The life of the *Mimetic Starfish*, 2000-2012

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Abstract

This paper is written from the perspective of the artist, programmer and exhibitor of the *Mimetic Starfish*, a gestural responsive A-Life artwork first created for the Millennium Dome in 2000 and recently exhibited at the Emacao Art.ficial in Brazil 2012. The author concludes with the suggestion that despite the advances in technology and the ubiquitous presence of touch and gestural interfaces, it is the underlying aesthetic and socially engaging qualities of the *Mimetic Starfish* that ensure its currency, presence, relevance and continuing exhibition.

Keywords

Mimetic, art, emergence, gesture, real-time

The Millennium Dome (2000)

The *Mimetic Starfish* (originally entitled *The Neural Net Starfish*, figure 1) was created in 1999 as a commission for the Millennium Dome a showcase that set out to awe and inspire the general public in the spirit of the Great Exhibition, London, 1851. The Millennium Dome consisted of a number of themed zones and the *Neural Net Starfish* was exhibited in the *Mind Zone* designed by Zaha Hadid where it received a glowing review from the Times:

> "The Mind Zone does contain the best bit of the entire dome: The Neural Net Starfish.
> A-larger-than-life, gold, 3-D starfish has been somehow incorporated into a marble table top.
> It is incredibly lifelike and responds to human contact by retracting disdainfully or stretching out a tentacle in friendship when a hand approaches"
>
> The Times, Saturday, 8th January, 2000.

Figure 1: *Neural Net Starfish*, Millennium Dome 2000 (Image courtesy of Cohen Wolf)

The installation ran constantly without fail for a year, it was interacted with by many thousands of visitors and created a sense of magic, mystery and awe in people of all ages and walks of life.

At the end of the exhibition evidence of engagement and intense interactivity was clearly visible on the aluminium projection surface which in parts had been physically worn away as a result of people stroking the limbs of the virtual starfish!

Behind the projection, software written in C++ simulates the 3D properties of muscles, skin and a neural net to create an organic form with life-like behaviour. A hidden infra-red camera detects the visitor's hands, which the virtual starfish reacts to, if they move slowly a tentacle reaches out towards their hand, if they move too quickly it jumps back as if startled. Stroking the skin of the virtual starfish triggers the firing of artificial neurons, producing undulations, quivers and pulses of colours.

The inspiration for the movement and behaviour of the *Neural Net Starfish* arose from a childhood experience observing the stalk-like eye of a snail suddenly retracting when surprised.

Alembic, *Biotica* and Art as a Mode of Enquiry (1995-2000)

In 1995 I was a Research Fellow in Computer Related Design at the Royal College of Art where I used "Art as a Mode of Enquiry" as a research methodology to challenge the conventional paradigms associated with human computer interaction and real time 3D visualisation. The outcome of this research was *Alembic*, an alchemical "Virtual Unreality" installation that used the medium of Virtual Reality (VR) to create a multi-user un-encumbered interactive experience of dynamic form (figure 3).

Alembic used a real-time dynamic particle model to simulate the states of physical matter in relationship to energy changes. Sensing was achieved using the "MIT Fish" – a four channel Theremin-like device. Under a rubber mat around a circular central projection area, a layer of foil produced a transmission signal, participants walking on the mat literally became mobile transmitters. Four aerials at the corners of the work corresponding to the four elements air, earth, fire and water sensed the proximity of participants and altered the temperature of the virtual *Alembic*. In addition, by moving nearer or further from the projection, viewers could exert a force on the simulated matter and affect its form. Filtered white noise, suggesting the changing temperatures, produced auditory feedback as participants moved near each aerial. In order to complete the immersive quality of the work, 3D "Chromadepth" glasses were worn by participants producing the illusion of a spherical ball of matter cutting through the gallery floor.

