Talk to me: getting personal with interactive art

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Getting computers to respond in a more human-like manner is a significant area of research in the development of AI systems and chatbots that interact with humans using natural conversational language. In this paper I will explore the ways in which artists are using simulated human personas to interact with audiences. I will be discussing four key aspects of this interaction: the 'interactive moment' where the audience is engaged by and taken up in interaction with the technological 'other'; the 'Eliza effect' which describes the way humans attribute meaning to the content of the interaction; Masahiro Mori's allied but counter-pointing concept of the 'Uncanny Valley' which describes the sense of unease that can be generated by nearly human simulations; and, drawing on actor-network theory (ANT), the way these works activate and rely on a complex socio-technical networks incorporating the artist, the 'technology' and the audience. Artists discussed include: Luc Courchesne, Gary Hill, Sean Kerr, Julian Opie, Mari Velonaki, Linda Erceg, Ken Feingold, Stelarc.

1. Introduction

Derrick de Kerckhove, director of the McLuhan Program in Culture and Technology at the University of Toronto, sees a new relationship developing between people and machines.

> Today, we don't want our machines to obey us, we want them to respond, which is a part of this inversion of man/machine. (de Kerckhove 1991)

Getting computers to respond in a more human-like manner has become a major area of research in the development of AI systems and chatbots that interact with humans using natural conversational language. Humanoid

chatbots ('bots' for short) are computer software programs that are designed to 'converse' with humans. These bots may be purely textual like Joshua Weizenbaum's Eliza program or graphical like Raymond Kurzweill's virtual host Ramona or the virtual newsreader Ananova.

Figure 1 Ramona, www.kurzweilai.net

Figure 2 Ananova, www.ananova.com

With the incorporation of new digital technologies into the visual arts, we are seeing the advent of a distinctly new form of portraiture – the interactive portrait that 'talks back' and interacts with the audience challenging the traditional relationship between the active viewer as

subject and the art work as passive object to be gazed at and interrogated.

Computer technologies allow art to 'come to life', demonstrating life-like behaviours and sophisticated communication skills enabling art works to 'converse' with audiences. In this paper I will explore the ways in which artists are using simulated human personas to interact with audiences. I will be discussing four key aspects of this interaction: the 'interactive moment' where the audience is engaged by and taken up in interaction with the technological 'other'; the 'Eliza effect' which describes the way humans anthropomorphise non-human entities and attribute meaning to the content of their interactions; Masahiro Mori's allied but counter-pointing concept of the 'Uncanny Valley' which describes the sense of unease that can be generated by nearly human simulations and, finally drawing on actor-network theory (ANT), the way these works activate and rely on a complex socio-technical network incorporating the artist, the 'technology' and the audience.

2. The interactive moment

We are used to seeing human portraits in galleries but these are usually static images. We can look at them and interrogate them imaginatively, reading their expressions and speculating on the personality and identity behind the image but our interaction with them is essentially one-sided, they can't respond or talk back. Video art and video installations have already gone a long way in bringing the human figure to life in the gallery, animating the static portrait and creating new interactive experiences for audiences. Now this trend is being taken even further by interactive digital technologies which are enabling some interesting new possibilities for audience interaction and further challenging the ontological status of the art object. Because these new artworks are animated and responsive, they take on even more of the characteristics and behaviours associated with real living beings. These works occupy a liminal space between the animate and inanimate, between the living and the non-living. There is an ontological shift as the gallery object starts to display signs of emergent life and subjectivity.

There is a shock or frisson when eye contact is made with these, to use Haraway's phrase, 'disturbingly lively' artworks (1991). We are used to looking at images; we're not used to them looking back! We're used to talking about works of art but not having them talk about us or to us. In the interactive moment, these works interpellate us, calling out to us and positioning us in new ways. There is a strong voyeuristic characteristic inherent in the concept of the audience; as an audience member, you watch and listen, that's what an audience does. When the tables are turned, the audience is forced to enter into a new interactive relationship with the artwork. This can be a magical moment or a challenging confrontation depending on the style and content of the interaction.

Two seminal interactive video installations, Luc Courchesne's "Portrait One" (1990) and Gary Hill's "Tall Ships" (1992) are interesting precursors in this field exemplifying some of the ways in which the video portrait can engage audiences in a dynamic two-way interactive relationship reversing the traditional subject-object hierarchy between audience and artwork.

