Uncanny Interaction:
A Digital Medium for Networked E.motion

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Séa.nce: *a networked glossalalia* is a collaborative project involving a sound artist, visual artist, and a remotely-located interaction designer. The aim of the collaboration was to make a multiuser live performance work for local and remote players, in a work that asked how it would look, sound, and feel to interact in a networked séance environment that channels the e.motional relays within the network (the dot in 'e.motion' emphasises the moving aspects). This paper focuses on lessons learned during the process of designing uncanny interactions, dealing with both the piece itself, the collaborative process which created it, and how each of these informs the other. In the case of *Séa.nce* the work itself is a creative collaboration, and the process of creating it is an e.motional network.

T his paper is a commentary on the development of the piece *Séa.nce*: *a networked glossalalia*[1] (hereafter referred to as *Séa.nce*). *Séa.nce* was created as a collaboration between artists Norie Neumark and Maria Miranda, based in Paris, and interaction designer Greg Turner, based in Sydney, assisted by creative collaboration specialist Alastair Weakley, also in Sydney. After two introductory meetings in November and December 2003 we worked on the whole project online (no telephones or face-to-face meetings), until the work was ready for installation in August 2004. This paper presents

a discussion of the rationale for and major design features of the *Séa.nce* interface, and our reflections on the process of networked creative collaboration.

Broadly, the structure of the paper is as follows: First, we provide a background to *Séa.nce*, so that the reader may become acquainted with the concepts, methodology and terminology we employ. Next, we describe the significant artistic, interactional and technological features that emerged during the development of the work. Thirdly, we describe our reflections on the collaborative process and the role that collaboration played in the development of the piece (and indeed vice-versa). This is followed by some notes to guide future development environments for interactive art, based on this and previous experiences.

Our reflections are based upon the following: The interaction with *Séa.nce* has been user-tested throughout its development, evaluated both according to Human–Computer Interaction (HCI) guidelines, where it is appropriate, and artistically, where it is not—as Höök et al. relate in their excellent paper (Höök, Sengers, & Andersson, 2003), creators of art systems have to distinguish between frustration that arises from bad design choices and frustration that comes from having a system that cannot be controlled. Our testing consisted of several informal tests of specific functionalities and one semi-formal test/rehearsal (Figure 1) in which seven participants (in Sydney) plus the two artists (in Paris) tried out the full range of functionality under observation (filming and event-logging), and gave (unstructured) feedback about the experience which informed our reflections here and later versions of the work. The work was launched on the ISEA2004 ferry.

Figure 1. A participant in the semiformal trial of Séa.nce. The right-hand monitor shows the video feed from the artists in Paris.

In writing this paper, we considered three different aspects of *Séa.nce*: the artistic aspect (e.g. the question to be explored), the interaction design aspect (e.g. the desired effect for the audience) and the technological aspect (e.g. implementation issues). These aspects are so highly interrelated that their descriptions in such interdisciplinary research are prone to confusion, both for authors and readers, and so we have mapped out a tentative structure for framing such descriptions, evidence of which is retained as an aid to the reader: as we follow certain specific links between each aspect, we will indicate each change of focus with a kind of mock-ambient cue, the prefaces *A:*, *I:*, *T:*, or a combination of the three, for Artistic, Interactional and Technological aspects respectively.

1. The Perpetual Emotions Project

A: *Séa.nce* is part of an ongoing Internet project by Norie Neumark and Maria Miranda titled *The Perpetual Emotions Project*, which requires some discussion here as the locus and context for *Séa.nce. The Perpetual Emotions Project* began with a fascination with the *motion*, rather than sentimental, side of emotion, hence the term 'e.motion'. Emotion in this sense may be understood as feelings that move bodies. Miranda and Neumark's aproach to emotion or e.motions has been to stress the kinetic aspect—e.motions as motion, jumping for joy etc., and, importantly, that this motion of emotion is not just within individual bodies but also *relays* between bodies and machines[2].

