Life Speculatrix

an evolutionary physical skin based on local and remote feedback

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Contents:

Introduction

Interaction is the latest currency in architecture and art, as responsive components are now reacting to the inhabitant of the space. These components are designed and installed by the architect with a view to the phenomenology of space. However, this traditional approach to new technology leaves no scope for the architecture to be alive in and of itself, and thus the installed piece quickly becomes just that—
an installation: isolated and uncontained by its environment.

"Life Speculatrix" is a kinetic evolutionary physical skin based on local and remote digital environmental feedback. Direct user input plus RSS Environmental feeds, like pollution levels, climate features, retrieved randomly from around the World Wide Web will affect its performance continually interacting spatially and temporally with the environment and their inhabitants.
Looking at Situationism as an inspiration for alternative forms of HCI design with this project we argue that a Human Computer Interaction conceptual framework has to cross the phenomenological environmental matrix with the complexity of human input in order to create a truly living interactive experience and not just a detached interactive art device

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Concept

"Life Speculatrix" suggests a conceptual framework for spatial interactions that evolve their own expressive performance producing a continuous transformation.
The system has a responsive membrane controlled by a genetic algorithm that reconfigures its behaviour and learns to adapt itself continually to the evolutionary properties of the environment, thus becoming "a situated, living piece".
With our experiment we propose local and remote interaction: a "virtual drifting", created by different digital inputs from around the globe.
Participants here approach the environment outside of a goal-oriented frame, aiming to experience a new social, ambiences or moods that will affect a physical wall in an evolutionary fashion. All the necessary and sufficient conditions are therefore present for a hidden dimension to be added to a phenomenology and a poetics of visual space.

The goals are:
i) To create a responsive system as a "living", evolving material using sensor-computer-actuator technologies.
This material has the ability to act in a responsive way, thus communicating and constantly reshaping our perception.

iii) To develop artifacts and propose a mix of technologies as a way to augment the physical properties of responsive environments.

Design Description:

The prototype behaviour is the result of a system composed by:
- sensors,
- microphones,
- web cams,
- shape memory alloys actuators,
- a Genetic Algorithm (GA) component.

The dynamic of the system is made by:
- levers actuacted by the Smart Memory Alloys (Flexinol),
- different types of materials and textiles shaping the membrane,
- sound sources
- LED's

Design Method:

i) A GA involves a "genotype", which by definition is the "internally coded, inheritable information" carried by all living organisms. It is a string of code specifying a "phenotype" which is the "outward, physical manifestation" of the organism.

ii) Here, our "phenotype" is the shape of the membrane and the behavior of the actuators.

iii) The input actions of the users and the environment are inputs for the genetic variations.

iv) 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.

v) These inputs change the behaviour of the prototype in shape, trigger motion and light and create patterns on the membrane.

Machine Learning Feature

i) The material should respond to "empathy" and/or "repulsion" from local and remote inputs.

ii) A wide range of possible phenotypes can be generated, and are evaluated for their "fitness" , based on some formally specified criteria.

iii) The wall begins its learning phase, by running a random set of behaviors (raising and lowering levers to form patterns), and will try to adapt its effect sequences to get the maximum "empathy" responses.

There are 2 types of user responses/interactions:

Local mode:

(a) Empathy:
The user approaches the wall and stays close (< 100 cm) to the wall for 2 minutes or more.
(b) Repulsion:
The user approaches the wall (< 100 cm) and leaves after less than 1 minute.

