Artistic Participation in eRENA

Abstract

Descriptions of four proposals submitted to eRENA by three artists. These proposals form a basis for activities in eRENA years 2 and 3, especially in the “open” Work Package 7.

In the proposals links with and aesthetic expressions of the themes in work packages 4, 5 and 6 have also been considered and promoted. The proposals strongly connect to the production themes of work package 4, the crowd representation themes of work package 5 and the interaction, mixed reality and audience participation themes of work package 6.
DELIVERABLE 1.4

Artistic Participation in eRENA

Introduction

KEN FEINGOLD

WHERE I CAN SEE MY HOUSE FROM HERE SO WE ARE

MASAKI FUJIHATA

IMPRESSING VELOCITY IN REAL TIME

MASAKI FUJIHATA

GLOBAL INTERIOR PROJECT

SIMON PENNY

CAUCUS AND IMAGINARY FRIENDS
Introduction:

At the i3 symposium at the Multimediale 5 (ZKM Karlsruhe) a call was launched to artists to submit proposals for projects with the context of eRENA. Six artists responded, and of these four projects were chosen as appropriate for further consideration. These are described below. Following further discussions with these artists and our eRENA partners, it was decided that actual production commitments should be made to Masaki Fujihata and Ken Feingold.

Feingold has developed a modified version of his original proposal that is specifically orientated to WP 6.2 LINKING BETWEEN REAL AND VIRTUAL SPACES, WP 6.3 INDIVIDUAL AND GROUP INTERACTION and WP 6.4 TESSEATING BOUNDARIES FOR MIXED REALITIES. The realisation this project will be the important component of the ZKM's effort within those work packages. Feingold's revised proposal is described in our current WP 6.2 document.

Fujihata's two projects 'Impressing Velocity' and 'Global Interiors' also innovatively address the thematics of WP 6.2, WP 6.3 and WP 6.4 and their realisation will also constitute an important part of the ZKM's contribution to these three work packages.

Ken Feingold

where i can see my house from here so we are

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An interactive video-telerobot installation for four spaces and the Internet
Three robot-puppets, each with a video camera-eye and microphone ears, are together in a diorama-like space. The three back and side walls of the space are rear-projected computer graphics. These graphics contain both landscapes and other virtual puppet characters. Each robot-puppet is connected, via the Internet, to another space, in which their sight and hearing is seen and heard by another viewer-ventriloquist as projected video and amplified sound. In each remote space, there is a control device, consisting visibly of a joystick and microphone built into an attaché case. The viewer-ventriloquist there may drive around the robot-puppet to which they are connected in the diorama space, and when the remote viewer-ventriloquist speaks, their voice is "projected" through the robot-puppet, amplified within it, and moves the robot-puppet's mouth. In this way, three viewer-ventriloquists may meet in the exhibition space, speak with each other, and with other visitors in the room. The movements of the robot-puppets interact with the main graphics computer, and thereby interact with the playback of specific real-time graphics and sounds. The positions of the robot-puppets determine their landscape and the other (virtual) characters to be called up.
The work was conceived as eventually being a permanent installation with travelling elements. The diorama construction with the robots should eventually have a permanent location, while the interfaces may be set up in public or private spaces wherever the appropriate telecom services are available.
Hardware and Telecom Requirements

This work was created with the assumption that the means of transmitting video, audio, and data from one location in the world to another will continue to change for the foreseeable future. Because of this, the actual artwork is comprised of its core elements - three motorised robot-puppets with video cameras, microphones, embedded micro controller and other electronics, and three remote-control interfaces with embedded micro controllers. The new software for the interactive projections will also become part the core artwork.