In "Portrait One", Luc Courchesne uses video footage of a real live actress to create a fictional interactive portrait of a young woman. In the gallery installation of the work, the image of the young woman is displayed on a video monitor and audiences converse with her by choosing from a series of predetermined conversational options displayed on the screen. The woman's audio responses are generated from a database of pre-recorded conversational fragments. Depending on your conversational choices, the young woman's responses are by turns friendly, coy and flirtatious or abrupt, uninterested and offended. Even though you know that the work is operated from a pre-recorded database, the eye contact, facial expressions and vocal inflexions of the woman create a surprisingly intimate bond. Many audience members stayed with the work for a long time trying out different conversational options to see what responses they would elicit. This was certainly a new experience for audiences drawing them into an intimate interactive conversational encounter with the artwork.

Figure 3 Luc Courchesne, "Portrait One", 1990.

Gary Hill's immersive video installation "Tall Ships" also uses pre-recorded video footage of human figures to directly engage with the audience although it is a very different interactive experience from that experienced in "Portrait One".
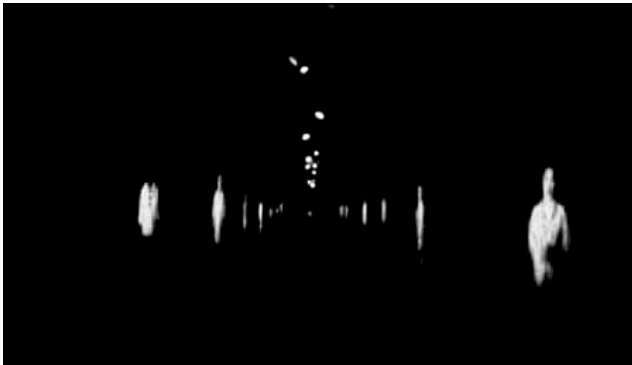

Figure 4 Gary Hill, "Tall Ships", 1992.

In "Tall Ships" the audience enters a long dark corridor lined by a series of pale figures waiting like ghostly ships in a harbour, their luminous white faces providing the only source of light. As you walk along the corridor, the figure that is nearest to you leaves the shadows and walks towards you until its black and white image stands life-size directly in front of you – the confrontation is mute but profoundly affecting. The haunting apparitions which include men, women and children appear to want to communicate, they hover uncertainly in front of you as if they are about to speak but then they turn away and recede back into the shadows taking their secrets with them.

Both of these works use video images of real human beings and draw much of their power from the emotional responses these human figures elicit from the audience. Audiences respond to the nuances of real human facial expressions, gestures and behaviours – it is not difficult to respond to the figures in these works as we would respond to a real human presence – after all, they are human. Can these same responses be generated by digitally created human personas? How photo-realistic and life-like does a simulated human persona need to be to successfully engage an audience and for the audience to treat it and respond to it in the same way they would a real human?

The answer is: perhaps not much! The human tendency to anthropomorphise non-human entities and attribute them with human characteristics and motivations means that humans seem to be quite happy to identify and empathise with a diverse range of non-human entities from cartoon characters like Bart Simpson to animated tropical fish in "Finding Nemo".

Similarly, interactive art works don't necessarily need to be photo-realistically human or to exhibit complex, realistic human behaviours to successfully engage audiences. Very simple responses or animations can be enough to bring the artwork alive and give it a sense of agency and subjectivity, disrupting the traditional subject-object hierarchy of audience and art object.

Even very simple cartoon-like animations can have a powerful effect. New Zealand artist Sean Kerr uses a very simple iconic representation in his interactive work "Bruce

(The Watcher)" (2003). Bruce takes his name from one of the voice presets in Apple Macintosh's simpletext program. Bruce is represented by a pair of large spherical cartoon-like eyes. The work incorporates video surveillance cameras which feed information to Bruce about the position of gallery visitors as they move around the gallery. As they move, Bruce's eyes follow them and their movements trigger one of a series of pre-recorded comments from Bruce's database. These comments are taken from previous comments in the gallery visitor book and the tables are neatly turned with the comments being fed back to the unwitting and startled audience member with apposite and frequently hilarious effect. Rather than the audience member commenting on the work, the work gets the chance to speak back directing its own critical comments to the gallery visitors. As you're walking across the room, Bruce may call out "You are always interesting and a bit challenging" or more critically, "You are ambitious but ultimately quite lame with a few notable exceptions." Or my personal favourite, "You are a treasure. Thank you."

