Conversational Environments Revisited

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Abstract

Designers do not require the use of the most advanced electrical, mechanical & computational engineering to build highly sophisticated interactive devices, art & architecture. Instead what is crucial is that the conceptual framework within which they are conceived has a thorough understanding of interaction.

A common current misconception fostered by so called 'human computer interaction' design is that by giving functional devices, or aesthetic works of art & architecture, the ability to 'React' in some way to the stimuli of a 'User', qualifies this artefact as 'Interactive'. Such an over simplification trivialises the powerful & productive quality of interaction.

This paper insists on Interactivity as a more productive & advanced form of Reactivity, & explains the process of interaction as a conversational activity between participants. The conversational model is examined through this authors recent art installation & reflects on the powerful precedent Gordon Pask provides for understanding interaction through the experimental machines that he built to embody his Conversation Theories.

1 Introduction

Artists, architects & designers are increasing investigating the creative uses of of low cost sensing, computation & actuating technologies. With huge growth in open source initiatives & online communities the once difficult financial & knowledge base obstacles have been considerably diminished. “The 21st Century designer will have to be fluent in automatic, reactive & interactive design, i.e. Time based design in its three forms. Designers & architects are faced with an essentially new extension to their craft.” [Gage 2002]

To understand & develop this craft, we must first identify these three forms of design. If we consider 'Automatic' design, to be the creation of such artifacts as, clocks, repeating kinetic sculptures, & cinematic film, then 'Reactive' design differs from these automata, in that reactive artifacts have some ability to be triggered by stimuli, in some way, that causes a change in their output.

Examples include anything from simple bed side lamps, building elevators & home security systems to mp3 players, digital cameras & touch screen kiosks. All of these reactive systems whether elements of our built environment, artworks, or consumer gadgets, have (to varying levels of complexity) a range of preset content/behaviours that can be triggered to change.

How then does the third form of time based design, 'Interactive' differ from 'Reactive' design? It's a question that surprisingly stops most so called 'interaction designers' in their tracks.

Perhaps one explanation for this lack of distinction between reactive & interactive, is as Glanville calls it, “Terminological Inflation”. 'Interactivity' has become a buzzword used to encompass many technologies which provide some form of 'Reaction' to a 'User' input. “They perform tricks, but they do not give us anything that is remotely interactive, nor is there any meaningful sharing: simply a response to some stimulus in an action/reaction mode.”[Glanville, 2001]

As a result, the widespread mis-use of the term 'interactivity', has trivialised its meaning to the point that it holds no more conceptual value than reactivity to most of todays artists, architects & designers.

The common use of the term interactivity particularly in so called human computer interaction design, is incorrect. Most interaction design today is an aesthetic enhancement of models of reactive design rooted in the earliest methods of computer instruction; a rigid & restrictive master/slave model.

I will suggest that a more useful & productive model for interactivity is dialog or conversation, which we naturally find between human beings & in the wider animal kingdom. Using this understanding of interactivity as a conversational activity between participants, i will analyse current (mis)use of the term interactivity in artistic discourse examining celebrated examples of so called 'interactive' art works.

In order to develop this argument I will describe my recent art installation 'Performative Ecologies', in which I have tried to build interactive environments that follow the conceptual distinctions I have made, leading to the design of a community of conversational objects that can engage with people & with other objects in a dance like relationship.

2 Control

2.1 Restrictions in the Reactive Model

'User Interface' design has provided usability & a sense of control to the otherwise extremely complex world of digital computation, but at the same time it should be recognised, that these interfaces construct rigid restrictions on how we use technology.

Artist David Rokeby argues that the 'computer sets up the illusions that total control is possible. But the crux of this illusion is the fact that the control only functions effectively within the carefully constructed ambiguity vacuum of the computer'. [Rokeby, 2003]

One particularly prescriptive model, the WIMP Graphical User Interface or "Windows, Icons, Menus & Pointing device" conceived by Douglas Englebart in the 1960's & developed in the 1970's at Xerox Parc. has become the ubiquitous model for our daily use of computers at work & in the home. While it has been credited with making the use of computers more accessible to a larger market, it could equally be credited with typifying the homogenization of human computer interaction.