In thinking about emotion, one of the things tha Neumark and Miranda explore is the issue of *instrumentality*. Their aim has been to work with emotion to question instrumentality as a social and cultural value and in particular to explore how emotion can work in art in perturbing ways rather than as 'added value'. In order to counter the rationalistic and utilitarian thrust of post-industrial digital culture, which is turning the Internet into what Critical Art Ensemble call a 'profit machine', they adopted an artistic strategy of working with the messy and noisy aspects of emotions in *The Perpetual Emotions Project.* In making *The Perpetual Emotions Project,* Miranda and Neumark were also interested in blurring boundaries, such as between metaphor/literal, science/fiction, or rational/irrational. They do this by making a 'fictive' work, which establishes a research institute, *The Institute for the Study of Perpetual E.motions* (Neumark & Miranda, 2003) (hereafter referred to as the *Institute*).,The *Institute*, under the direction of Doktor Rumor (a.k.a. Norie Neumark) and Professore Rumore (a.k.a. Maria Miranda)—renowned Australian rumourologists—is presented as the leading international centre for the science of emotionography.

Miranda and Neumark considered the fictive mode particularly suitable for the Internet, because the Internet has been since its inception the

locus of significant fictional and hoax works. It is important, however, that the 'fictive' plays with this approach in a particular way that is neither a hoax nor strictly fictional. While this is not the place to rehearse details of the fictive, we will outline its history and relevance. The ficitve as a concept is borrowed from the literary theorist Wolfgang Iser. In brief, in his book *The Fictive and the Imaginary* (Iser, 1993), Iser outlines a theory where fiction and reality are no longer binary opposites. Instead he posits a triadic relationship to understand the fictionalising act, which can be thought of as 'the real, the fictive, and the imaginary.' Quoting from Iser "…the fictive becomes an act of boundary-crossing which, nonetheless, keeps in view what has been over-stepped."

Iser's 'fictive' was a first step in a new media art strategy which involves the interactor in a boundary-crossing way. This was useful for thinking about how to involve interactors in making the 'fictive' rather than in consuming a predetermined and given fiction or being objects of a hoax. Another inspiration for the approach to their work has been the 'pataphysics of Alfred Jarry (the single apostrophe is intentional). Again, space permits only a brief discussion of the well-known work of Jarry, a French writer who did most of his work in the last decade of the 19th century. His neologism 'pataphysics was a play on metaphysics, the science of being and ontology. In *Exploits and Opinions of Doctor Faustroll, 'Pataphysician: A Neo-Scientific Novel* Jarry defines his 'pataphysics as:

> … the science of imaginary solutions and … above all, the science of the particular, despite the common opinion that the only science is that of the general. 'Pataphysics will examine the laws governing exceptions, and will explain the universe supplementary to this one. (Jarry, 1980, p. 192)

In his monograph *'Pataphysics: the Poetics of an Imaginary Science* (Bök, 2002), Christian Bök suggests the importance of 'pataphysics both for postmodernism in general and for the relations between science and poetry. What he notes about poetry can inform an understanding of how 'pataphysics opens new ways of understanding the relations between science and culture in a broader sense too. 'Pataphysics "rules out the rule", as Bök explains, and revels in the fragmentary, the exception and the anomalous. (This discussion of the fictive and 'pataphysical is elaborated in Miranda (2003).) This is particularly relevant to a work like *The Perpetual Emotions Project* which sets up an imaginary or 'fictive' scientific institute in order to offer comment on the cultural effects of contemporary science (in particular, neuroscience). 'Pataphysics sits beside science, playing with and against its truth.

Artistically, *The Perpetual Emotions Project* began with a series of small 'machines' known as e.motion machines. Initially they worked aesthetically and conceptually with the machines of Etienne-Jules Marey. Marey was famous for his late 19th-century motion studies, machinic inventions, and now for the role of his machines in the history of cinema. *The Perpetual Emotion Project* plays with Marey's *machines* in order to re-map the e.motions that were left out of his original motion studies. In the beginning, the *Institute*'s urge was to find new e.motions emerging in digital culture as people merged with their machines. It did this by interviewing subjects about incidents in relations with machines and then putting their material through its specially-constructed Marey Machines. The interest in Marey is serious and ironic—what better time to revisit his work, predicated on measurement of motion and located in a pre-Freudian moment, than the present, when measurement still/again predominates the study of e.motion in this post-Freudian climate?