Figure 5 Sean Kerr, "Bruce (The Watcher)", 2003.

Another example of the effectiveness of even the most minimal use of animation to bring an otherwise static artwork alive is Julian Opie's simple animated line drawing

portraits. At first glance the portraits appear to be static, lifeless images but as you keep looking at them, the figures in the portraits may suddenly blink, shake their head, smile or raise their eyebrows. It's over in a moment, making you wonder if it happened at all, and so of course you wait to see if it will happen again, it's a bit like that game of statues where you are trying to catch the static image moving. It is interesting that such a simple idea and animation can be so effective. A simple blinking suddenly brings the 'portrait' alive as you are looking at it, you also get the sense that it is looking back – who will blink first? Will you miss the blink because you are blinking at the same time? We read 'life' into the portrait because a few moving pixels simulate behaviour we associate with life. We are also caught up in the interactive moment, as the portrait we are looking at suddenly looks back and subject object viewing relations are reversed, we become the object, subject to the gaze of the portrait.

Figure 6 Julian Opie, "This is Fiona", 2001.

The next two examples of artists' work use much more realistic human representations, Mari Velonaki's "Unstill

Life" (2000) which uses digitised human images and Linda Erceg's "Skin Club" (2002) which uses computer generated humanoid models.
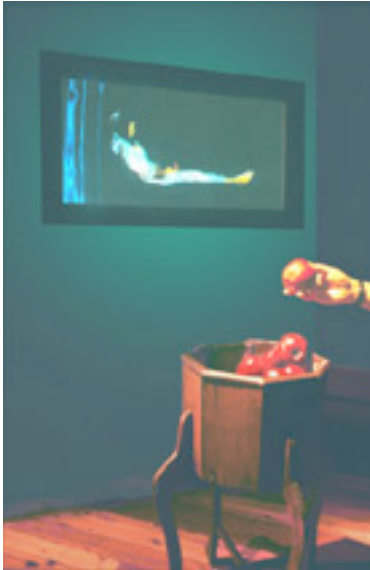

Figure 7 Mari Velonaki, "Unstill Life", 2000.

Mari Velonaki's "Unstill Life" (2000) also plays with the idea of the portrait coming to life and interacting with the audience. This digital portrait, housed in a conventional renaissance-style frame, shows a woman (the artist) reclining, seemingly asleep. In front of the portrait is a pedestal with a basket of apples on it. As you approach the portrait and reach toward the apples, the woman in the portrait 'wakes up' and looks directly at you. The experience and connection you feel with the woman is startling and surprisingly intimate. What does she want? She seems to want something as she looks expectantly, even beseechingly at you. If you pick up and start to eat an apple, the woman becomes more animated and excited. Who is she? What does she want? The work piques our curiosity and draws us into the interaction.

A far more confronting experience is generated in Linda Erceg's "Skin Club" (2002) which features naked,

computer-generated characters who regale the audience with intimate and disturbing stories of sexual encounters and experiences.

Figure 8 Linda Erceg, "Skin Club", 2002.

The work is an interactive installation triggered by motion sensors. As audience members enter the exhibition space they see a chair positioned in front of a giant screen on which one of a series of digital characters is projected. Sitting in the chair acts as the trigger for the waiting digital character to begin their story and the audience member then becomes an unwitting confidant held captive as the story unfolds in sordid detail in front of them. The different characters show varying levels of nervousness and aggression in their body language and facial expressions and in their direct comments to the audience, alternately entreating them to stay and listen to them or reprimanding them if they fidget or walk away from the viewing space. Erceg describes the stories her digital characters tell as "

> …hovering somewhere between the urban myths of our collective cultural imaginary and our most private desires and experiences. (Erceg, 2002)

The emotional intensity of the work is increased by the use of real human voices to relate the narratives.

The digital characters Erceg uses in "Skin Club" have been appropriated from online pornographic cultures where photo-realistic nude male and female models are traded in web communities and used in pornographic interactive on-line sex sites. In "Skin Club" these figures have been liberated and re-contextualised, they still carry the pornographic and voyeuristic traces of their origins but have also been empowered with a sense of agency and subjectivity. They talk back to their audiences and although their stories may be about sexual experiences, those experiences are uncomfortable and disturbing rather than titillating. Unlike the usual voyeuristic scenario typical of pornography where the audience remains hidden and unseen, in "Skin Club" the audience becomes as much an object of scrutiny as the digital character they are watching.

