F26.09 Development of a new concrete mixture for 3D printing using local materials

Overview

Additive manufacturing in concrete construction is an emerging field significantly impacted by innovative materials—an area that is generating substantial interest in academia, federal agencies, national labs, and industry. A 3D concrete printer continuously extrudes layers of a cement-based mixture from a nozzle to create the desired building elements. Many proprietary 3D concrete material blends exist. However, the objective of this I2S project is to begin developing a local concrete mixture focused on using local materials available in the Flagstaff area, Verde Valley, and Phoenix Valley. Work related to creating local and regional concrete mixtures that can be 3D-printed is required to make this technology more widely accessible.

What the student will DO and LEARN

A student intern will work directly with faculty members, undergraduate students, and graduate students who are actively using the 3D concrete printer to learn how the technology works. It is envisioned that a student intern will learn how to integrate the web-based proprietary user interface with student-created STL files and modern slicing technology; success in this step leads to printing objects with local concrete mixture ingredients. It is anticipated that the I2S student will complete hands-on work in the 3D printing laboratory (069-117) to meet the following objectives: (1) Complete a 3D print with a proprietary concrete mixture while analyzing the ingredients, batch consistency, and material workability; (2) Re-complete the 3D print with 1-2 concrete mixture using local materials; (3) Analyze performance of the mixtures during Objectives (1) and (2) and recommend how to optimize ingredient

Additional benefits

Students involved in this internship will benefit from learning how to create concrete objects using cutting edge technology. This advantage may lead to more employment-related discussion with regional employers, and it will establish that the student is an active and responsible learner who can adapt and flourish in a diverse and fast-paced environment.

Additional qualifications

Beneficial but not required: experience with filament, resin, or clay-based 3D printers and the required software.

Time commitment

6 hrs/week for 30 weeks