

3D-Printing Insect Habit

Brief Description of Design Project Goals:

Overview:

We are interested in the potential of robot collectives for parallel task execution. Such systems are inspired by social insects in nature, where thousands of relatively simple individuals coordinate with no central point of control. Unfortunately, such colonies are notoriously hard to study and little is known about how they organize. Here, we will attempt to develop new tool sets to automatically gather large amounts of data to verify old or prompt new hypotheses. In other words, the goal is twofold; to design tools to help analyze and learn from social insects in nature, and using this knowledge to implement robotic swarms capable of long-term autonomous behavior in complicated real-life settings.

Specific MEng Contribution:

The students will work together to modify a low-end 3D printer, such as a Makerbot, to print reliably using mud. These mud structures will consist of 2.5D surfaces used to test the response of various insect species to geometrical features. This project will involve modification of a G-code compiler, implementation of a pump and related driver circuitry for mud extrusion, as well as testing of various mud consistencies. The outcome will be evaluated based on the resolution and accuracy of the printed structures; the students should aim for a resolution better than 0.5mm. Weekly meetings will be held to assure progress of the project.

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Project Web Site:

<http://cei.ece.cornell.edu/research-2/mound-building/>

Number of MEng Students Needed:

2-3

Required Skills:

Smart, motivated, and creative students interested in 3D-printing, hacking, and practical implementations. Knowledge of programming (C/C++ or python), Solidworks, and rapid prototyping is required. Experience with DIY 3D printers, microcontrollers, sensors, and/or motor drivers a plus.

Estimated Project Time Frame:

2016-17 Academic Year, Two (2) Semesters