The use of a digitised human form in Velonaki's work and the combination of the computer generated humanoid forms and human voices in Erceg's work combine human and non-human qualities creating hybrid technological others that engage audiences in dynamic and compelling two-way interactive encounters. The next works I will discuss take this process a step further by incorporating artificial intelligence and chatbot technologies to create more open-ended conversational encounters where the technological other starts to exhibit an increased sense of agency and autonomy. These new human-like computer entities are starting to blur even further the line between the human and the non-human and raise important issues of emergent technological intelligence, agency and subjectivity.

3. The 'Eliza effect' and the 'Uncanny Valley'

With advances in artificial intelligence programming, digital animation and rendering, we are starting to encounter a new species of human-like entities that inhabit the cyberspace worlds of the Internet and virtual computer environments. As more and more of our communication is becoming mediated by computer technologies, these human-like entities such as autonomous agents, guides and avatars reflect the desire to further 'humanise' the human-computer interface and enable human users to

communicate with computers in much the same way as they would with another person.

Jeet Singh, co-founder and CEO of Art Technology Group (ATG), believes that the most important interactivity that computers will offer us in the future is not our interaction with the computer itself but interaction with other people through the computer,

> …in the long term, the most stimulating interactions will continue to be with human beings, and with human proxies. (Singh 1993)

However, as digital imaging technologies and artificial intelligence programming becomes more complex and sophisticated it may become very difficult to tell whether the human entity you are communicating with in a computer generated environment (whether via email, in a website or in a virtual community) is indeed human or is a humanoid AI or chatbot.

In her article "Human/Machine Reconsidered", sociologist of science and technology Lucy Suchman documents the discourse of the machine as an "acting and interacting other" and comments that

> … attributions of human-like machine agency seem alive as ever in both professional and popular discourse. The growth of the Internet in particular has brought with it a renewed interest in the idea of personified computational artefacts attributed with a capacity for intelligent, interactive behavior. The dominant form of this project today is the promotion of computational agents that will serve as a kind of personal representative or assistant to their human users. (Suchman 2003)

The Eliza effect is named after Eliza, one of the earliest and most famous artificial intelligence computer programs designed by Joshua Weizenbaum in 1966. The Eliza effect describes the human tendency to anthropomorphise technology and to read human-like meanings, motivations and even emotions into otherwise meaningless or value-free technological outputs and behaviours. Eliza was programmed to act as a virtual psychotherapist establishing a therapist-patient relationship with human users. Eliza responded to users' statements and questions by turning them around and rephrasing them into

questions directed back at the patient. The program operated using simple pattern recognition and a few linguistic tricks whereby key words used by the patient were inserted into stock phrases. For example, a question like "What is your favourite movie?" might be answered by responses such as "What about your own favourite movie?" or "Does that question interest you?" This meant that the computer program could operate on a relatively simple set of rules and parameters along with a few stock phrases such as 'Tell me about your mother' and didn't need a large database of real-world knowledge.

Although the Eliza computer program operated on arbitrary, pre-determined algorithms calling up particular phrases or responses, there are many accounts of people being emotionally drawn in by the seemingly perceptive responses of the program and even insisting on being left alone to talk to Eliza in private.

The software programs underlying more recent chatbots like ALICE (Artificial Linguistic Internet Computer Entity), created in 1995 by Dr. Richard Wallace, are far more sophisticated and complex than Eliza. They operate using AIML (artificial intelligence mark-up language) written in Java and rely on detailed and comprehensive databases that can generate creative, autonomous responses.

Get ALICE Silver Edition with talking VHost[tm]

Figure 9 ALICE from www.alicebot.org

These computer entities may also be virtual doctors, teachers and even friends. On the ALICE website

<http://www.alicebot.org> you can interact with a variety of these virtual humans, ALICE herself and also DAVE an E.S.L. bot you can practice your English with and CLAUDIO, a personality test bot, who will chat with you to assess your personality.

C.L.A.U.D.I.O. Personality Test Bot

Sample Dialog

Human: Can I take the personality test now?
Bot: *Just keep chatting with me.*
Human: okay, what does CLAUDIO stand for?
Bot: *Yeah okay, C.L.A.U.D.I.O. = Cybernetic Lifelike Android Used for Dialogue Interaction and Observation.*
Human: What is my personality type?