The means for it’s networked realisation and for projection of video at the remote locations must be determined for the time and places of the actual installation. As it is like a kind of raw nerve, sending and capable of receiving analogue video and audio, and simple serial data, it may be configured to work with any combination of hardware and telecom services capable of meeting its basic requirements:

Central location with robots:

- 3: Silicon Graphics Indy or O2 computers with Video Option, or other with similar capabilities
- appropriate telecom/computer hardware as required for service to be used network connection for each space: Internet = minimum 1.5Mbs line, LAN with Switched Hub, CSU/DSU and Router. “closed-circuit” versions may be produced with local TCP/IP network and appropriate LAN hardware and wiring ISDN, others: appropriate audio, video, data interfaces

for new aspects:

- SGI capable of running real-time software, multichannel output
- three data projectors
- video camera for public transmissions from site
- network interface for video camera, as appropriate

Remote locations:

- 3: Silicon Graphics Indigo2 computers with Galileo boards, O2 computers with Video Option, or others with similar capabilities
- network connection (as above)
- analogue video projection or head mounted display
For its first realisations, the work has utilised the Mbone software for audio and video transmission over the Internet, and custom software for the transmission of control data. It was developed for use with Silicon Graphics computers capable of digitising and outputting analogue audio and video. The work may also be configured with other types of inter-faces, such as those made to work with ISDN, or other types of PC or Unix computers.

All of the six network interfaces (one for each end of each robot-puppet), in whatever form, must be capable of digitising analogue NTSC video and audio and the three network interfaces on the remote side must also be capable of outputing analogue video from a 640X480 portion of the screen.

The software for control data transmission was written for Silicon Graphics computers. It may be reconfigured for use on other systems. Video/audio software can be configured for Solaris, Linux, FreeBSD, Windows95, and a few other specific systems.

**Masaki Fujihata**

**Impressing Velocity in Realtime**

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The speed is fun to everyone. The speed can give us unusual experience for perceiving the world. It is a distorted view of the world. In a situation of high speed driving, the view of an automobile driver is distorted, but his final perception is revised by our brain program to the normal view. The fun of high speed driving is caused by affecting to generate some endorphin in our brain for keeping up the process of revising distortion.

The aim of producing this art piece is to develop special algorithm to distort the view of the viewer, instead of viewing actual view in front of him. The algorithm abducts the process, which our brains are processing normally in the situation of accelerating the speed. It will be a visualisation of the impression of speed.

The former research was done in 1992, which was titled "Impressing Velocity", a famous modern technology "GPS" (global positioning system) was used with laptop computer for collecting 3 dimensional data path which was generated corresponding to our climbing up and down Mt.Fuji. These 3 dimensional data were used to calculate the velocity in each part of the path and corresponding to the velocity data, the form of a cross-section of the Mt.Fuji was distorted. High velocity will shrink that cross-section data, and in the other hand, low velocity will expand the form of that section, because low velocity shows that the person is tired. The state of zero velocity, when we have a rest, will make an explosion like form of Mt.Fuji (see figure 1.) This image could not be generated in real-time in 1992.
Figure 1.

Deformed result from Impressing Velocity in 1994.
Top: deformation was done referring to the data of climbing up.
Bottom: referring data of going down.
The development process
In this proposed project, there are 2 phases on the schedule of development.

Phase 1: The development of algorithm.
To examine the algorithm, using Radio controlled miniature model car as a work bench. This miniature car has CCD camera, accelerometer, and transmitter of video images and data. The image will be captured by the CCD camera mounted on the miniature model car will be processed by Onyx and will project on the screen in front of the participant. He will control that miniature model car with the remote-controller and he can not see the actual miniature model car directly and he can only see the screen.

Phase 2:
Installation in actual size. For example using real car. This car will be installed with CCD camera, video monitor, accelerometer, transmitter of video images and data, and receiver of video images from Onyx. The driver can see the images only through the monitor where processed images from Onyx is displayed. The monitor will be installed in front of the driver. The car will actually be drove by him. He will feel the actual motion of the car with accelerated vision of the front view of the car. For the safety, we can choose roller coaster or train, etc, instead of car.

An idea for constructing the most safety system is using 6-axis oil pressure platform for giving the experiences of driving by user.