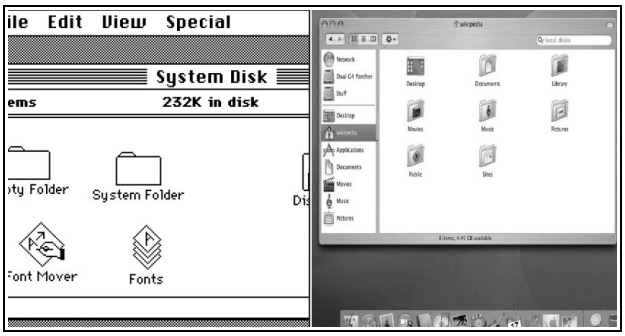

Fig. 1 left Mac OS 1984, & right Mac OSX 2007

Todays Operating System GUI's are for the most part identical to GUI's developed in the late 1970's & early 80's (Fig. 1) apart from now coming in glorious high resolution 32bit Colour with bouncing icons. As Cybernetician & Software Designer Paul Pangaro humorously suggests 'Most modern software interface designs... do not involve interacting very much at all. They are more like command-line instructions dressed up in drag'.[1993]

Underneath the aesthetic surface of current 'interaction design' as it is now fashionably called, is a formula that dates back to the earliest days of 'batch' oriented mechanical punch card technology. A formula of user/master commanding computer/slave rather than of interaction.

2.2 Novel forms of the Reactive Model

Artists & designers investigating novel approaches to engaging with responsive objects & environments have over the past half century explored the entire spectrum of sensory & actuation technologies. A driving factor in these works is a dissatisfaction with the rigid limitations of conventional human computer interaction (HCI) approaches.

Creative use of technology in the arts has provided a huge amount of research & development into new creative applications. In dance for example, motion tracking, & gesture recognition using computer vision, mechanical motion capture devices & force sensors such as accelerometer have not just enabled new artistic expression but also revealed the otherwise unexplored potential of these technologies beyond the confines of more rigid HCI research. These innovative explorations are starting to make a significant impact on the computer gaming industry which has long been looking for new gaming paradigms beyond the ubiquitous joystick 'button bashing' model inherited from Arcade Machines of the 1970's.

When the seventh generation of home gaming consoles came onto the market with the release of Microsoft's Xbox 360 in November of 2005 it appeared that the standard derivative controller format had been kept, with improvements in graphical processing & the usual upgrade to the most recent data storage discs. Indeed Sony's PlayStation 3 release in November of 2006 reinforced this approach with a more powerful system largely familiar in all other respects to its two previous incarnations.

One week after Sony's release, Japanese competitor Nintendo released their 'Wii', a comparatively less powerful gaming console going against market trend. One year later against seemingly all odds, the Wii was the world's best-selling next-generation games console [Sanchanta, 2007] because rather than focusing on computational power, it offered gamers a new gestural form of control

Wii Remotes, made up of a combination of built-in accelerometers & infrared detectors enabled position tracking & force sensing in 3 Dimensions (Fig. 5), a radical & liberating alternative to joystick 'button bashing'.

Fig 2. Nintendo Wii controller used to play Baseball

Clearly there is still space for rethinking the most fundamental elements of how we control & communicate with computational systems & it is often at the fringes of the creative arts that these new territories are challenged, providing an important testing ground for liberating & extending our relationship with technology in both commercial and artistic endeavors .

2.3 Experiments in complexity

In the early 1980's David Rokeby was an artists who's discontent with the limitations computer interfaces lead him to develop 'Very Nervous System' as an attempt to "draw in as much of the universe's complexity into the computer as possible." [Rokeby, 2003]

His 'interactive environment' as he described it, built between 1982 & 1990, was for its time, a sophisticated computer vision system detecting accurate location & movement information which was then interpreted, & mapped to a bank of sounds & instruments.