Figure 10 CLAUDIO from www.alicebot.org

These humanoid computer entities offer their human interlocutors the best of both worlds – a realistic human conversational encounter but one without the ethical responsibility and anxieties involved in actual human encounters where you have to consider the feelings of the person you are talking to and worry about what sort of impression you are making. You can say whatever you want and try out different conversational techniques without any lasting social repercussions.

ALICE and other chatbot programs compete for the Loebner Prize for the 'most human computer'. The Loebner Prize is based on the famous Turing Test named after Alan Turing which stipulates that if a person can't tell the difference between the textual responses given by a computer and a human, then the computer can be said to 'think' or demonstrate intelligence. Although many would dispute this as a true test for intelligence, many of the artificial intelligence programs or chatbots that populate virtual worlds on the Internet interact with humans in a

sufficiently convincing manner to pass as human, at least on a superficial level.

Once they have been created, autonomous agents and chatbots act on their own with apparent agency achieving their own identity and ersatz subjectivity. The interface plays a paramount role in these relationships between human and computer. It is through the interface that the human user and the computer system 'talk' to each other. The style of the interface determines how people communicate with computer entities and the types of relationships they develop with them. Most people who use computers do not fully understand computer systems and their operations; the computer is, essentially, a 'black box' technology. Paradoxically, it is this lack of transparency and lack of understanding of computer systems that allows human users to attribute psychological characteristics and motivations to computers and form complex psychological relationships with them particularly when the interface takes on a human 'face'.

The attribution of a human personality to computer entities means that people will also expect them to act like people and to understand like people. When humanoid entities don't react appropriately or don't understand things we would normally expect humans to understand, the illusion is shattered. When the Eliza effect breaks down in this way, the human interactor may experience a variety of emotions: a sense of incomprehension, frustration, embarrassment or resentment that they have been 'tricked' or even a sense of betrayal. The more extreme emotions like resentment or betrayal are perhaps more likely to be experienced in an online context where the human interactor has indeed assumed they are communicating with a real person. In a gallery context this element of deception is not usually a factor as it is obvious that we are dealing with a virtual, rather than a 'real' human. In this situation, there is either a willing suspension of disbelief as the audience member 'plays the game', treating the human entity as a person or, alternatively, the audience member might try to catch out and wilfully break the illusion.

The human desire to anthropomorphise non-human technological entities which we see played out in the Eliza effect is also counter-posed by a phenomenon described

by Japanese roboticist Masahiro Mori as the 'Uncanny Valley'. Mori arrived at his concept of the 'Uncanny Valley' while conducting psychological experiments where he measured human responses to robots displaying varying degrees of anthropomorphism. While robots that displayed partially human characteristics evoked strong positive, empathetic responses, these responses became more ambivalent as robots became more human-like, eventually turning to feelings of disquiet or even repulsion.
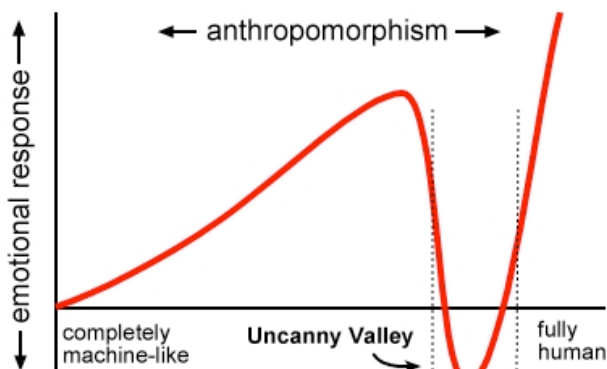

Figure 11 Masahiro Mori 's "The Uncanny Valley", image source: http://en.wikipedia.org/wiki/Uncanny_Valley

Although originally applied to robotics, the principle of the 'Uncanny Valley' can also be applied to computer-animated virtual characters. It appears that it is easier for humans to suspend their sense of disbelief when human-like characteristics are displayed in entities that are clearly non-human, for example, cartoon-like entities such as Bart Simpson and the virtual newsreader Ananova and robots like R2-D2 and C-3PO. If an entity is sufficiently non-human, it is the human-like characteristics that stand out and generate a sense of empathy. On the other hand, when robots and computer animated characters start to look 'almost human', it is the non-human characteristics that tend to stand out, we start to notice the not quite right facial expressions, the flat skin tone, the strangely lifeless eyes and the disjointed movements. These 'almost human' entities appear more like animated corpses or zombies evoking feelings of disquiet and a sense of the uncanny rather than positive feelings of empathy.