The algorithm of distortion:
The image which is captured by the CCD camera mounted on the car is mapped onto the virtual screen in computer space, which is Bi-cubic spline curved flexible surface, and this screen is distorted according to the data which is grabbed by the accelerometer which was also mounted on the car. This virtual screen will be rendered with 2 view-points to generate stereoscopic capability. The viewer will see fully 3 dimensionally distorted screen where the captured image
is mapped on. The basic algorithm for distorting the screen is: when the driver accelerate the speed, the centre of the screen will come toward the driver, when he turns to the right, the centre of the screen will be stretched to the left. And more, corresponding the brightness or some other factors, the surface of the screen will be embossed or grew up.

This algorithm will be developed to affect as impressing the velocity. The distortion is a kind of deformation of the form. Traditionally the deformation is an important factor of the expression of the art. The certain factor of deformation will control the impression of the viewer.

This is not the way of solving the problems in science, but the way of the art.
Figure 3. An example plan for the Phase 1 installation.
A list of equipment:

Phase 1:

- ONYX computer with Sirius video capture board.
- Radio controlled miniature car with CCD camera, video transmitter, accelerometer, data-transmitter.
- Video receiver, data receiver.
- Data projector, Crystal Eye glass sets.
- Two different spaces are needed. One is the space for Radio controlled miniature model car. Second is the space for the projection images and computer.
- The space One is approximately 6m x 6m and Second is 3m x 4m.
- People are using Crystal Eye glass for stereoscopic viewing.
- One participant is using Radio controller for driving the miniature model car.

Phase 1 will be realised at Centre for Culture and Communication (C3) in Budapest, where I will stay from the middle of June until the end of July 1997.

Phase 2:

It is still needed to be modified the details.

IDEA-1:

An actual sized car will be used instead of Radio controlled miniature model car. Two different sites are needed for installation.

1. Outside
   - A car is needed to be customised.
   - CCD camera, video transmitter, accelerometer, data transmitter, video receiver, and video monitor at the front window.

2. At the computer centre
   - Video receiver, data receiver.
   - Video transmitter.
   - Onyx with Sirius video capture board.
   - Wide open space for actual car driving, the width will be depended on the limitation of the domain where the radio waves can be reached.
IDEA-2:

Actually, for the reason of safety, we have better use another kind of vehicle, instead of car. Such as roller coaster or train for child and so on.

Or 6 axis oil pressure platform normally used for flight simulator.

Masaki FUJIHATA

Global Interior Project

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Introduction:

"Global Interior Project" is a Networked Multi-User Virtual Environment where people can meet, talk and discover the metaphysics of reality. It is a kind of example of communication media design, which shows new possibility of connecting people in new way. The aim of this project is giving imagination of the meta-mechanism of electronically networked communication space, Cyberspace, while people are acting, coming back and forth between real and virtual space.

Hardware system is a typical VR setup but without goggles it is constructing with ethernet LAN, 3D graphic workstation, trackball and projector. A remarkable point of this project is to set up an actual object as a representation of the virtual space. It is constructed with boxes which has actual door, controlled by computer. The status of this door shows an existence of someone in virtual space. Here we have 3 different stages, real space, virtual space and physical object which is representing that virtual space.

Visible System:

There are 2 major objects are installed for this project, one is called "Cubical-terminal" and other is called "MatrixCubes". Cubical-Terminal is an interface to the virtual space from our real space. From its window, participants can see the image of virtual space and manipulate the image by a TrackBall. It has a speaker, microphone, and video camera. MatrixCubes is a symbolic statue and is constructed with 18 cubical boxes which represents the map of the virtual space. The status of the door of each boxes shows whether some one is in or out that room in the virtual space. It is identical, the design of the Cubical-Terminal, the interior design of the virtual room, and the cube of MatrixCubes, these are white, cubic, and with square window.
Function of the System:

Participants can manipulate their view and move their position by rolling TrackBall. Through the window he can move into the next room. Each room has an object which identify the room, and in a same time same object is stored in a box in the MatrixCubes. When he clicking the object in virtual space, it will react in several different way, for example sound will be generated or object will be animated. When 2 or more people are exist in a same room, they can talk to each other. At this moment he will be identified with the name of the place where the Cubical-Terminal is placed, and not of his real name. So he would be existing in 2 different realities.
A 2mx2mx2m cubicle made with plywood. PC+3D board+LCD projector are installed. Cubical-Terminals are possible to distribute in any location. Through this Cubical-Terminal as an interface to the Virtual World, participants can manipulate the image of virtual world using trackball placed on the edge of the window. Also speakers, microphone and video camera is installed in this system.
The room titled ‘The Self’ is special, the image of MatrixCubes which was captured by a live camera is mapped on the wall of this virtual room. By clicking the door of a room, he will be jumped into that room in virtual space. The image of the MatrixCubes is coming from real object, and is also functionable as a map for changing the place, he can manipulate his position in virtual space by the real object. And in a same time he can see the real MatrixCubes by his real organ of the eyes.

18 different rooms are constructed as a symbol of 18 different categories which reflects the world.

+ right hand, left hand, as a sense of tactility,
  eye as a vision,
  nose as a smell,
  ear as a audition,
  mouth as a language,
  book as a memory,
  pen as a expression,
  house as living,
  the self, telephone as a media,
  weapon as a war,
  penis as a sex,
  cross as a religion,
  trash as a after,
  material as before,
  right foot and left foot as a foundation or transformation.

+ All object in a real space was sculptured by Masaki Fujihata with LEGO block.
The function of LEGO can be read as a metaphor of atoms.
Each room in virtual space is a part of the world. Passing through these rooms means essentially knowing the world. To know the path and to imagine the whole, some form, configuration will be coming in your thought. It will be a same as a form of MatrixCubes, it is a map of the virtual world, and also a total form of the map was designed for reminding a chromosome. It is a symbol of standing human. So, human is the world.

Avator's design:

For instance, 4 Cubical-Terminals are installed, 4 different form is needed for identifying each avatars. Video images of each participant is mapped onto each avatar's face. Different design of the form of avatar identifies the place of a Cubical-Terminal, and the video image shows real participant existence. In the contrast of the cubic design of the virtual room, Cubical-Terminal, and MatrixCubes, the design of avatar is spherical. It reminds a shape of atom or molecular. An avatar, virtual existence of the participant, is an activator of this virtual world.

When he move to next room, his foot-print will be left on the edge of the window of the past room, and small foot-print will be left at the room before the past room. Which notifies to the other people whether he was there.

We are designing an artificial avatar now. He will be controlled by an artificial intelligence type computer program.
Windows:

The window at the Cubical-Terminal is a window for the virtual space. TrackBall at the edge of this window is used as a manipulator for participant’s view and position.

The window at the virtual space is the path to the other room. Out side window, there is a picture of outside is mapped onto, but participant can never be there. It expresses the existence of the complete outsideness.

Technical Specifications:

- Cubical-Terminals (Max 4 kiosks are available)
- Wooden Box (200x 200x 200cm with window)
- Intergraph Computer TDZ-300 (WindowsNT PentiumPro CPU)+GLZ1t, Meteor(video capture board), track-ball
- Audio Mixer, Microphone
- CCD camera
- LCD data projector (VGA, 640x480 pixels)
- Mirror 80 x 90 cm

Matrix-Cubes

- Steel made white cubes (30x 30x 30 cm) x 18 +Air cylinder, plastic door
- Steel foundation (30x 90x 150 cm) +Air Bulb Solenoid x 18, Controle CPU
- Steel empty cubes (30x 30x 30 cm) x 2
- Air Compressor

Controler PC

- PC (WindowsNT for controlling sound switcher and Matrix-Cubes)
  +keyboard, mouse, display, Ethernet-HUB
- SoundSwitcher(Custom Made)
Cables:

- Capability of exchanging sounds are not included with Ethernet protocols. (temporal situation: BALANCE type audio cable is needed separately for sound capability between each kiosks and SoundSwitcher.)