As the project developed, the *Institute* became more interested in developing 'pataphysical theories of emotions. For instance, e.motions

are mathematically 'modelled' using String Theory, which posits that on a subatomic level matter and force are vibrational strings. Within the conceits of the Institute, this model makes audible and visible previously unnoticed e.motions, which are at a lower level of complexity and are different from familiar emotions, which operate at a higher level of complexity.

2. The Origins of Séa.nce

Séa.nce arose as an initiative of the *Institute* which explores the artistic and 'pataphysical potential offered by e.motionography in the context of a network of people participating in a séance. The focus of this exploration is on the e.motionographic products of collective e.motion. In keeping with the Internet residence of the *Institute*, the séance takes place in a networked environment, in which the audience is not necessarily physically co-located.

A/I: Through a system which relays the collectivised[3] motion of the players"[4] avatars (a single avatar appears near 'C' in Figure 2), the planchette (the ouija board's pointer or puck—the shape over 'Q' in Figure 2) is moved around the board from letter to letter. When the planchette lands on a letter it responds with the sounds of the spoken alphabets selected, according to the e.motionographic results of the player's e.motions, from over twenty languages. This selection 'audiolises' the networked emotions of the players. At the same time players type their interpretations, comments, feelings, thoughts and ideas into the message box creating a corresponding textual cacophony.

Figure 2. The *Séa.nce* interface during development.

While playful, *Séa.nce* is not strictly gameplay. Artistically, it is an exploration into issues of non-control and non-instrumentality. Our aim is not to have a 'game' environment with rigid rules and control, but rather to have people play in an environment where they become part of the event. In a way, players are in a networked space which is both controlled and uncontrollable; both individual and collective. These coexisting oppositions are suggested by the term 'uncanny', and our task as designers and performers is to help people to get into that space.

T: From the early discussion (the two 'real life' meetings), it became clear that, since the involvement of players over the Internet was a key component of the performance, we were limited by what hardware (and to a lesser extent software) might be available to remotely-located players, specifically by the use of mouse/trackpad (or unconventional

use of keyboard) to convey e.motions. We used Macromedia Flash to implement the interface (see Figure 2 for an image of the interface during development), the rationale for which we will explore in the discussion towards the end. To arbitrate the network communication, we commissioned a specially built communications server running in PHP, which was much cheaper to develop and more flexible than Macromedia's own Flash Communication Server (more of this also in the later discussion). The software-side analysis and performance controls are located in specially-built versions of the interface, for the performers to use. We used off-the-shelf software to manage the video streaming from the live performance.

A/I: The artistic vision of *Séa.nce* presents the artist and interaction designer with several important questions: How can we create an interactive environment where local and remote players communicate in a séance mode? What would it look like, sound like and feel like to produce motion and sound from e.motion that is relaying in the network? More specifically, how do we work with the kinetic motion of e.motion to move the planchette and produce the sound? Our approach to addressing these questions is covered in the next two sections.

3. Engendering Networked E.motion

The production and measurement of networked e.motion requires an interface which encourages collective action and which is sensitive enough to measure it. From the interaction design perspective, several techniques were used to encourage such interaction, and a description of these follows:

Firstly, we extend the system beyond the computer and as far as possible into the physical environment, in order to create a suitable atmosphere in which Doktor Rumor and Professore Rumore can lead the séance. At the physical location of the performance, we hold the event at midnight with dimmed lighting, burn incense and so on, and ask

remote networked participants to do the same where appropriate. The interface takes over the computer, minimising the potential for distraction from other processes. To complete the effect, interface elements are brought out into the real world, with fortune cookies containing guidance and advice.