This tension between the human willingness to suspend a sense of disbelief through anthropomorphisation and the Eliza effect on the one hand and the more disturbing and alienating effects of the 'Uncanny Valley' on the other can be clearly seen in the work of U.S. artist Ken Feingold and Australian artist Stelarc who have both created animated realistic talking heads that can engage audiences in surprisingly sophisticated human like conversation.

Figure 12 Ken Feingold, "Head", 1999-2000.

U.S. artist Ken Feingold's "Head" (1999-2000) is a realistic three-dimensional animatronic head that sits on a small table in the gallery. It blinks its eyes and converses with people in the gallery in a quirky, idiosyncratic manner but it also has a disturbing and distinctly uncanny feel about it. It's a bit like an animated corpse or the supernaturally animated Chucky doll in the horror movie "Child's Play". The work uses commercial speech recognition software, IBM's 'Viavoice' Speech Development Kit (SDK) to process the text it receives from the audience and then uses natural language processing routines which Feingold calls ACE (Absurd Conversation Engine) to formulate a response which is sent as audio out to the

mouth controller circuitry and to the speakers and back to the audience. ACE is a descendant of the Eliza program and has a whimsical database using pattern matching algorithms. It is capable, among other surprising literary abilities, of producing rhyming and alliteration based on what it has heard. Feingold describes the head as having "moods" which can be triggered by certain words or phrases, much like people and these moods determine the nature and form of its responses.

Figure 13, Ken Feingold, "Head", 1999-2000.

A sample of the head's conversational responses sounds a bit like a cross between Weizenbaum's Eliza program and something out of "Waiting for Godot". Here is a sample of a conversation from Ken Feingold's website.

> Visitor: Hi
> Head: Hello
> V: How are you?
> H: I am so offended. I can't tell if everyone would prod her to the left or not.
> V: Who offended you?
> H: The delicious conditions delay disturbed daredevils.
> V: Which daredevils are disturbed?
> H: The bothersome one
> V: Which one is bothersome?

H: The absurd one
V: Who is absurd?
H: The unconscious
V: What is the unconscious?
H: It is something that makes me feel slow with groups.
(Source: http://www.kenfeingold.com/)

Stelarc's "Prosthetic Head" (2002) is another interactive 3D talking head, although in this case the head is a virtual projected image. Like Feingold's "Head" the work is a self-portrait, a more or less realistic visual representation of the artist. Scanned digital images of Stelarc's head and face were wrapped around a 3D digital mesh and animated by facial animation software so that the head can perform a variety head movements and facial expressions. The head speaks to audience members using real-time lip-synching speech synthesis. The conversation is generated by conversational agent software based on the alicebot software developed by Richard Wallace and has been customised with Stelarc's own biographical details.

Figure 14 Stelarc, "Prosthetic Head", 2002.

In the gallery installation, the head is projected in a darkened space and a keyboard is positioned on a plinth so you can type in questions to interact with it. As you enter

the gallery space the head usually has its eyes closed and is facing the entrance to the gallery space. As you approach the plinth, your presence is detected by an ultrasound sensor and the head 'wakes up' and looks at you. This is a somewhat spooky and confronting experience. It's a bit like a death-head that suddenly comes alive. The head initiates a conversation by asking a question like "Hello, who's there?" or "My name's Stelarc". This digital doppelganger is like an amplified self-portrait, it's not just a physical portrait but also incorporates specific biographical details of the artist as well as his ideas and philosophies. However, the head is increasingly starting to exhibit its own autonomous behaviours and unpredictable conversational patterns.

Figure 15 Stelarc, "Humanoid CD", 2003.

Stelarc comments that the head is becoming increasingly autonomous in its responses and that he may no longer be able to take full responsibility for what it says. As the head starts to assume its own independent existence Stelarc speculates that with modifications to its database it could also develop a series of specific identities and behaviours, becoming for example, a philosophical head or a flirting head. The "Prosthetic Head" is also achieving its own independent identity as an exhibition persona and has an

emerging identity as a pop star with its new CD "Humanoid".