Figure 2: *Alembic*, 1997 (Photograph by Douglas Cape)

Alembic (figure 2) was first exhibited at the Bonington Gallery, Nottingham in 1997, and subsequently at ISEA97 and the ICA in London. After *Alembic* I commenced the *Biotica* research project[1]. Setting out to harness the power of emergence to create a primitive soup from which we hoped Artificial Life creatures would spontaneously emerge. Sadly this did not happen and we had to physically engineer the construction of the cellular creatures. This was achieved using a finite state automata language which acted as a form of digital DNA, defining the growth, characteristics and physical form of the cellular A-Life organisms.

Although we did not manage to harness the power of emergence to produce A-Life organisms, we were surprised by a different type of emergence, that of group behavioural emergence – unpredicted organisational emergence from the complex interaction of the cellular neural net creatures, swarming, chasing, rhythmic dances and pattern formations (figure 3).

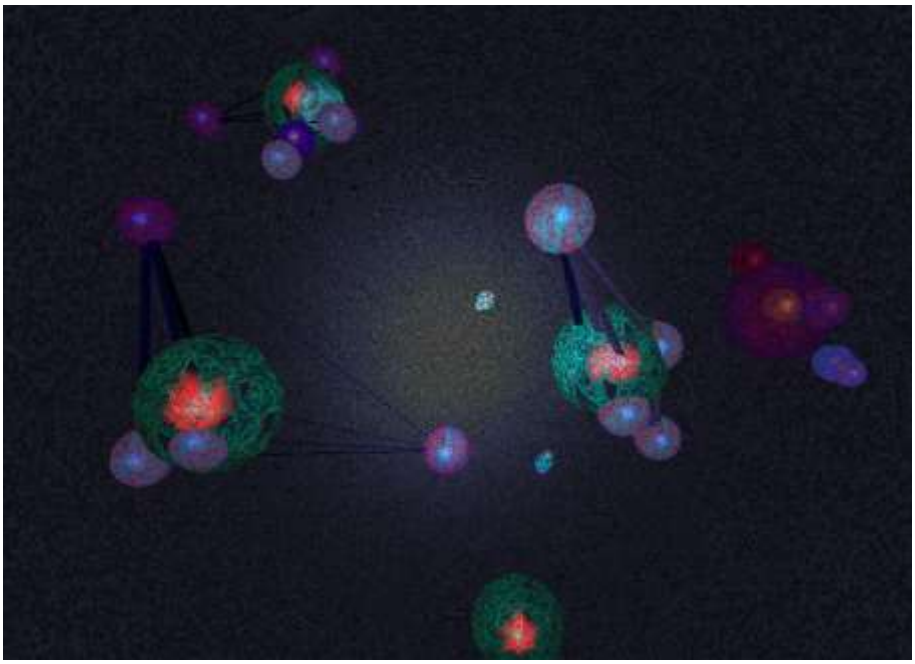

Figure 3: *Biotica* Screenshot: A-Life creatures

The underlying structures of the *Biotica* creatures shared similarities with the construction of the *Mimetic Starfish*, forms were constructed from single celled units called *Bions*, connected together via artificial muscles, skin and neurons to create multi-celled creatures. With *Biotica* the world was populated by simple cellular creatures which "evolved" over time from two-celled creatures into more complex multicellular creatures. These then were free to move around in the *Biotica* space, reacting to each other's presence through neuron signalling, which then produced the complex emergent behaviour.

[1] Biotica was a collaboration between the author, Professor Igor Aleksander from Imperial College London, co-programmer and researchers Gavin Bailey and Jonathan Mackenzie.

The *Biotica* installation encapsulated our research in an attempt to engage with the public, where using their arms one person at a time would navigate in a virtual 3D world of *Biotica* creatures (figure 4). The proximity sensing system we used was a development of the MIT Fish device first used in *Alembic*.