Secondly, an important part of the séance interface was that it should not work via conventional controlled interactivity and should indeed trouble such interaction. This is a difficult balancing act to achieve, because too much enforced blurring of controlled perceptions and actions within the interface may trigger feelings of frustration or anxiety and a rejection of the process, rather like trying to hypnotise an unwilling subject. Although it is not possible to get all audience members to enter the fictive space and interact in a new way (without pre-selecting for suitability, which is something we are not ready to do at this stage), the interaction techniques we employed were designed to assist those who wished to do so. Foremost amongst these was to make the avatars all look and behave the same—what starts as a mildly humorous surprise after login soon becomes an important property of the collective interaction as the conventional player/avatar relationship is troubled and the boundaries of individual identity are blurred in the interface.

I/T: In order to reduce the perceptual impact of making sudden movements, we smoothed out the position data for each player's avatar, interpolating between each avatar's current position and its destination as indicated by the true motion. **T:** This approach additionally addressed the problem that, due to the way the avatars' messages propagate over the network means that to display the raw position data would result in a jerky updating of positions and it would be easy for a player to distinguish his or her avatar from others by the others' lack of flowing movement. To combat this, we smoothed out the position data for each network avatar in the same way. (It is worth noting that the smoothing

of motion does not affect the e.motionographic analysis, which happens on unaltered data, so that sudden movements are appropriately analysed, but simply not rewarded in the interface.)

I: The avatar behaviour was rounded off by stipulating that no clicking of the mouse or trackpad buttons should ever be needed during the séance phase (in fact, no clicking is required at any stage after login, except for information request buttons).

In an effort to diffuse frustration built up by lack of individual control, players are tasked with a series of warm-up exercises, designed to get the player used to the way the interface works, to bond collectively with other players, and to relax and "go with the flow". Figure 3 shows some examples, and Figure 4 shows players carrying out one of the exercises.

Visualization Exercise
Please hold up your index finger at a 45˚ angle. For participants online please point towards the Baltic Sea. Close your eyes. Visualise the emotional power of your avatar. Picture it moving around the board giving you the answers that you seek.

Breathing Exercise
Next is the Remembering to Breathe exercise. Breathe in slowly through the nose, then out slowly through the mouth while trying to keep your mind blank. Repeat this 3 times. The goal is to get calm and in touch with your emotions. This will help you accept that there is no individual control in the network.

Wiggle exercise
Please wiggle your avatar and then practice approaching the planchette but not touching it. The Planchette is the small green ovaloid shape in the middle of the larger black oval Board. It's looking at you. This will help you get in touch with your avatar. If at some time you lose connection, you can repeat this wiggling.

Noses Exercise
Touch the nose of a nearby avatar. Feel the emotional relay. You may feel more intensity with some players than others. Don't worry, this is considered normal. This will also help you understand the networked e.motions of and through your avatar.

Figure 3. Examples of warm-up exercises

Figure 4. Players warming up for the seance.

Another important device to compensate for lack of individual control was to engage players in collective dialogue through the message box. This was a place to replace individual game type control with collective textual play. Here are some reactions from the players to their avatars during the first performance at ISEA2004. The excerpts provide an example of how this worked both as a way to 'discuss' the uncanny interface as well as to create it through their engagement (the numbers identify the player):

8	My avatar is an arrow. Will it fade?
14	which one is me?
5	that's funny - my avatar is an arrow too!!
8	Is everyone's avatar an arrow?
	…
14	my arrow is cooler than yours
11	I am not here
	…
8	My arrows are very elegant
	…

10	Cool! I found my arrow, but I propably lost it again :-)
	…
5	my arrow is calm
3	mine is pointy
4	can I have my avatar back
6	my arrow points in wonder

We are pleased to note comments indicating some success in our efforts: players appeared to equate the avatar with themselves ("which one is me?") and with emotions ("calm"; "in wonder"), and exhibited a disturbed sense of individuality ("I am not here"; "can I have my avatar back"). This suggests a successful troubling of the relationship with the avatar too, which time does not allow us to discuss further in this paper. The intense engagement with the message box also indicates the success of the strategy of involving interactors in making the fictive rather than just playing out a pregiven fiction. It is worth noting that this sense of the potential of the message box developed during the process of collaborating on the work, as discussed below.

