developed for specific tasks. Artists working in this area have a choice of acquiring technical knowledge such as computer programming, or forming collaborative arrangements with technologists. This kind of initiative can lead to new technological developments but there are implications for how such interactive artworks are to be developed successfully. The many levels of requirements for new software and device technology requires significant technical knowledge and it is not easy for the individual artist to address these challenges working alone. Collaboration inevitably involves multi-disciplinary teamwork and, where the participants are engaged in the creative process, we call it 'co–creativity'. Co–creativity has several dimensions: interaction between artist and digital technology, interaction between artist and audience and, important to the scenarios described in this paper, interaction between artist and technologist.

The interest of artists and art theorists in audience participation with artworks has been particularly active since the 1960s. Interactive artworks that could transform viewers into participants were envisaged and created using the media available at that time. The period from the mid to late 1960s was an exciting period for experimental art during which time the coming together of technologists and artists in collaborations of one form or another began to take place. Then, for an artist even to talk to an engineer was thought to be remarkable. Nevertheless, more and more people with backgrounds in science, engineering and art began to present their 'computer art' work. It was a time of individual effort supported by small interest groups whose work was often

sustained by having some form of access to academic facilities. From the 1980s onwards, there was a surge in the growth of experimental digital art. Organizations were formed to facilitate developments and the number of artists involved multiplied. The organizations promoting such work came from a wide variety of backgrounds, including the visual arts, music, performance and film. Each of these starting points brought with it different orientations with respect to art and technology. The organisational context of the work described here is based in a university, an environment that has frequently been the source of significant innovative digital work.

Creativity and Cognition Research Studios (see C&CRS) were established for the purposes of developing new art and technology projects and also to conduct research into the creative process. Research issues include: the impact of the technology on creative practice, the implications of such practice for technological requirements and the environments in which new developments can take place. This paper draws on current research into the nature of co–creativity and the examples of interactive art systems (see COSTART).

## Co–Creativity in Interactive Digital Art

Digital systems are increasingly significant in modern technology-based art. Artists are putting considerable effort into the specification and construction of interactive experiences of many types.  In general, the challenges inherent in working with digital technology can have an influence in encouraging artists to break with existing conventions and abandon well established techniques, a development that is a core element of truly innovative practice. In deciding to use new forms of technology, the artist is not changing a medium such as oil paint, for an equivalent computer–based one. There are many software applications that can apparently make the creation of visual material very easy but this kind of digital art does not represent the front edge of current work. Where innovative concepts direct the artist to seeking out new techniques, it often takes considerable time and effort to develop the technology to a level where it can deliver the desired result. Few artists are in a position to achieve this themselves in short time-scales and this is where collaborative projects involving people of different kinds of expertise are required.

Interactive digital art systems are being developed by partnerships in co–creativity. The nature of such co–creativity is exemplified by the work of three artists drawn from the C&CRS artist-in-residencies described below (see Candy and Edmonds, 2002 for the full story).

*Jack Ox* makes artworks in which music and images are closely related and her primary goal is to create an intimate correspondence between visual and musical languages. She describes what she does as a form of "translation" of music into sets of visual languages. To achieve this, she has to determine structural parameters of the piece of music to be visualized, which take the form of operating principles and data sets that are encoded in MIDI files in the art system she calls, *The 21st Century Color Organ.* Once a work representing a transformation from music to a virtual world has been constructed, the audience, or rather 'participant', can move around in a three-dimensional visual space that is also a representation of a musical space. A vizualization from a recent work is shown in Figure 1.

*<fig 1 in here>*

Figure 1: Spiral visualization of "Im Januar am Nil" over "Beating Objects" landscape in the desert organ stop, Jack Ox, Clarence Barlow and David Britton, 2001.

An essential and vital part of Jack Ox's creative process has involved collaboration with composers and technologists. Over time she has moved from having a technological assistant to developing partnerships where the technologist is acknowledged as a co-author of the artwork. She also finds that the partnership model of collaboration provides triggers for significant creative advance. It is her experience and firm belief that, in the technology and art collaborations that she finds so necessary, the technologist has much to gain and that the artist should positively engage in achieving such benefits as well as progressing their own art practice. The type of co-creativity that Ox aspires to is one in which there is a partnership between the artist and technologist. In this scenario, the creative process takes place as a shared and equal contribution to the development of the work (Ox, 2002).

*Esther Rolinson* works with natural elements and architectural structures and creates installations in the physical world. She is developing an approach to using digital technology in order to control her light structures and to explore the way it affects the relationship between the object and the viewer. In order to progress her work she put her efforts into defining and communicating her intentions rather than developing programming expertise herself. The technical challenges involved the development of both hardware and software and the combined skills of three expert technologists were needed to develop the technical infrastructure of the work. Before an artwork is installed, it is difficult for the artist to visualize the effect of the sequences that have been programmed. For this reason, a simulator was built which produces a graphical representation of the artwork in two dimensions; this can be shown with a further representation of the elements that are to be controlled, such as the LEDs (Light Emitting Diodes). The simulator can 'run' the sequence and portray the results on the image (Machin, 2002).