Remote mode:

(b) The viewers connected to the internet have a virtual representation of the skin and two buttons:
:) Empathy
:(Repulsion

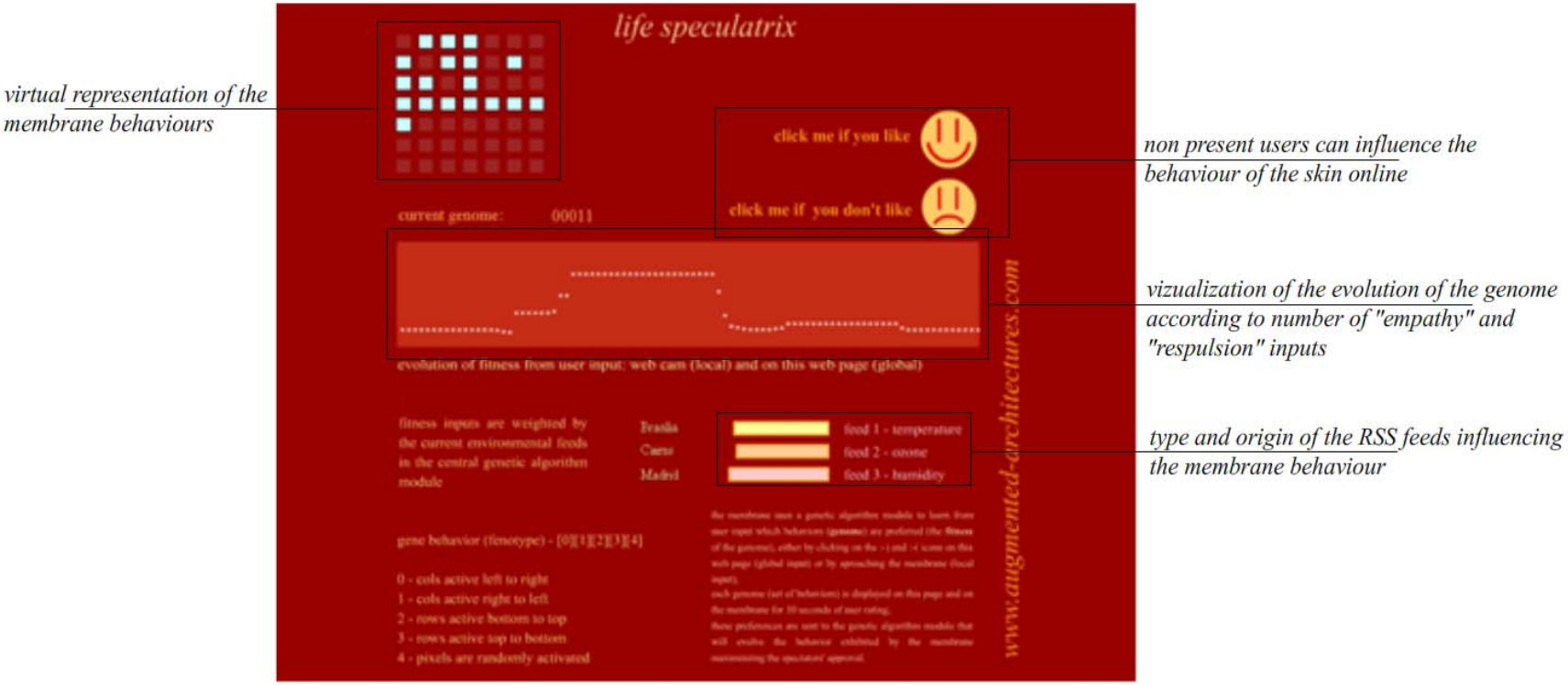

Fig.1. Interface for remote interaction, and local supervision: the evolution of genome and origin and type of RSS Feeds.