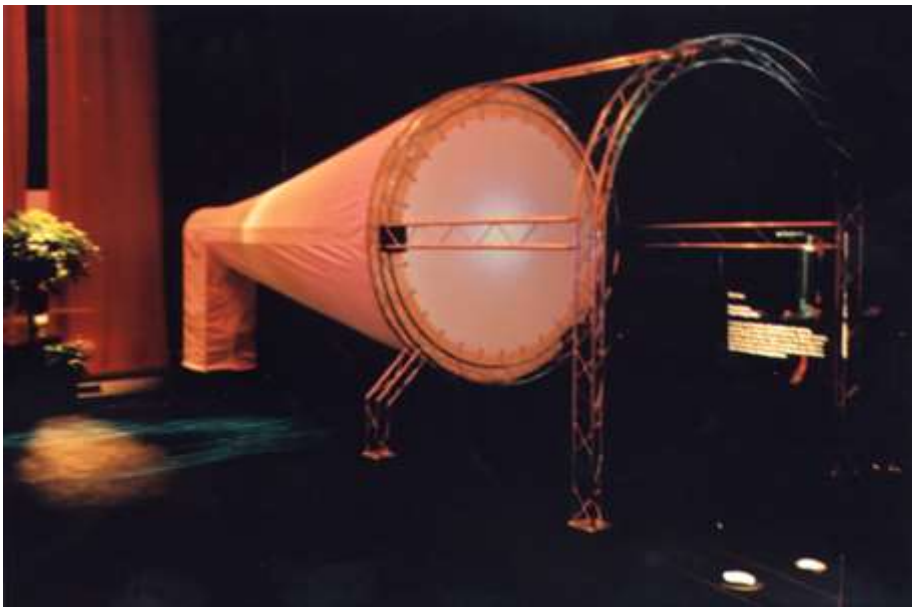

Figure 4: *Biotica* Installation: Siggraph 2000

My original intention was that *Biotica* would provoke the question "What is it for something to be thought of as alive?", but *Biotica* did not work as a successful engaging installation. People found the navigational interface too difficult to use and the visual aspect of the work was perhaps too abstract to engage with its audience.

At the end of the two year project a critical appraisal examining *Biotica* and its relationship to art, emergence and A-life was published in the form of a book [1].

Biotica though not entirely successful, laid the groundwork for the creation of the *Mimetic Starfish*. The experience of creating a somewhat overtly abstracted and esoteric work, inspired me to create a work where the user and visual experience would be the total opposite of *Biotica* – accessible and obvious.

Emacao Art.ficial (2012)

When I was invited to exhibit the *Mimetic Starfish* at Emacao Art.ficial I was presented with the challenge of either porting the software to a present day Windows-based computer or finding an old computer to ship out to Brazil.

Technology has moved on since 1999 and rather than trying to rewrite the software, I chose to try and find an old computer to run the *Mimetic Starfish* which proved quite a challenge. The machine had to have the same specification of 3D graphics capability, processing speed and appropriate hardware interfaces to support the frame grabber and security dongle.

Figure 5: *Mimetic Starfish*, Emacao Art.ficial, Itau, Sao Paulo, Brazil 2012

It was a great pleasure witnessing the delight of the school children from Sao Paulo, they were enchanted by the *Mimetic Starfish*, despite their total familiarity with concept of a touch interface due to the ubiquitous prevalence of smartphones and *ipads* (figure 5).

When the *Neural Net Starfish* was originally shown in the Millennium Dome in 2000, such technology did not exist, and visitors would not quite believe that their hand gestures on a table top could produce a reaction from a six foot projected starfish! Despite the fact that gestural interface technologies are now commonplace, the *Mimetic Starfish* encourages both social and gestural interaction through its dynamic responsiveness and has an inherent organic aesthetic quality which continues to engage and evoke wonder even with today's modern *iphone* savvy audience. The fourteen year old *Mimetic Starfish* captured the imagination of its young audience, suggesting there is still life in Artificial Life art.

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References

[1] Brown, R. (2001) ***Biotica: Art, Emergence and Artificial Life****, by Richard Brown with Igor Aleksander, Johnathan Mackenzie and Joe Faith. Published by RCA March 2001.*
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