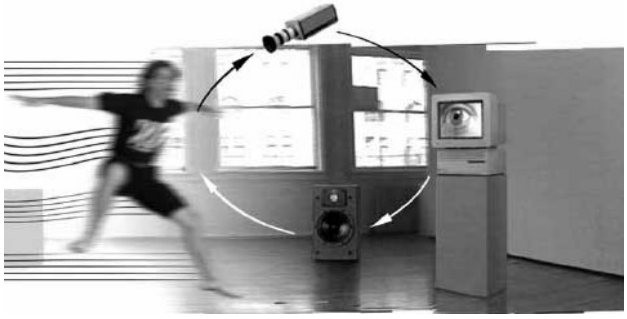

Fig. 3. Collage Diagram of Rokeby's Very Nervous System

The system constructed by Rokeby was made up of video cameras, image processors, computers, synthesizers & a sound system. He personally developed & mapped out the sounds through his own experimentation in front of the camera & as a result was able to achieve a considerable level of control, much like a musician using his own musical instrument. " that every 'pixel' of the space corresponds to a sound." [Rokeby 1998] In a metaphorical sense, he knew what keys to press.

When Very Nervous System was first presented in Vancouver, Rokeby was surprised by how difficult other people found it to use. Over time however people started to play with the space & become aware that the system was reacting to even very subtle gestures & started to build mental maps of the spatialised instrument. The complexity & surprising musical expressions that came out of this system were however not of the machine's doing, but rather of the complexity of human movement within space.

In an interview Rokeby described how he wished to create systems of 'inexact control'. 'I think that the computer is the result of a fetishization of control & so I like, in my contrary way, to work against that dominant paradigm. Control is over-rated...Or perhaps it is better to say that we need to learn to balance control which is very useful in surgery or driving, with other sorts of engagements with other things & otherness that are looser than control relationships where we allow ourselves to be open, engaged & willing to be surprised. Otherwise life is dead.'[Rokeby 2003]

The desire to make artworks that not only surprised the audiences but the artists themselves, became a notable characteristic of mid to later 20th Century time based Art practice. A desire to break free of rigid processes led to aleatoric artworks in Dadaism & Surrealism. At the extreme edges of aleatoric artwork, John Cage; a leading figure of the post-war avant-garde, experimented with computer music using randomization or chance within parameters defined in the ancient Chinese book 'I Ching', as a generator for constructing musical scores for performances.

Cage's approach could be argued to be just as rigid algorithmically as traditional reactive systems because the designer of the system (master) commands (slave) to produce a response between parameters that the designer decides. As a result the randomization is a constant range of varying values within the boundary values set & hence there is no possibility that something surprising will appear outside of these constraints.

In both Cage's use of randomization & Rokeby's capture of the complexity of human movement, rigid rules about the processing of input stimuli into output action can be seen to create great variety, but equally we should recognise that these rigid rules build finite barriers that cannot be passed. The weakness of such rigid systems is that the user of these reactive systems is unable to extend or push the system beyond the fixed parameters that the designer pre-choreographs.

2.4 Loss of Control

Rokeby's installation could be described as forcing its inhabitants to adapt their behaviours to meet the rigid configuration of the installation.

Rokeby himself describes how his installation began to control his own behaviour. "I saw a videotape of myself moving in the installation. I was moving in a completely unusual & unnatural way, full of jerky tense motions which I found both humorous & distressing."[1998] His own installation contorted his actions, control was inverted & Rokeby became a slave to suit its uncompromising algorithms.

The intentions of Rokeby to find new forms of artistic expression by building systems that capture human gesture in greater resolution is admirable & so too, the work of other pioneering artists who've used computer vision such as Myron Kreugar & Rafael Lozano Hemmer. Sensory data provides rich material for artists to work with, however the use of sensory technologies which then influence the behaviour of an art work in some manner do not immediately qualify an art work as interactive.

Rokeby's Very Nervous System is just one prominent example of an 'interactive installation' that does not involve interacting very much at all. nevertheless it is not uncommon in the arts for such work to be described as 'interactive' & Rokeby was awarded the Prix Ars Electronica Award of Distinction for Interactive Art for 'Very Nervous System' in 1991. This only serves to highlight a general confusion within the arts on the definition of interactivity. General confusion in terminology has led to this award now having an even less defined and frankly baffling title of 'Hybrid Art'.