In Rolinson's experience of co–creativity, there were clearly defined roles and the artist retained the overall artistic direction. In this type of co-creativity the technologist provides an assistant role for the artist in making available more accessible technologies for the artist to use. One of the key issues that arose here was how the different ways of thinking that solving technical problems compared with developing artistic ideas influenced the creative process. This also revealed a concern about how much control over the process the artist might have to relinquish to the technologists. Where the artist relies heavily on the contribution of key technical knowledge in order to carry out the work, there is an inherent risk that artistic control may be compromised. It is not simply a case of specifying a piece of software and handing the implementation over to a programmer; there are often issues that require judgement that are not apparent to a non-programming artist and that have implications for the artistic outcome (Rolinson, 2002).

*<fig 2 in here>*
Figure 2 Digital Garden, Under Construction Exhibition, Esther Rolinson, 1998

*Michael Quantrill* works on interactive sensor environments in which the visual and sound work reacts to the movement of the audience in front of the projected images. A particular characteristic of Quantrill's approach that distinguishes his work from the previous example, is a focus upon his *own* interactions with the work rather than on those of the audience. It is through this kind of involvement that he feels he learns most. He refers to his computer programs with the sensor grid interactive environment as 'sketches'. Each version of a computer program is seen as a tentative experiment leading to ideas for the next sketch. He is experimenting with interaction spaces in which the position and movement of people, the participants, constitute the primary or only input to a computer system. He regards his work as an investigation into the language of interaction that is expressed as a form of correspondence between human movement and formal representations

within the computer. In doing this, his relationship to the technology is very intimate and he explicitly refers to its role as one of actively informing the work. For this artist, the computer is much more than just a tool (Quantrill, 2000).

Quantrill's work represents co–creativity between artist and digital system. For this artist, there is no particular need to work with technologists because his technical expertise allows a high degree of self-sufficiency. He is developing an interactive digital system whereby the artificial system is a partner in a highly specialized form of personal exploration. A key point to note is that the artist is author and creator of the system and has ultimate control over its character. The role of the system is in providing the artist with a mechanism for evolving the creative process in the light of his experience of the interaction process.

*<fig 3 in here>*

Figure 3 Sensor System, Michael Quantrill and Dave Everitt, 2000

Having said all that, it is interesting to reflect that Michael Quantrill also proved to be eminently suited to collaboration with other artists because of certain attributes that afforded partnership possibilities. Successful co–creativity requires partnerships that are based upon certain key factors, for example, the capacity of the partners to:

- Devise a shared language
- Develop a common understanding of the artistic intentions and vision
- Engage in extensive discussions and "what if?" sessions
- Give time to establish the relationship and recover from mistakes

The characteristics of a partnership in co–creativity are many and varied. Some key features were identified from our research as follows:

- Partners receive mutual benefit but, at the same time, retain ownership of their individual achievements.

- To be able to enjoy such mutual benefit, partners agree to relinquish individual control of the creative process and to that end, it is necessary to play different but complementary roles.

- Having a respect for differences is also a key contributor to the partnership approach and this means identifying how their differences in approach can benefit one another and, by contrast, when they do not really matter in the larger scale of events.

**Conclusions**

The paper has identified several issues about the nature of co–creativity in interactive digital art. Where the role of the technologist is solely to implement the concept of the artist, this is an assistant model of collaboration. Where both parties participate fully in all of the key creative stages, a full partnership results. The partnership model of co–creativity has a variant, where the artist retains ultimate control of the evaluation of the outcomes. In a true partnership, complementary interests exist even where the outcomes by each individual may differ. Indeed, successful partnerships operate in such a way as to serve convergent interests but, at the same

time, they produce quite distinct and separate artistic outcomes. It was clear that developing a partnership, as distinct from having an assistant relationship was a significant factor in the success of the collaboration between artists and technologist. Therefore, the issue of *how* to collaborate was a very important one. To be successful over time, creative partnerships need an environment that supports co–creativity. This involves much more than a choice of which technologies and technical skills are needed, vital though that remains. Fostering co–creativity through sustainable partnerships is a key requirement for successful developments in interactive digital art.

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## Biography

**Linda Candy**

Creativity & Cognition Research Studios
Department of Computer Science
Loughborough University, UK

Linda@lindacandy.org.uk
Web: http://www.lindacandy.org.uk

Linda Candy is a Senior Research Fellow in the Department of Computer Science at Loughborough University, UK. She has a first degree in English and French, a Masters degree in computer-aided learning and a doctorate in Computer Science. She is currently research manager and investigator for the COSTART project 'Studies of Computer Support for Creative Work: Artists and Technologists in Collaboration'. Her main research areas are creativity, interaction design, interactive digital art and usability evaluation. She has conducted many studies of creative people and has published widely in this area. She is a member of a number of international conference programme committees and is co-chair of the international symposia on Creativity and Cognition and the Strategic Knowledge and Concept Formation workshop series. She has been invited to present her work in Europe, Japan, Australia and the USA.