Networks:

This system is developed upon 10-Base Ethernet environment.

Simon Penny

Caucus and Imaginary Friends

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Caucus:

A Robotic Community in which Social Behaviour is emergent from the exchange of Linguistic Tokens.

Imaginary Friends:

A Hybrid Community of automata and human agents, embodied and online.

1. Project overview:

Consistent with the authors professional location, the Caucus/Imaginary Friends project has both artistic and technical goals. Technically, the project consists of six autonomous, roughly human scale robots which relate to obstacles and people in a manner developed in Penny's previous work. The robots also locate each other and exchange information with each other through the use of simple language.

Caucus is a project of the Social Robotics Syndicate, co-directors: Simon Penny and Kerstin Dautenhahn. Imaginary Friends is a project by Simon Penny and Virtual Artists (Jesse Reynolds and Dave Sagg, principals). (see below, item 6, for a discussion of Imaginary
Friends) The core assumption of the project is that social behavior will emerge autonomously if the devices are supplied with adequate language capability. An entirely emergent, bottom up approach is pursued, in which there is no centralised control and no centralised location/navigation hardware. Social roles and relationships are not preset. The robots do not transmit raw sensor data, nor is any distributed processing attempted. Each robot preserves its autonomy and individuality, and behaves in response to the utterances of the other robots in addition to its own local sensor data.

Artistically, a major goal is to expand the range of real space interactive artwork by the introduction of the concept of a self sufficient and interacting community of agents. Such a community is “aesthetic” and behaving, even in the absence of human viewers. Viewers can either watch the behaviour of the community at a distance, or interact with individual robots and hence perturb the behaviour of the group.

2. SRS Background

The approach taken by Kerstin Dautenhahn (biologist and roboticist, Dept of Cybernetics, University of Reading UK) and Simon Penny (artist and robotic engineer) towards ‘social robotics’ is fundamentally different from the approach taken by other researchers. At the heart of our social robot paradigm is our strong belief that the fundamental factor which makes robots social, natural and appealing to humans is the way they move and interact! Thus, the "body" of a robot and its movements in robot-human interaction situations is the entry-point, which shapes human's attitudes towards the machines. Communication with humans cannot occur unless the robot behaves in a way which has 'meaning' to human observers and interaction partners, which allows the establishment of a 'relationship' to the machine. This relationship is based on the interpretation and attribution of behaviour to the machine. It is a self-organising, situated and emergent feature of the dynamics of the interaction in a specific context, it is not due to any in-built humanoid features. Sociality is re-invented in every new interaction between robots and humans.

The same principles apply to robot-robot interaction. Biologically oriented work on robot group behaviour usually models ant-like behaviour, focusing on the performance of the colony (the super-organism) and not on the level of the individual. The notion of robot sociality which we use in our project is completely different. Instead of building robotic, ant-like 'soldiers' we study groups with few individuals, focusing on the process of how each individual system identifies, and interacts with its group members. Such formations are more related to individualised societies which are typical for mammal (in particular primate) group structures. As opposed to the ethological models in which 'processing' is 'distributed' amongst the members, in the SRS model, robots maintain their 'individuality' and agency. They 'negotiate' sociality (with people and with robots) on-the-fly, as an emergent epiphenomenon.

