The Redefinition of Ornament
Using Programming and CNC Manufacturing

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Abstract: Architectural ornament, the art of decorative patterning, is commonly perceived as an historical characteristic which declined in the beginning of the 20th century. The lecture of Adolf Loos in 1908 “Ornament and Crime” can certainly be seen as a crucial contribution in the architectural discussion about the exclusion of ornament. Although the modernist emphasis on unadorned form, the upcoming international style and the replacement of craftsmanship by the rise of mass production yielded to a systematic elimination of ornament, we are experiencing its revival in contemporary architecture through experiments using digital technologies. This paper describes our ongoing research and teaching activities in the field of architectural ornamentation, surface modeling and texturing, as well as the related CNC manufacturing processes.

1 INTRODUCTION

In our work, different course environments and research projects have been developed which deal with the production of ornament Using Computer Aided Architectural Design (CAAD) & Computer Aided Architectural Manufacturing (CAAM). In each case the working method focuses on the complete production cycle, from the generation of the digital ornament to its final production. This complete work process is important in our methodology as each of the stages is interdependent.

Digitally generated ornament equates well with the concepts of mass customization and CAAM production in architecture. Ornament declined dramatically in the late 1800s through the standardization of building components, due at first to the industrial revolution, and then subsequently to the rise of the modernist style. This reduction of ornament in architecture can be directly attributed to the intensification of machines in fabrication. It is therefore ironic that a return to ornament may be possible through the use of CAAD/CAAM technology. The creation of varied ornament, especially when it is programmed, is a good test for mass customization from an architectural perspective.

The fundamental principle upon which this work was undertaken is the importance of working at the 1:1 scale. The result of any manufacturing method will leave traces

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of how it was made. If these traces are to be exploited for an aesthetic value then it is important that these “artifacts” be viewed and evaluated at their true scale. Within the university context this goal of working at 1:1 obviously cannot be applied on complete buildings, but only on building components, assemblies, or objects at the furniture scale. This immediacy of scale and fabrication is another reason why we are dealing with the issue of ornament.

This paper is structured in three chapters. The first chapter discusses different approaches to the generation of digital ornament, the second outlines the procedures used in the production process, and the final chapter illustrates the processes with examples from courses and research and actual projects.

2 DIGITAL GENERATION OF SURFACES

In both research and teaching we have developed three ways to create digital surfaces. Different methods allow for varying levels of complexity, both in terms of the skill required to create a surface, and in the intricacy of the final product. Levels of complexity are especially important in the context of teaching. It is essential that students can understand and control the processes in a way that facilitates an expressive and creative output, and likewise more advanced levels of complexity are required for subtle manipulations and sophisticated generation concepts.

2.1 Modeled Surfaces

Modeling of surfaces in 3D CAD software is the easiest approach to creating an ornamented surface topology, and for architecture students also the most intuitive. This work typically begins with manipulation and transformation of a NURBS surface using the digital tools available in the software of the students choice. This process is a direct analogy to “sculpting” a surface into the desired form for output. Although this seems straightforward, it is already important at this digital stage to know and understand which fabrication process will be used for the project output.

Figure 1 Surface modeling and production