4. Perceiving Networked E.motion

Having provided the environment in which to stimulate the production of e.motion, we were faced with several tasks. First, we had to find ways of detecting e.motion using the limited hardware we had at our disposal. Then we had to transform the collection of data so it could be analysed, both by software (in determining the movements of the planchette and the sounds to be played), and by the players themselves in their interpretation of the planchette's movement and the sounds.

The inseparable production/detection/analysis (or 'perception') of e.motional messages is constituted within a cycle of stimuli (instructions and performance events) from the performers, and counter-stimuli (question-asking, planchette moving, answer-receiving, interpretation)

from the players and the software itself. After the warm-up exercises, a "spirit guide" is introduced, who acts as a commentator on the proceedings and a mediator of the questions asked to the board. The players are asked by Doktor Rumor if they have any questions for the board, and can type in suggestions. The Doktor selects one of these questions and the e.motional relay begins.

A/I: *Séa.nce*'s input is made to be as sensitive as possible, given the technological limitations imposed by the mouse or trackpad and conventional operating system handling of pointing device (for instance, it is not generally possible to move the mouse beyond the screen boundaries) so that the system can elicit the maximum amount of data about the players' networked e.motion. The data needs to be aggregated and processed in order to be usefully analysed, both positively by the séance planchette (by 'positively' we mean analysis of that which is *posit*ed by the data), and interpretively by the players themselves (by 'interpretive' we mean a culturally-derived analysis of the data)[5].

An interesting way of looking at how this aggregation has come about in *Séa.nce* is by looking at it as a 'pataphysical effect of incorporating the 'séance' paradigm into an 'interactive system' paradigm, and the prominence of the term 'medium' in each of these. The séance-derived meaning of 'medium' (with plural 'mediums') describes a clairvoyant (literally 'clear-seeing'), who is thought to have the power to communicate with the spirits of the dead or with agents of another dimension. The second meaning, more usual in interactive systems (with plural 'media') is a means of communication, or a framework through which something else is conveyed.

In the way that we have combined them, these media/mediums become not so distinct. Broadly speaking, we could say that the culture-medium in *Séa.nce* can be found in the use of the body and physical interface

devices of the players to make and interpret gestures, whereas the clairvoyant-medium is found in the software's own collection/collation and interpretation of these gestures. However, by mutually interpreting, and thus influencing, each other, these 'medium' processes oscillate and *resonate* with each other to give rise not only to amplification, which is how e.motionographic representations can become apparent to recognise, but also to feedback loops, which can influence the construction of new meanings of *Séa.nce* results by the audience— medium becomes glossalalia.

T/A: The manner in which this interplay between, and consequent aggregation of, analyses and influences takes place is the most difficult aspect of *Séa.nce* to get right. Specifically, we spent most time on the way in which the avatar data are aggregated and how both the planchette and the subsequent sound react uncannily to that aggregation, and on modifying the performance to better inform the players about the space in which the interplay takes place.

Numerous techniques suggested themselves: we started with a realistic physical model of a séance, where the avatars represent force vectors, and the planchette (the pointer of the ouija board, remember) moves and rotates on a frictional surface according to the sum of these forces. The idea was that by summing several small forces we could produce an uncannily large force, in much the same way as a physical ouija board is (according to the skeptics!) supposed to work. Initial user testing showed, however, that this model was very difficult to control without hours of practice, because the haptic control and feedback afforded humans in a real-life séance is sorely lacking in this online simulation. Had the players used a physical ouija board with electronic position sensing (or even haptic devices over the network) as input, this model would have worked marvellously.