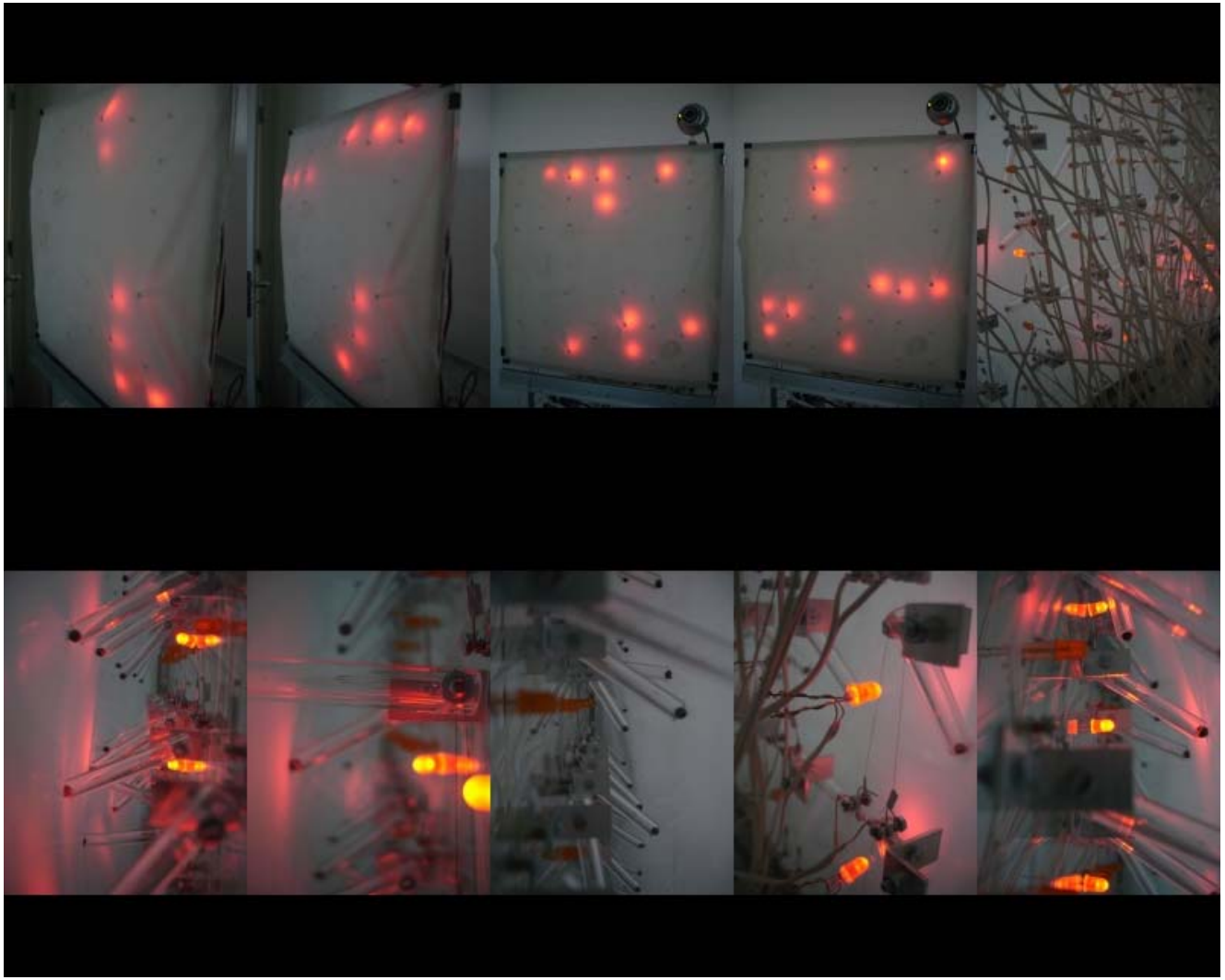

Fig.2. Images of the membrane and its actuators.

