Evolving modes of representation and communication continue to redefine the flow of information between designer, fabricator and manufacturer, while nimble means of fabrication recalibrate customization. As various types and scales of design practice reveal, opportunities for strategic collaboration between designer and fabricator abound. The work illustrated is the result of the first phase of a university – industry partnership with a global manufacturer of metal façade systems. Our industry partner sought to capitalize upon the alternate perspective the students and by extension the academy afforded to reconsider the standard metal façade panel that has served as the core of their business. We sought to structure a collaboration that strategically leveraged the material expertise of our industry partner while encouraging structured experimentation by the students. The resultant sponsored course relocated the design process from the studio to the lab, moving design decisions upstream to include considerations of tooling and material processing as inputs for design experimentation. This first phase of the partnership decontextualized the work from the building façade and the technical challenges of enclosure systems, to provide student teams with sufficient opportunities to develop and refine processes of robotic metal forming.

Our partner was motivated by a desire to use the collaboration to stimulate a broader discussion within their organization about the business model and corporate culture of standardized production. Engaging future architects (students) in processes of procedural and material experimentation provided a means to understand generational values while also providing fresh perspective and vision to products that are often seen as conventional and pedestrian.

Our collaboration relied upon the robotic fabrication facilities at our university to develop workflows that afforded versioning processes to explore alternative ways of forming metal sheet. Our partnership sought to leverage the robustness and precision of industrial robots to explore a limited number of sheet metal forming techniques that, by virtue of their recalibration, afford a subset of formed panels. Simple adjustments in robot tool position, rotation, force, etc. informed the behavior of the material and contributed to a range of possible outcomes or versions. Three distinct trajectories of research emerged that can be described through techniques of folding, buckling, and incremental forming. Each sought to reduce the need for material preprocessing, such as cutting or drilling of the sheets, in order to economize the workflow through the least number of tools or actions while yielding a range of potential versions.

The collaboration provided our student cohort with the perspective and rigor of industry and challenged the frequent desire for ultimate design freedom and its association with complete customization. The fabricated results and dialogue with our partner centered on the establishment and negotiation of constraints that were informed by the design motivations of our students and the seasoned expertise of industry. The partnership served as a means to explore alternative trajectories of design and fabrication that leverage material behavior and high fidelity fabrication to reveal a spectrum of possibilities.
DUCTILE EMPICRISM: Industry sponsored coursework at Carnegie Mellon University
Jeremy Picca

Evolving models of representation and communication continue to redefine the flow of information between designers, fabricators and manufacturers, while new modes of fabrication reorient fabrication. As various types and scales of design practices emerge, opportunities for engagement in fabrication between designer and fabricator abound. The work articulated in this project involves a specific industry partnership with a global manufacturer of metal facade systems. The resultant outcomes investigated the design processes from the studio to the lab-workshop, rethinking design decisions upstream to include considerations of testing and material processing as inputs for design experimentation. This first phase of the process is contextualized for a work from the building facade and the technical challenges of enclosures systems, to provide students bearing with sufficient opportunities to develop and refine processes of robotic metal framing.

Dialogue with our industry partner revealed a shared interest in leveraging the robustness and precision of industrial approaches to assemble a locked-surface metal framing technique that introduces the potential for customization in a manner that can leverage potential mass production and types of surface treatment. The work sought to recast the necessity for die, stamps or molds. Instead, students adopted a robot tool position, design, fabricate, that advanced material behavior and contributed to a matrix of possible decorative or structural. These distinct branches of research emerged that can be described through techniques of bending, forming, and incremental forming. Each sought to reduce the need for external pre-processing, such as bending or twisting of the sheets, in order to minimize the work-flow through the least number of tools or actions while permitting a range of potential variations, each with distinct visual characteristics.

Materials

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