4. Actor-network Theory (ANT) and interactive art

As life-like humanoid artworks like Feingold's "Head" and Stelarc's "Prosthetic Head" cross the boundary between object and subject, questions of agency and intentionality become important issues. Traditionally, the concept of agency has been limited to the human subject. How can we now theorise these new forms of technological agency and emergent subjectivity demonstrated by these artworks? Are these humanoid entities truly autonomous or are they merely puppets controlled by their human creators? Where does the agency reside in these computer generated assemblages whose existence relies on complex programming and digital imaging and animation technologies? And what about the role of the audience who plays such an integral role in bringing these artworks to life through their interaction?

Actor-network theory (ANT) is one model that provides a useful theoretical framework within which to look at a broader definition of agency that can include both human and non-human entities. ANT situates agency within a broad framework of socio-technical networks and breaks down the arbitrary distinction between human and non-human entities. In ANT, agency is not limited to human beings but can be found in artefacts, machines and software and in heterogeneous networks and human-machine assemblages. Bruno Latour, one of the key progenitors of ANT, defines an 'actor' or 'actant' as

> something that acts or to which activity is granted by others. It implies no special motivation of human individual actors, or of humans in general. An actant can literally be anything provided it is granted to be the source of an action. (Latour 1997 cited in Suchman 2003)

ANT blurs the boundary between human and machine by stressing the idea that agency is not limited to human beings but is found in non-human entities or in the network or the relationship between the human and non-human. ANT helps elucidate the process of translation where agency is shifted between humans and machines. As Lucy Suchman puts it, this translation

> …render[s] former objects as emergent subjects, shifting interests and concerns across the human/artefact boundary. (Suchman 2003)

While opening up the concept of agency for non-human actors, ANT also stresses the interdependence of the various actors and actants that make up any individual socio-technical network including artworks. In this way, perhaps we can view the interactive artworks I have discussed as distributed intelligent systems or networks. The artwork is not a discrete independent entity – it relies on a network of actors or actants including artists, designers, programmers, hardware and software. Agency is distributed across this network rather than adhering to any one discrete component.

The audience is also a vital component in this network. Interactive artworks only make sense in the moment of interaction. These works require the involvement and interaction of the audience and can only be experienced 'in action'. They are process-based temporal works, not static objects.

Feingold's "Head" and Stelarc's "Prosthetic Head" depend on the audience to initiate, and make meaningful, the conversational responses the heads generate. Stelarc describes his "Prosthetic Head" as "a conversational system, which can be said to be only as intelligent as the person who is interrogating it." (Stelarc 2003)

5. Conclusion

As more and more artists start to make use of digital imaging technologies and artificial intelligence and chatbot software, we are likely to see a growing proliferation of interactive humanoid personas both on the Internet and in the art gallery. As these life-like and lively artworks cross the boundary from object to subject, they create a new dynamic two-way relationship with the audience. In the 'interactive moment', as our eyes meet theirs and they start to 'talk back', these works interpellate us, calling out to us and positioning us in new ways challenging and disrupting the traditional subject-object hierarchy of audience and art object.

The Eliza effect and our tendency to anthropomorphise non-human entities encourages us to treat these engaging artworks as human surrogates and to see them as living autonomous entities with their own sense of independent agency and emerging subjectivity. But as they become increasingly life-like, these humanoid entities also start to evoke feelings of the uncanny – their human-like qualities are fascinating and compelling but there is also something spooky and unsettling about them. Caught between the twin poles of anthropomorphism and the Eliza effect on the one hand and the Uncanny Valley on the other, these digital doubles or doppelgangers occupy a disquieting liminal zone between the living and the dead, the animate and the inanimate, the human and the non-human.

ANT also helps to remind us that as life-like as these works are, they are not independent entities but depend on a complex network of human and non-human actants and relationships. The 'life' that they exhibit depends not only on the artist but also on software, hardware, designers, programmers and perhaps most importantly, us, the audience.

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Artists' Websites

Luc Courchesne - http://www.din.umontreal.ca/courchesne/

Linda Erceg - http://nextwave.org.au/skinclub/skin_club.html

Ken Feingold - http://www.kenfeingold.com/

Gary Hill - http://www.djdesign.com/artists/ghill1.html

Sean Kerr - http://www.seankerr.net/

Julian Opie - http://www.julianopie.com/

Stelarc - http://www.stelarc.va.com.au/prosthetichead/

Mari Velonaki - http://murlin.va.com.au/eyespace/unstill/