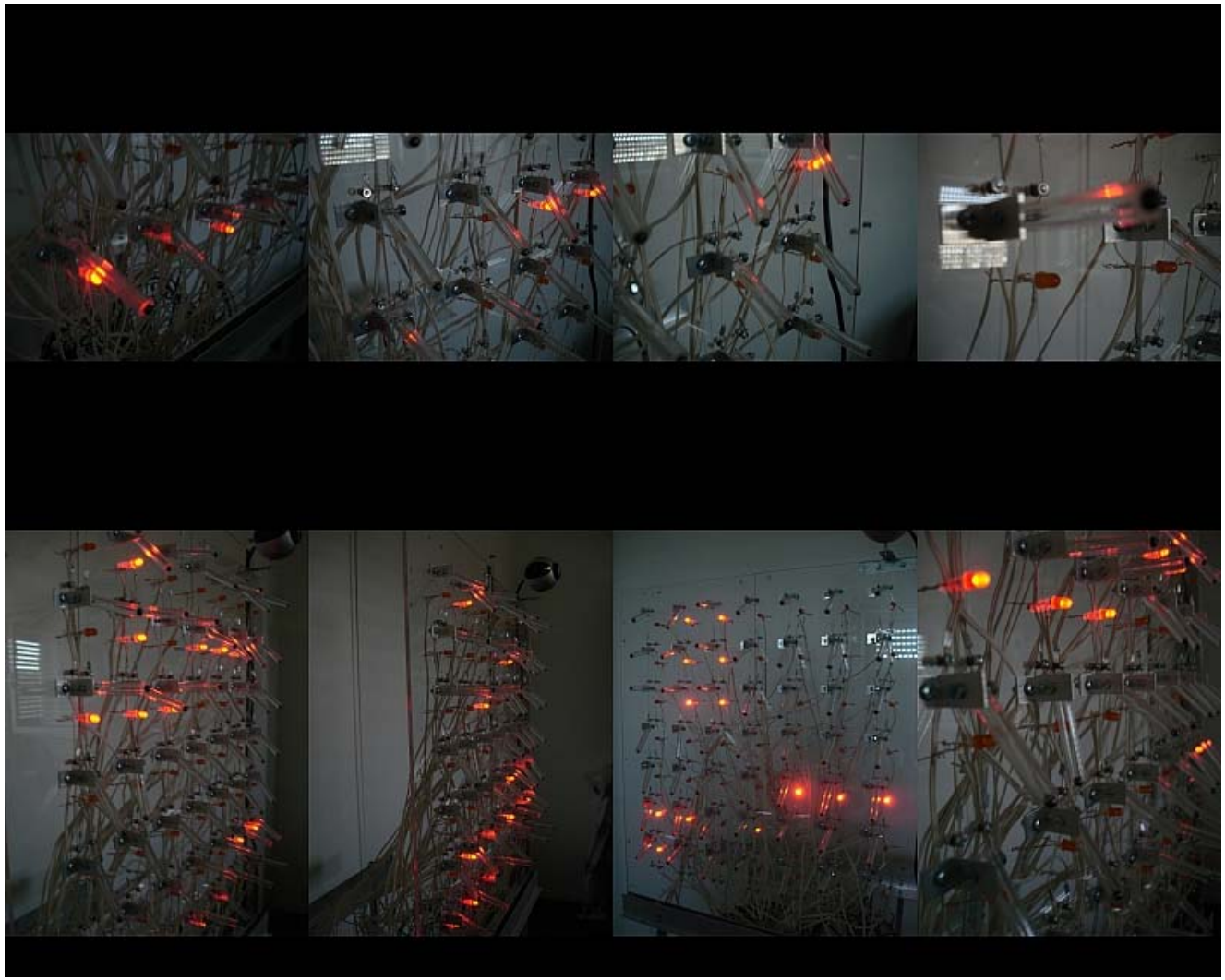

Fig.3. Images of the actuators and LED´s.