3 Redefining Interactivity

"By obscuring the distinction between interactive & reactive we lose a potentially fertile conceptual framework"[Haque 2007a] Very Nervous System reacted obediently rather than ever having a life of its own. When people entered & triggered sounds in the space, it was much like a musician activating keys on a keyboard as apposed to a dancer & musician improvising & collaborating a performance together. If the system perhaps had the ability to suggest alternative sounds or reposition the arrangement of the sounds spatially of its own accord then some control would be taken away from the inhabitant.

If this system could then observe how occupants respond to this, it could begin to learn what kinds of arrangements keep people in the space longest & start to collaborate in the creation of new performances. This capacity to adapt its own behaviour would move the relationship from master/slave towards a more natural conversational relationship with inhabitants.

This conversational model is participatory rather than dictatorial & is a form of social communication that promotes a circularity of inter-actions where participants contribute to a shared discourse negotiating their actions & understandings with other participants. Such a model of interaction is most evident in human conversation & can also be seen more widely in the ecological interactions of our entire natural kingdom.

A conversational model is a different form of communication to that of a network of computers sending packets of data to each other. Conversation rather than a transmission of signals with definite meaning, is a more creative process of exchange. We use conversation because we can never get inside the head of those we communicate with, so meaning has to be constructed between participants through verbal & non-verbal discourse.

"An endless loop of confrontation & disagreement is the process of negotiation: & negotiation involves a process of exchange & potential difference (error) reduction that is both inherently cybernetic & familiarly everyday. " [Glanville, 2007]

This leads to the cross-fertilization of different understandings to form new understandings that are not from either of the participants but rather a construct of their shared interactions together. In this way interaction is not just restricted to the rigid behaviours of reactive systems but is open to forming new understandings & actions. Such a model is therefore productive & open to change beyond the preconceived ideas of individual participants.

As an extension of this, if designed artefacts are given the ability to improvise, negotiate & learn themselves, they have the potential, through interaction with other participants to evolve their own personal behaviours beyond the preconceived notions of their original designer.

Such an evolutionary process achieves the aesthetic desire to design surprising & un-choreographed behaviours in artefacts that many artists including Rokeby & Cage were interested in. The difference between these surprising outcomes & those of the rigid noisy algorithms of Cage & Rokeby, is that these are constructed out of the dialog that occurs in the conversational environment & as a result are contextual to the collaboration of participants rather than generated out of random or pseudo-randomization.

For designers to engage with this model of participation, some level of autonomy must be built into these artefacts, so that they may make suggestions themselves, & make judgments based on their own observations. Reciprocally I would suggest that for us to become conversational partners with these kinds of systems we must be willing to not just command them but listen & learn from them ourselves.

Certainly you can argue that this relinquishing of control can lead to systems that mis-behave or act irrationally & it is true that by giving systems the ability to make their own suggestions, the capacity for error is inevitable, much like it is in all human beings an animals. You would not want to make an elevator improvises where it stops & opens doors or a life support machine have surprising behaviours, but in the scenarios where we are looking for artefacts that can contextually adapt, collaborate, & surprise; sharing of control is a potentially rewarding strategy for all participants.

4 Conversational Environments

4.1 Performative Ecologies

Performative Ecologies (2007b), designed & built at the Bartlett School of Architecture, London is an ongoing investigation into the design of conversational (interactive) environments. It is a kinetic installation made up of three autonomous attention seeking sculptures (Fig. 4) which search out people using cameras in their 'heads' & orientate to face inhabitants & begin performing using their 'tails'.