This was initially replaced by a simple averaging algorithm. The planchette moved to the average position of nearby avatars. This was much easier to control, but hence completely lost any feeling of uncanniness—the planchette was manifestly following the avatars, not the other way round.

The next method we tried, and the beginnings of the one that *Séa.nce* currently uses, was to have the planchette point in the average direction of nearby avatars (which was later refined to having the planchette point in the average of the directions indicated by the *letters which the avatars pointed to*). This prompted a redesign of the board to be ovular (it was originally rectangular), so that the planchette had a more evenly-distributed range of letters to which it could next move. In further informal tests, this was found to *sometimes* produce the uncanny effect (later described as the "fun" movements by one of the testers). Quite often, these movements were inhibited by avatars which hadn't moved since the last planchette decision, so were guiding the planchette to the same or a nearby letter. We addressed this by introducing "e.motional energy" for each avatar—the less an avatar is moved, the lower its energy becomes, and the lower its influence on the planchette (this is why the avatars go transparent when left still).

I/T: Having settled upon the fundamental *modus operandi* for the planchette, the remaining refinements consisted mainly of determining precisely under what e.motionographic circumstances this uncanny movement should be produced. The main factors are: the proportion of avatars that need to be influencing the planchette, how much their direction agreed, what their e.motional energy should be, how that compared with the energy of the non-influencing avatars, and what counts as influence anyway. These factors, derivatives and others also inform the generation of the sound for the planchette's decision. The sound is composed of the nth letter (n is indicated by an animation of a number near the letter) of each of a selection of recorded alphabets

from different languages[6], played at different times, rates and auditory positions, and is distributed amongst players' computers (except for remotely-connected players, who receive a stereo equivalent). The performance script was modified to support the behaviour of these factors.

The way the factors behaved and the nature of the performance were significantly informed by our user reports. The most interesting example of a significant change arose from a confluence of factors that became clear through the user testing and feedback. Firstly, a problem with the planchette movement meant that it tended to get stuck between two letters. This disrupted the 'uncanny' feeling and meant that participants were encouraged to make conscious actions:

> "I enjoyed that it seemed to have its own life... it made me think I wasn't supposed to play an active role in the decision making... but then when the words seemed to come out as neighbouring letters, I thought it would be more interesting to send it onto the other side of the board or try and actually make a word, and then I wanted to influence it and didn't feel that I could."—Trial participant.

Secondly, both performers and players found that, by the time the board had given its answer, it was hard to remember the question. Thirdly, some participants commented that the visual display of the answer, the literal letters, was not as rich or ripe for interpretation as the sound. To deal with all of these, we decided that (as well as fixing the problem that got the planchette stuck), we modified the control panel to allow highlighting of a question, which was then displayed in the box below the board, which had hitherto been used to show the answers.

I/A: After each question-séance-answer-interpretation pattern, the cycle is repeated until the end of the performance.

5. Networked Creative Collaboration—inside and outside of *Séa.nce*

It was interesting for all parties to be involved in an entirely online collaborative development—the total face-to-face meeting time before installation on the final hardware was 2 hours of preliminary meetings, followed by 12 hours of work before the first performance at ISEA2004 (where co-location is mostly a necessity).

One might think that we relied on the next-best thing to face-to-face interaction, such as videoconferencing or telephone calls, but we found these completely unnecessary except for at the performance trial. We used email, FTP (for transferring files) and *Séa.nce* itself as our sole means of communication. (One exception: we used iChat once, before the messaging function of *Séa.nce* was finished).

However, we do not feel that the development process was stunted by this lack of face-to-face interaction. On the contrary, the very nature of the medium we are working with (namely networked interactive systems) means that we can collaborate *through* manipulating that medium, much as sculptors may collaborate through manipulating clay (or from the technologist's perspective, much as open-source programmers may collaborate through manipulating code). We found that using the medium as the medium for collaboration on the medium calls for a certain discipline, but also that we quickly evolved a certain shared tacit knowledge—just by studying each others' interactions with the embryonic piece we were able to get a sense of each others' concerns with it and thus react accordingly. This tacit awareness could not have been gained from interacting via another medium.

