Topic: Plant bio-actuation and novel interactions

Project IGR205

Supervisor

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Live plant bio-actuation

Description

Plants are usually considered as immobile living organisms always stationary in their habitats or gardens. However, plants do exhibit movements ranging from circumnutation in seedlings, sleep or circadian rhythm actions, tropic responses to movements of climbing plants. What if such plant movements could be re-appropriated for digital interactions?

Researchers in the field of Interaction Design have traditionally looked at artificial devices and displays, and thus interaction primarily revolving around such electronics devices. However, our natural interaction mechanisms with humans or other species are subtle, unlike with our digital devices. While researchers have previously used living plants as passive information displays [1], what if we were able to connect our digital functions with natural plant responses? A nascent field of interaction design, where biological organisms may be connected with digital interaction, is now upon us. Through this project, we explore the potentials of biohybrid interfaces, in the context of living plants.

Goal

The goal of this project is to interface the capabilities of a living plant with a digital function to establish bidirectional input-output. We will specifically look at leaf movements of a Mimosa Pudica or a Venus Flytrap plant, and connect them with a custom software to prepare a bioactuation interface. Three students are able to work on this project to prepare an initial biohybrid circuit. Students are then encouraged to think outside the box for research applications of such an interface. What if there one plant movement triggers another plant movement at a different location? What actions/notifications on phones or routine activities in home are suitable for plant bioactuation? The students will then implement this application showcasing specific scenarios that leverages and showcases this novel type of interaction. Each group is expected to meet once a week with their supervisor and discuss their ideas and the direction of the project. The students will be provided with the relevant living plants and initial circuitry for plant actuation.

Attention: The first half of the project, Prof. Sareen will be supervising the group remotely from New York and later in the year (depending on the COVID situation) physical meetings will be possible. The students will get support by Jan Gugenheimer on issues that need to be addressed in person.

[1] Holstius, David, et al. "Infotropism: living and robotic plants as interactive displays." *Proceedings of the 5th conference on Designing interactive systems: processes, practices, methods, and techniques*. 2004.

Prerequisite

- Arduino and basic embedded programming
- Basic understanding of Human-Computer Interaction (HCI) Methods
- Basic understanding of biological mechanisms (high-school level)

Acquired skills

- Being able to apply a research driven design process for HCI projects.
- Being able to look at analogies of plant physiology through the lens of chemical signaling
- Being able to create electrical circuits with plants in the loop.
- Basic famliarity with the cuting edge concepts of bionic materials and design with/for non-humans
- Outstanding projects will have the option to contributing to a scientific publication or exhibitions in art galleries around the world

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