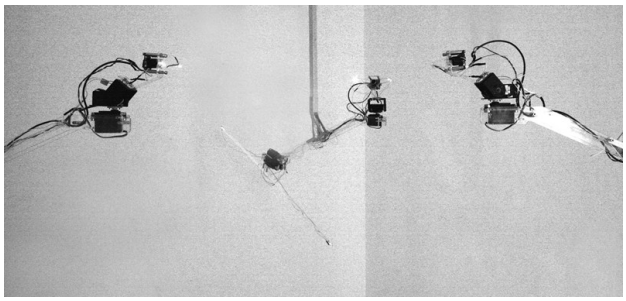

Fig. 4 Performative Ecologies Installation, London 2007

The performances are generated from a gene pool of evolving dances functioning in a Genetic Algorithm (G.A.) which uses facial recognition to assess attention levels & orientation of the audience before & after each performance as a way of assessing & assigning a fitness value to each new choreography. Over time successful maneuvers are kept & recombined to produce new performances while less effective ones are discarded. Mutation in the G.A. fluctuates based on how successful the sculptures become. If they get a lot of attention, mutation levels rise as if they are getting arrogant & as a result be-

come more experimental.

When there are no people around, they turn to each other & teach their most successful performances to each other negotiate new performances together. They take the suggestions of their surrounding partners & compare their gene pool of performances to their partners suggestions. If they are comparatively similar then they are accepted & replace a chromosome from their own pool. If they are too different they are rejected as if they dislike the partners dance moves.

Currently this is done via a wireless network but it is hoped that in later iterations, it will be possible for the sculptures to use their computer vision systems to interpret each others performances adding interesting potential for degrees of misunderstandings to occur.

As an ecology together with human inhabitants the installation constructs an intertwining of networks rich in circularities of reciprocal communication & adaption. Individual participants both human & synthetic operate as part of the conversational environment each performing independently, but continually negotiating their actions with each other.

The installation's physical composition of 3 independently responsive sculptures is built from perspex, & aluminum. Each one is actuated by servos; 2 in the 'head', 1 in their 'tails' & 1 up at ceiling level which orientates their body. The Servos & Lighting are controlled by an Arduino microcontroller receiving instructions from the G.A. running in Processing (A Java based language designed for Artists). Each head has a low light vision camera on board transmitting to facial recognition software built using the openCV library.

Fig. 5 Facial recognition of one of the robotic Sculptures transmitting onto the Kunsthaus Facade while it performs.

At the time of the writing of this paper, Performative Ecologies most recent installation was at the Kunsthaus gallery in Graz, Austria. The sculptures were strategically positioned on the ground floor of the Gallery looking out at the people walking by. In this scenario, they were able to learn not just how to attract people within the gallery but also out on the street, almost beckoning them to come inside. The vision of the robots (Fig.5) was additionally transmitted onto BIX, the Kunsthaus gallery's large media facade, presenting the activity of the installation out over the city.

4.2 Colloquy of Mobiles

In the process of developing Performative Ecologies, I made the fortunate discovery of theories & experimental machines of Cybernetician Gordon Pask (1928-1996).

Pask provided rigorous terminology for conversation, interaction, environments & participation for artists to use. [Haque 2007b] His ongoing contribution to the design of interactive art, architecture & design was in distinguishing the essential features of conversation & the mechanisms by which participants could enter into & continue to converse. Pask himself embodied these conversational mechanisms in a number of computation & theatrical machines he developed.