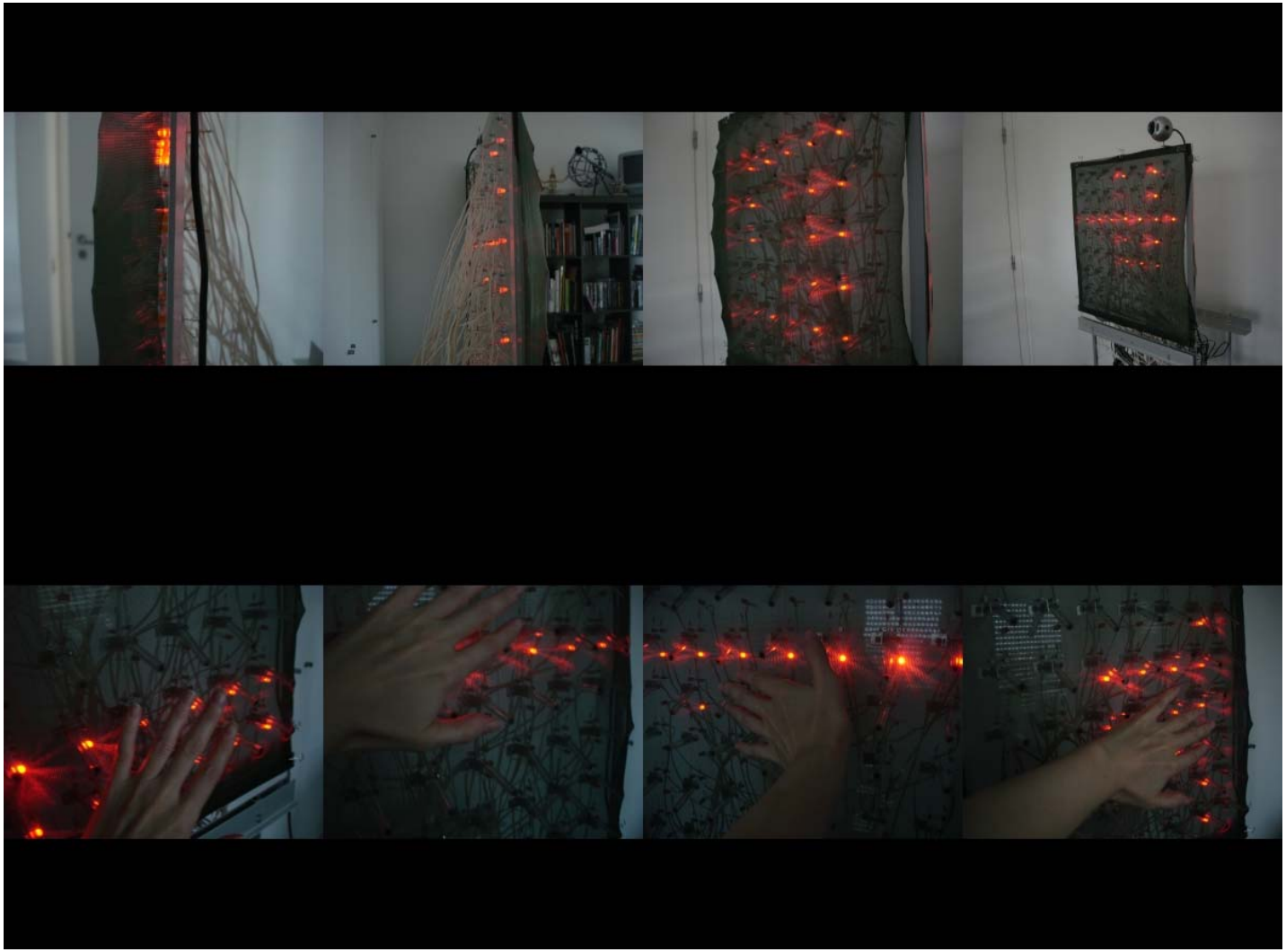

Fig.4.Images of user interaction with the membrane.

Related Publications:

Diniz, N. and A. Turner. 2007. Towards a Living Architecture, for Proceedings of ACADIA 2007 Conference "Expanding Bodies" Halifax, Canada, 1-7 October 2007.

Diniz, N., . Branco, M. Dias, and A. Turner. 2007. Morphosis: An Interactive membrane. For Proceedings of CAAD Futures '07, 12th International Conference, Sidney, Australia, 10-13 July 2007.

Diniz, N. and C. Branco. 2006. An Interactive membrane: Envisioning Physically Mutable Materials for Architecture. Second International Conference in Design Computing and Cognition '06, ed. J.S. Gero, Heindoven, The Netherlands [Poster abstracts edition]. 11-13 July 2006.