Interestingly enough, we realised that not only are we collaborating through the medium we are shaping, but also that the collaborative process itself shapes of the medium. So we are able to exploit the

conveyance of tacit knowledge in the *Séa.nce* performance—we have designed the interface so that players are able to gauge the other players' involvements with the interface and react accordingly, in much the same way as we collaborators have done during development. As mentioned above, one place this happened for us was as we used the message box to communicate while séa.ncing, as a form of collaboration, and, in so doing, realised its rich artistic and interactive potential.

A short word on the role of email in our collaboration: email fulfils one particularly useful function that *Séa.nce* as a work hasn't needed to—off-line working. So, for example, collaborators in Sydney could, one evening, email a set of questions and thoughts to collaborators in Paris, and arrive the next morning to find responses and updates, and vice-versa. This, combined with the several shared waking hours that the time-difference affords us which can be used for higher-frequency-yet-still-no-need-for-realtime communication, meant that there was pleasantly little waiting around for the other party to formulate a response.

Both *Séa.nce* and email provide us with logs of transactions for later referral and analysis.

6. Meta/Further work

A/I/T: The development of *Séa.nce*, particularly when considered against the background of Interactive Art in general, raises several important issues for the requirements that artists have of technology, and the ease with which those requirements can be fulfilled.

Specifically, digital artists are responsible for many of the most exciting advances in human-computer interaction today, precisely because they are not exclusively technologists, who "are often taken by surprise to find that their world can be looked at in unfamiliar terms" (Candy &

Edmonds, 2002, p. 32). The main barrier to achieving such an advancement of technology is the lack of understanding, control, and consequent perceived power over current technology by many artists (and other people).

Earlier work (Turner & Edmonds, 2003) has identified several potentially-useful features that are important to provide a powerful environment for the creation of interactive art. Some examples are: to provide visualisation of the computer and the 'program' (although the program may not look like what we conventionally perceive programs to be); to have no particular distinction between using the computer and programming it; that the environment should allow its own modification (which, when taken with the previous tenet, means that the environment should be made in itself), and so on. None of these things are beyond the technology we have available today, and examples of each exist, but they have yet to be integrated. Macromedia Flash, one of the most widely-used techniques for making creative interactive systems, supports these principles not at all or in a very limited way, so why did we choose it for *Séa.nce*, and how might competing technologies be improved in future? How might Flash itself be improved to better support this kind of work?

Our rationale for the use of Flash was a combination of availability of the necessary tools, and ease of distribution. Flash creates high-quality vector graphics in realtime—its historic strength, and just what is required for this application. Additionally, it publishes to a single cross-platform file, the .swf, which contains *all* of the information for any Flash player to be able to run *Séa.nce*.

However, Flash relies on an uncomfortable union between conventional programming environments and conventional animation techniques as its (dual) interfaces, both of which are prone to hard-wired, yet technologically arbitrary limitations. Although the language *per se* was

not a problem for us, we repeatedly found ourselves confronting the built-in limitations of the Flash system (particularly with respect to video and batch processing), and had to devise ingenious workarounds, or work manually, to compensate, rather than being able to modify the way the system worked. Even after our attempts at compensating for the limitations, Flash's stamp on *Séa.nce* is evident.

It is doubtful whether we will see Flash, in the form that we know it, develop the kind of flexibility we envisage in any sort of general environment for building interactive art. Such a system would have to be created from the ground up, in itself, to allow the user to 'drill' back down as far as he or she wishes to make modifications. One promising contender is Squeak Smalltalk (Ingalls, Kaehler, Maloney, Wallace, & Kay, 1997), which was written in itself. *Séa.nce* could conceivably have been written in Squeak, but Squeak's conceptions of ease of use and understanding (and aesthetics!) still leave much to be desired, making it difficult for a non-technical artist to engage with the environment. Although its cross-platform distribution mechanism is at least on a par with that of Flash, the environment again presents a barrier to the non-technical user trying to run it.