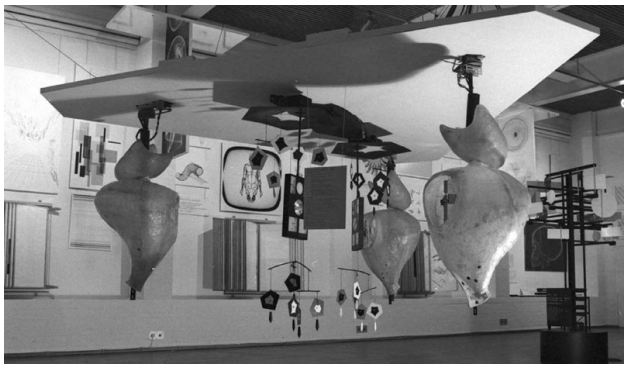

Fig. 6 , Colloquy of Mobiles, Cybernetic Serendipity 1968

In 1968 Pask presented the 'Colloquy of Mobiles', an installation (Fig. 6) made up of conversational machines at the 'Cybernetic Serendipity' exhibition, ICA, London. Prior to the exhibition, Pask wrote 'A comment, a case history & a plan' later published in 1971, in which he outlined his belief that “Man is prone to seek Novelty in his environment & having found a novel situation, to learn how to control it...These propensities are at the root of curiosity & the assimilation of knowledge. They impel man to explore, discover & explain... they lead him into social communication, conversation & other modes of partially co-operative interaction... My contention is that man enjoys performing these jointly innovative & cohesive operations. Together they represent an essentially human & inherently pleasurable mode of activity”[Pask, 1971]

His view of conversation as innovative, & pleasurable gave it an aesthetic value that he considered could extend artistic practice & the experience of those who engage with an art work. Pask presented four key attributes that create 'Aesthetically Potent Environments' which as he described it were 'environments designed to encourage or foster the type of interaction which is (by hypothesis) pleasurable'. The fourth of these points stated that an art work may 'respond to a man, engage him in conversation & adapt its characteristics to the prevailing mode of discourse.'[Pask, 1971]' With this understanding Pask's Colloquy of Mobiles was built as a 'socially orientated' environment. His use of mobiles was intentionally to give the conversation objects formal characteristics 'within the conventions of art'.

“The form of communication that he conceived re-

ferred unmistakably to a sexual analogy: hung from the ceiling were two males & three females... The goal of communicating was to achieve a moment of satisfaction, & the mobiles learned to optimize their behavior to the point where this state could be reached with the least possible use of energy. With the help of flashlights & mirrors, the exhibition visitors could assume the roles of the mobiles & influence the learning process." [Rosen, 2005]

Pask recognised that conversation was not exclusively a human ability & showed that could occur between machines with the capacity to adapt & learn performing as social & conversational environments without the need for human stimulation. With the addition of people entering into this environment the richness of interactions & relationships could transform & grow into further surprising collaborative performances.

Importantly, Pask's Mobiles were not technologically advanced machines by todays standards yet they had a conceptual sophistication missing in most contemporary so called interactive art, architecture & design.

Pasks work is not well represented in literature perhaps through a lack of detailed documentation or perhaps because his work was ahead of its time & was not recognised widely enough until much later. Fortunately Usman Haque & Paul Pangaro are running an on-going project called 'Paskian Environments' to rediscover the work of Gordon Pask & reconsider its relevance to the construction of interactive environments. Their detailed analysis of his theoretical constructs & machines are intended to lead to a number of future installations.

From a personal perspective, Pask's models of interaction as conversational & the embodiment of these ideas in machines have been inspirational, providing a useful precedent for interaction design in its truest sense. I believe that if he was still with us today, he would be building machines employing the latest computer vision & advances in machine learning to create interactive systems that could participate in increasingly sophisticated conversations.

5 Conclusions

Today, time based design follows a predominantly reactive model. With ever increasing saturation of sensors, processors and actuators in our built environment, commercial products are being produced using reactive & I have argued archaic HCI models which often limit the potential of systems, making them not just slaves to our demands, but ourselves slaves to their rigid algorithms. "Now at the beginning of the 21st Century, Pask's Conversation Theory seems particularly important because it suggests how, in the growing field of ubiquitous computing, humans, devices & their shared environments might coexist in a mutually constructive relationship." [Haque 2007b]

Performative Ecologies is my first of a series of investigations into gestural and performative forms of conversation. My next stage will focus on three issues, improved complexity and improvisation of performances, improvements in observation and learning, and finding a range public spaces to test out new conversational environments, recording behavioural differences in the systems due to differing contexts.

The potential benefits of 'Conversational Environments' being revisited by a growing number of practicing artists, architects and designers are far reaching not just in creative but commercial practice. The role here for artists, architects and designers with an understanding of the conversational model of interaction must be, to use and promote this approach to time based design, as a more progressive alternative to the reactive model.

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