Welcome Machine: workflows for the at home fabricator

Zach Seibold | Erin Hunt | Nathan King

Abstract:
The translation from design to realization is mediated by a range of tools and processes whose development is informed over time by material properties, skill, technology, and culture. As a whole, these systems are the vehicle by which design teams, manufacturers, installers, and ultimately users engage the materiality of architecture. Parallel technological developments relating to the way in which things are designed (digital modeling, simulation, generative design, etc.) and the way things are made (automation, computer-controlled equipment including robotics, advanced materials, etc.) have afforded new opportunities and challenges related to the realization of new forms in architecture, part customization, user-centered design, and enhanced building performance.

While these technological advancements have radically increased the diversity of achievable material effects in design and architecture, the industrial fabrication technologies at the core of this production method are only just being considered as a venue for design intervention or creative exploration. Additionally, access to standard industrial machines, typically housed in large-scale fabrication facilities, has been fundamentally disrupted by the Covid-19 pandemic.

Within this context, this workshop positions material systems and the numerically controlled machines which manipulate them as a venue for speculative design research in an at-home setting. It is intended for students, researchers and practitioners interested in methods for
designing, prototyping and simulating custom, numerically-controlled material processes.

Participants will learn the detailed steps for machine implementation and gain an understanding of performance possibilities. The workflows will be demonstrated via the assembly, programming, simulation and operation of a modular, digitally controlled 3-axis fabrication machine developed by the workshop team as part of a course at the Harvard University Graduate School of Design.

A second phase will focus on strategies for the development of a novel material process and will leverage the machines fabricated in the first phase to prototype a machine designed to generate a specific material effect. It will examine the specific demands and opportunities of at-home fabrication research.

Requirements:
To achieve the best experience, participants are asked to have windows-based laptop running Autodesk Fusion 360 and Rhino/Grasshopper 6.0+. Additional software will be provided by the instructors.

Bios:
Zach Seibold is a Lecturer in Architecture at the Harvard University Graduate School of Design and a Research Associate with Harvard's Material Processes and Systems (MaP+S) Group and Laboratory for Design Technologies. His research asks how emerging fabrication techniques and material technologies can impact the production of architectural form. Seibold's work has included the development of integrated digital workflows for novel fabrication methods ranging from 3D printed ceramics to magnetically-controlled casting processes. He received a Master of Design Studies with a concentration in Technology from the Harvard Graduate School of Design and a Bachelor of Architecture from Syracuse University.

Erin Hunt is pursuing a Master in Design Studies in Technology at the Harvard Graduate School of Design. She is a computational designer whose research interests include applications for additive manufacturing technology. She holds a Bachelor of Architecture degree from Iowa State University.

Dr. Nathan King is active in industry, practice, academia and policy, and works to create opportunities at their intersection. King is senior industry engagement manager for the Autodesk Technology Centers where he develops applied research within Architecture, Engineering and Construction, and contributes to the development of strategic initiatives related to robotics, automation, and the future of construction. King is currently a faculty member at Virginia Tech where he is co-director of the Center for Design Research (CDR) and leads design technology and impact design initiatives. He is a regular lecturer at the Harvard University Graduate School of Design and University of Pennsylvania Weitzman School of Design in robotics and autonomous systems in design.