The Future of Collaboration: Exploring Two Cases on the Design of *Architectural–Robotics*

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Extended Abstract

FIGURE1. Left: Interactive Flower. Right: Inflatable Chair. (Authors)

This paper presents a collaborative effort to develop two *Architectural-Robotics* projects. This term defines architecture embedded with robotics and electronics to achieve certain levels of responsiveness and become architecture in action.

We once interacted with static things of stone, metal, wood. Recently things are becoming less and less "something to do something else" and increasingly "something that does something." [1] Things and especially architecture now acquire interactive properties: they sense, communicate, react and change.

This complex nature in which we explore *Architectural-Robotics* requires different design strategies and methodologies. The two projects here described were part of a *transdisciplinary* class at Clemson University where one doctoral student from Architecture and one from Electrical and Computer Engineering collaborate in search of new design processes.[1]

The Interactive Flower presented the challenge of designing an architecture to stimulate creativity in children. Initial collaboration produced a vision of an installation as might be found in a children's museum. The space would include elements of flora and fauna designed to interactively cultivate a child's creativity by affording a hands on experience involving basic cycles found in nature. The prototype developed would be part of a larger environment containing dozens of different interactive flowers or other species of flora and fauna. Together the robotic components present different interconnected puzzles where children learn basic concepts in nature. The built prototype used optical sensors to detect placement of growth components to trigger an actuating servo motor creating a real time human-robotic experience.

The Interactive Inflatable Chair challenged the team to create an architecture for a population aging in place which faces an increasing in-life time expectancy and requires special space conditions as it grows old. For most senior citizens, mundane activities such as sitting, sleeping and getting up can be difficult. This project defies traditional low-tech and conventional domestic environments, creating a piece of furniture which morphs to accommodate multiple uses.

[1] More information on this class can be seen at: http://workgroups.clemson.edu/AAH0503_ANIMATED_ARCH/academics-ARCHrobotics.htm

The Inflatable Chair is designed as a spine with three degrees of freedom where multiple motors with robotic actuation bend its shape affording different sitting configurations, an architecture which senses variations in body position and changes shape slightly adapting to everyday living circumstances.

A built prototype was designed in a 1:5 scale space allowing the authors to experiment with its multiple degrees of freedom, robotic actuation, and levels of responsiveness.

The two projects presented demonstrate collaboration between architects and engineers in search of novel possibilities towards *Architectural-Robotics*. Both the Interactive Flower and Inflatable Chair prototypes demonstrate the beginning of an architecture for real time interaction. Such levels of interaction are designed to help improve space and life conditions of the inhabitants.

Such projects have as goal to support human activity, respond naturally, and perform according to our necessities; such interaction must complement and redefine our urban living patterns. More than the technological condition, answers to life problems and opportunities must come from the way these technologies, embedded in architecture, help forward the interaction across people and their surroundings to create places of social and psychological significance.

Citations

[1] Manzini, E. *The Material of Invention: Materials and Design*. Cambridge, MA: The MIT Press (1989), 40.