Body Tailored Space:
Experiments in Evolving Spatial Interactions

Nancy Diniz
Bartlett Graduate School, UCL, UK
n.diniz@ucl.ac.uk

Abstract

The way we perceive built environment is through our own physicality — through our senses and through our body's interactive movement, therefore I argue that an aesthetically more stimulating physical experience of a building will be produced if an effective connection to space through a more multi-sensory approach to architecture is recognized. This would be possible in a time-based architecture, where systems rather than pre-determination, that will propose through trial and error new spatial interactions that evolve their own performance while negotiating with human and synthetic systems. The methodology for supporting this hypothesis is executed over a design experiment that explores how architecture could enter into a dialog with its inhabitants and surrounding environment.

Introduction: developing a model for evolving spatial interactions

What I am interested in creating is a model (Figure 1) that describes the rules for generating evolving behaviours in architecture not the behaviours per se. The rules are constant but the outcome of the results varies according to the participant's feedback, environmental inputs and materials. It is my intention that the behaviour-making process will be part of the system itself or in other words that the system can evolve its own goals through a learning process. The purpose is to create conditions where the built environments are able to discover for themselves, ways of attracting and keeping the attention of its inhabitants.

A participative model of interaction should:

- create behaviours to get the maximum attention from users;
- modify its behaviours according to feedback; and
- evolve by suggesting new behaviours according to feedback.

Body tailored space: a design experiment

"Body Tailored Space" (Diniz 2007, 2008) is a physical performance space incorporating computer vision motion tracking, and real time sensor-actuated interactive membranes. This project looks into issues of embodiment as a way of stimulating the physical response of

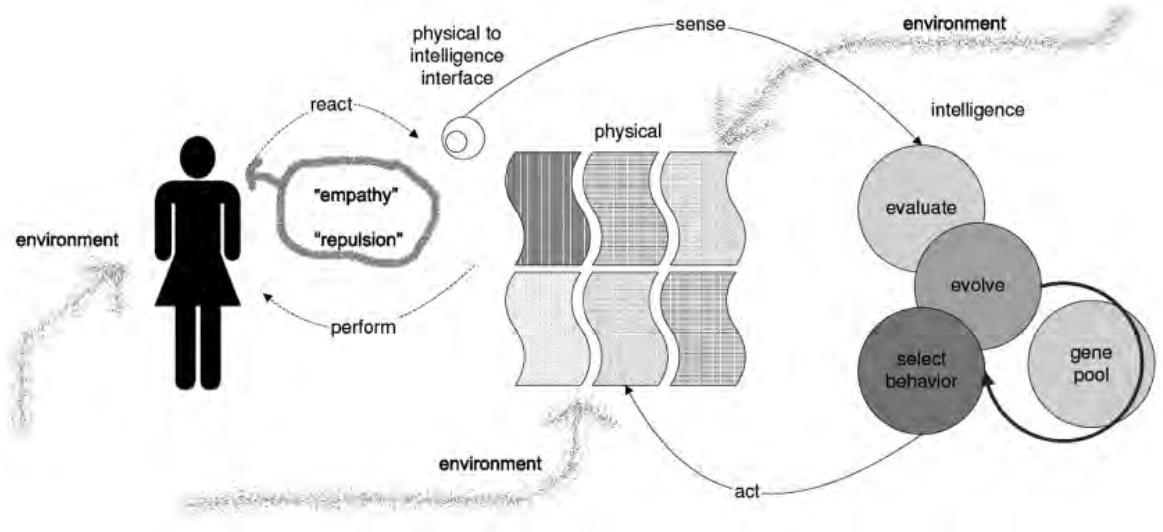

Figure 1: Sketch of a participative model of interaction

Figure 2: Membrane of "Body Tailored Space"

interactive surfaces. The system (Figure 2) continually senses the movement of performers and responds with a physical manifestation on the surrounding membranes. The membranes are controlled by a set of machine learning techniques that start to adapt and predict movement, not just reacting but suggesting movement creating a "give-and-take" relationship between body and space. The prototype's behaviour is the result of a system composed by sensors, microphones, web-cams, shape memory alloys actuators, and a genetic algorithm (GA) component. The dynamic of the system is made by levers actuated by the smart memory alloys (flexinol), different types of materials and textiles shaping the membrane, sound sources and LEDs.

The input actions of the users and the environment are inputs for the genetic variations. The main sensory unit is a web-cam and a video analysing program that determines the empathy or repulsion regarding the current skin behaviour by noticing at any given time how close the viewers get to the wall. These inputs change the behaviour of the prototype in shape, trigger motion and light and create patterns on the membrane.

The material should respond to "empathy" and/or "repulsion" from local and remote inputs. A wide range of possible behaviours can be generated, and are evaluated for their "fitness", based on some formally specified criteria. The wall begins its learning phase, by running a random set of behaviours (raising and lowering levers to form patterns), and will try to adapt its effect sequences to get the maximum "empathy" responses.

Conclusions and future work

The concept of this experiment is very inspired by the concepts of Gordon Pask (Pask 1976) and his ideas during his collaboration with John Frazer (Frazer 1995) at the Architectural Association. They very much argued that the central task of architecture is to provide opportunities for spatial enjoyment and unexpected interactions through specific materials and emergent interventions in the physical environment. Embodied systems are constantly being designed and re-designed through the interchange of information with the environment and people (Dourish 2001). These approaches to interactive design I believe hold exciting potential to generate interactions beyond the preconceived visions of the original designers, and create systems able to evolve to changing contexts over the lifetime of architecture. With this experiment I tested possibilities to enhance and broaden participatory levels and not just reactive levels of adaptation in space. The behaviour-making process is part of the system itself or in other words, the system can evolve its own goals through a learning process.

This model of interaction would make possible the creation of systems that have the capacity to store and react to information, exhibit behaviours, evaluate signals to display or inhibit behaviours, thus exercising "judgment and intentionality". Space within an embodied interactive approach is to be perceived not as an abstract and neutral space, but as space of "***lived experience***".

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