Our project intends to demonstrate the potential of new forms of interaction which can emerge from this distinctive, individual- and dynamics-centred approach to social robotics. Implementations by Simon Penny such as the 'Petit Mal' project which has been presented at numerous events (see http://www-art.cfa.cmu.edu/Penny) have already demonstrated that machines can be built which behave in a way which humans find interesting and appealing. This motivates humans to become engaged in interactions with them, so that 'communication' can emerge which could not be predicted solely on the basis of the mechanisms and technology which the machine is comprised. Such interactive machines are not dangerous or frightening,
they are interpreted as 'friendly'. However, by their size, construction principles and behaviour they are not regarded as toys, they are accepted as 'sensitive' machines and interaction partners. Developing this technology further and implementing a group of such systems will be a major milestone towards robot sociality. Work done by Kerstin Dautenhahn has studied robotic social intelligence, e.g. a group of robots that can interact with each other, e.g. recognise a group member, co-operate, imitate movements, and follow each other. This has been studied in an ecological context the robots were running in a particular ecosystem where they had to interact in order to survive. This particular biological and artificial life viewpoint implies the careful co-adaptation of environment, robotic bodies and the dynamics of action and interaction.

Neither Simon Penny’s nor Kerstin Dautenhahn’s robots are anthropo- or zoo-morphic. They are new, artificial, interactive creatures. We do not try to mimic nature by building humanoid robots and trying to copy precisely human movements. Instead, we are building interactive machines which do not directly resemble any animal or human. The machines look like machines, but they do not always behave as they are expected to behave. In that way, they indicate a direction towards a new interpretation of what a robot could be, a new species, interacting and living together with us. The ‘vision’ of a hybrid robot/human society should become visible in the output of the project.

3.1 Petit Mal: Overview

Central concerns in this project were: an holistic approach to the hardware/software duality, the construction of a seemingly sentient and social machine from minimal components, the generation of an agent interface utilising purely kinesthetic or somatosensory modes which “speak the language of the body” and bypasses textual, verbal or iconic signs. General goals are exploration of the “aesthetics of behaviour”, of the cultural dimensions of autonomous agents and of emergent sociality amongst agents, virtual and embodied. The research emerges from artistic practice and is therefore concerned with subtle and evocative modes of communication rather than pragmatic goal based functions. A notion of an ongoing conversation between system and user is desired over a (pavlovian) stimulus and response model.

I began to design “Petit Mal: an autonomous robotic artwork” in 1989. At the outset, I did not describe the project as an embodied agent, I was unfamiliar with that terminology at the time. The goal of Petit Mal was to produce a robotic artwork which is truly autonomous; which was nimble and had “charm”; that sensed and explored architectural space and that pursued and reacted to people; that gave the impression of intelligence and had behaviour which was neither anthropomorphic nor zoomorphic, but which was unique to its physical and electronic nature. It was not my intention to build an artificially intelligent device, but to build a device, which gave the impression of being sentient, while employing the absolute minimum of mechanical hardware, sensors, code and computational power. My focus was on the robot as an actor in social space.

The formulation “autonomous robotic artwork” marks out a territory quite novel with respect to traditional artistic endeavours as there is no canon of autonomous interactive aesthetics. Petit Mal is an attempt to explore the aesthetics of machine behaviour and interactive behaviour in a real world setting. Petit Mal seeks to raise as issues the social and cultural implications of “Artificial Life”. I wanted to avoid anthropomorphism, zoomorphism or biomorphism. It seemed all too easy to imply sentience by capitalising on the suggestive potential of biomorphic elements such as eyes, ears, legs, arms etc. I did not want this “free ride” on the experience of
the viewer. I wanted to present the viewer with a phenomenon which was clearly sentient, while also being itself, a machine, not masquerading as a dog or a president.

3.2 Physiognomy and Design Theory

I wanted to build a device in which its physiognomy was determined by brutally expedient exploitation of minimal hardware. The two wheeled design offered the most expedient motor realisation for drive and steering: two pulse width modulated DC gearhead motors. This two wheeled design then demanded a low centre of gravity to ensure stability. This swinging counterweight then demanded a solution to the problem of the stabilisation of the sensors so that they would not swing radically, looking first at the ceiling then at the floor. The second internal pendulum gave this stability. In this way the structure specified the necessary extrapolations to itself, the development of the mechanical structure was not a gratuitous design but a highly constrained and rigorous engineering elaboration based on the first premise of two wheeled locomotion.