T: It is appropriate at this point to briefly mention (plug!) the simple-to-use yet extremely capable networked collaboration server which was designed by Weakley and Turner. The server uses XML to communicate three main types of message: messages to one client, messages to all clients, and messages to all clients that indicate a state change (allowing new clients to quickly become up-to-date). In addition, the server can be distributed across many locations to better handle bottlenecks (the ISEA2004 boat had a satellite Internet connection) and can be set up relatively easily and flexibly (for example, only one server has to be able to accept incoming connections from the Internet—all others, running on LANs of clients, connect to this). It is not difficult to see how this server could be generalised to suit a whole range of collaborative systems, not

just e.motional networks or Flash interfaces, and this work is currently being undertaken. Our only complaint is that it is not (yet) end-user modifiable, but when such a generalised end-user environment exists, we are confident that networking of this type will become a part of it.

7. Conclusions

The anthropologist Lucy Suchman, in a commentary on affective interfaces (Suchman, 2002), contrasts two main types of emotional machine, those which attempt to simulate human emotion (which, argues Suchman, is a "fetishised humanness, stripped of its contingency, locatedness, historicity and particular embodiment") and those which evoke human emotion (an artwork she gives as an example is described as "an emblematically human encounter"). She concludes:

> "…affective encounters at the computer interface are those moments of moving complicity between persons and things achieved through particular, dynamic materialities and extended socialities."

Such e.motional encounters con be understood as arising *between* bodies and machines (Neumark, 2001). It became important when designing the system to work with this sense of e.motions that are not entities but motions that relay *between* actors. Phenomenologists would say that the setting into motion of, and perception of, e.motions is active, embodied and always generative of meaning—one cannot detect e.motions without at the same time analysing them, and conversely, e.motions are meaningless until they are detected. It is interesting to note here that this way of thinking about the motion of emotions also plays with and interrogates the compulsive twitch behaviour of some forms of gameplay and interactive behaviour.

The interactive artist David Rokeby investigates the social responsibilities carried by the creators of interactive systems (Rokeby,

1998), by looking at the long- and short-term effects that features of interfaces have on users' perceptions of the world. He writes:

> "The process of designing an interaction should also itself be interactive … we need to expand the terms of [an evaluative] feedback loop … to include an awareness of the impressions an interaction leaves on the user"

This describes well the approach we have taken in designing Séa.nce, but we have extended the concept to apply to collaborative design of collaborative systems. In this instance we have exploited uncanniness in order to relay and perceive e.motion. The more general challenge, then, is to find techniques for supporting the relay and perception of e.motions and other affective entities within digital systems. These techniques can be used by creators of interactive systems to inform Rokeby's "experience of being" for the user/audience. We believe that the further exploration of creative collaboration with the network as medium could provide us with additional insights into the nature and role of affective entities in interaction.

8. Notes

[1] Briefly, glossalalia (or glossolalia) is meaningless and eruptive speech.

[2] By machines we are referring to objects—from tools to vehicles to media instruments—as well as Deleuzian (literal) assemblages of the organic and the mechanical.

[3] We use the term 'collectivisation' to refer to the process of drawing together independent, yet mutually co-influential data to form a unified collective.

[4] We use the term 'player' as opposed to 'audience member' to connote the playful nature of *Séa.nce*, and our desire for the individual to succumb to the networked e.motion within the environment.

[5] Within social research methodology, the opposition between positivist and non-positivist modes of analysis is indicative of the types of values

we wish to place on each mode: positivist analysis presents its findings as fact, or as close to fact as we may reach, whereas non-positivist or intepretivist analysis invites people to weigh the interpretation and judge its application. Both modes can stimulate emotional reaction from the players. For more on this opposition in a methodology context, and its relation to quantitative vs. qualitative approaches, see Crotty (1998).

[6] The sound palette is, depending on various parameters, composed of samples of the nth and p^{th} letter of alphabets, where p is a number above 26, to account for alphabets with more letters in than the English alphabet.

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