

CNC Adaptable Molds for Thin Shell Structures

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Abstract

Recent innovations in CNC (computer numerically controlled) fabrication are promoting remarkable research into form-making in architecture. Unfortunately, the material waste of methods such as CNC routing is often costly and environmentally harmful. In addition the capital cost of the equipment itself is also prohibitively high. Is it possible to realize the advantages of CNC technology – adaptability, precision, and automation – with processes that are material conservative and economically modest?

CNC adaptable molds would be less expensive and less wasteful than current CNC processes. I propose to design and build a prototype CNC adaptable mold for fabricating large-scale (2ft by 4ft) cast concrete or fiberglass panels. My prototype mold would use a flexible aluminum honeycomb sheet as a deformable bed on which material could be laminated or poured. This honeycomb would sit on a matrix of 12 vertical motorized pins controlled from one computer running a 3D CAD program. Such molds could change shape to hundreds or thousands of different parametrically related configurations. Since an adaptable mold avoids the wasteful cutting process typically required to fabricate a mold, it will be more economical and have less environmental impact than current processes. I will demonstrate the application of this mold by casting several unique panels on the mold and assembling these panels into a single selfsupporting thin-shell structure. My ultimate goal is to understand how automated and motorized fabrication equipment designed by the architect can enable innovative construction. This research has a broad range of architectural applications from mass customization of prefab homes to façade construction of complex singular buildings. This funding will partially support research for my Masters of Architecture thesis. I am entering this proposal in the student category of competition.