The double pendulum structure then implied a separation between logic and motor parts. The lower or outer pendulum carries motors, motor battery and motor drive electronics. The inner pendulum carries the sensors at the top, the accelerometer in the middle and processor and power supplies as counterweight in the lower part. The batteries are not dead weight but in both cases also function as the major counterweights. The inner counterweight provides passive self stabilisation for the sensor head. It then became clear that the angle between the two pendulums could be measured and this angle could be used. The analogy to the semi-circular canals of the inner ear as the primary sensor of balance in humans is clear: the accelerometer is a rudimentary proprioceptive sensor, it measures relationships between parts of the robot’s “body”. It was important to me that this robot was “aware” of its body.

From the outset I wanted to approach hardware and software, not as separate entities but as a whole. Data collection requirements necessitated the development of the stable inner pendulum, likewise the physical structure, together with the basic requirements of navigation and interaction with humans, determined the choice of sensors and the code. The suite of sensors is absolutely minimal: three ultrasonics, three pyro-electrics, two very low resolution encoders and an analogue potentiometer on the “accelerometer”. I wanted the software to “emerge” from the hardware, from the bottom up, so to speak, The code would make maximal utilisation of minimal sensor data input. Petit Mal has had four successive sets of code, each increasingly more subtle in its adaptation to the dynamics of the device and more effectively exploiting the minimal processor power (one 68hc11).

The heart of the mechanical structure of the robot is a double pendulum, an inherently unpredictable mechanism. Emblematically, this mechanism stands for the generative principal that the machine, as a whole, is unpredictable, and a little “out of control”. This is the logic behind the choice of name for the robot, in neurological terminology, a Petit Mal is an epileptic condition, a short lapse of consciousness. The humour of this notion originates in the way in which it is contrary to the conventional idea of “control” in robotics. Petit Mal has essentially no memory and lives “in the moment”. The code, while not adhering to a subsumption model, has strong sympathies with bottom up approaches. My approach has been that a cheap solution (in labour, money or time) to a particular problem which was 70% reliable was preferable to a solution which was 90% reliable but cost several times as much. Part of the rationalisation for this was that the very fallibility of the system would generate unpredictability, behaviour,
personality.

My approach has been that the limitations and quirks of the mechanical structure and the sensors are not problems to be overcome, but generators of variety, possibly even of “personality”. I believe that a significant amount of the “information” of which the behaviour of the robot is constructed, is inherent in the hardware, not in the code. My experience has shown that “optimisation” of the robots behaviour results in a decrease in the behaviours, which to an audience confer upon the device “personality”. In sense then, my device is “anti-optimised” in order to induce the maximum of personality. Nor is it a simple task to build a machine, which malfunctions reliably, which teeters on the threshold between functioning and non-functioning. This is as exacting an engineering task as building a machine whose efficiency is maximised.

3.3 Behavior, Interaction, Agency

People immediately ascribe vastly complex motivations and understandings to the Petit Mal. The robot does not possess these characteristics or capabilities, they are projected upon it by viewers. This is because viewers (necessarily) interpret the behaviour of the robot in terms of their own life experience. In order to understand it, they bring to it their experience of dogs, cats, babies and other mobile interacting entities. The machine is ascribed complexities which it does not possess. This observation emphasises the culturally situated nature of the interaction. The vast amount of what is construed to be the “knowledge of the robot” is in fact located in the cultural environment, is projected upon the robot by the viewer and is in no way contained in the robot.

Such observations, I believe, have deep ramifications for the building of agents. Firstly, any effective agent interface design project must be concerned with capitalising on the users’ store of metaphors and associations. Agents only work only because they trigger associations in the user. So agent design must include the development of highly efficient triggers for certain desired human responses. An application of semiotics is required. In his painting “Ceci n’est pas un pipe”, Rene Magritte encapsulated the doubleness of symbols and the complexity of representation. This signification can be used to good effect in agent design: a very simple line drawing of a pipe, for instance, triggers a rich set of associations in the user. However, for the same reasons, these associations, like any interface, are neither universal nor intuitive, they are culturally and contextually specific.

Another curious quality of Petit Mal is that it trains the user. Due to the desire of the user to interact, to play; no tutorial, no user manual is necessary. People readily adopt a certain gait, a certain pace, in order to elicit responses from the robot. Also unlike most computer-based machines, Petit Mal induces sociality amongst people.

4. Caucus

The goal of the project is to produce a group of roughly human scale robots, which interact with each other via the exchange of ‘language’ and individually generate social relations and behaviour. In this case ‘language’ is interpreted loosely, it is certainly not meant to mimic human language, except in the sense that it transmits interpreted, not raw data. Each robot, in the process of reacting to its environment, forms an “opinion” about its current situation. It
broadcasts this 'opinion' via linguistic tokens representing values for parameters, the
significance of which are “understood” by the receivers. Each robot enacts behaviour based on
a combination of the data received from its own local sensors and its 'understanding' of the
utterances of the other robots. The significance of such utterances is scaled by their relative
locations. The resulting behaviour is predicted to exhibit emergent sociality. This expectation is
based largely on the authors’ experience with another previous project “Sympathetic Sentience”.
Sympathetic Sentience is a multi-channel sound installation, comprising (an arbitrary number
of) communicating units, which exhibits emergent behaviour and self stabilisation. Sympathetic
Sentience is an extremely minimal system. it is assumed that an increase in the complexity of
information exchanged will result in an exponential increase in the complexity of resulting
emergent behaviour.

This community of robots will interact with people in the manner of Petit Mal. In the process of
such interaction the interacting robot will communicate its activity to the others. This
communication will produce reactions among the other robots. The combination of robot/robot
and robot/human interaction will thus produce an heterogeneous cyborgian community. The
product of the project will be a travelling exhibition which demonstrates the social robot
paradigm at the cutting edge of robotics research. The exhibition will be designed for use at
science museums, art and technology festivals and other appropriate events.

5. “Emergence” and “Behaviour”
It must be acknowledged that “emergence” and “behaviour” are rather loose terms and their
definition is somewhat self-reflexive. A system which manifests “emergent complex behaviour”
to one person may be an example of a chaotic system of a certain order to another viewer.
Likewise, a dimmer switch has “behaviour” in the same sense that a toaster is a robot. The
concept of “sociality” seems to offer the potential of more rigorous definition.

6. Imaginary Friends

Imaginary Friends includes with Caucus a mirroring virtual component, to create a hybrid space
of automata and human agents, embodied and online. The Imaginary Friends concept was
developed by Simon Penny, Dave Sagg and Jesse Reynolds Jan-July 1996. The embodied
agents of Caucus (Embots) share their space with a similar number of virtual agents (V-bots).
These V-bots, which inhabit a virtual space mapped onto, and corresponding one-to-one with
the physical compound of the Embots, are accessible online in a manner analogous to the
relation between people and Embots. Thus a hybrid cyborg community is constructed with
chains of communication. Online participants can only engage V-bots. V-bots engage Embots
and online participants, Embots engage V-bots and physically present participants. The
physically present participant interacting with the Embots may get the impression that the
Embots are also reacting to 'ghosts'. In fact they are reacting to the V-bots, which they regard
as the same species of beings as themselves.

Online interaction will include a real-time video representation of the exhibition space (available
perhaps from several perspectives) overlayed (in 3D) with representations of the V-bots. The
online participant can observe the interaction of the V-bots with the Embots, and the Embots
with both the V-bots and physically present participants. Online participant can control an avatar
in the V-bot space, which functions analogously to the presence of a person in the Embot space.