

[n]DM: Networked Design Machines

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INTRODUCTION

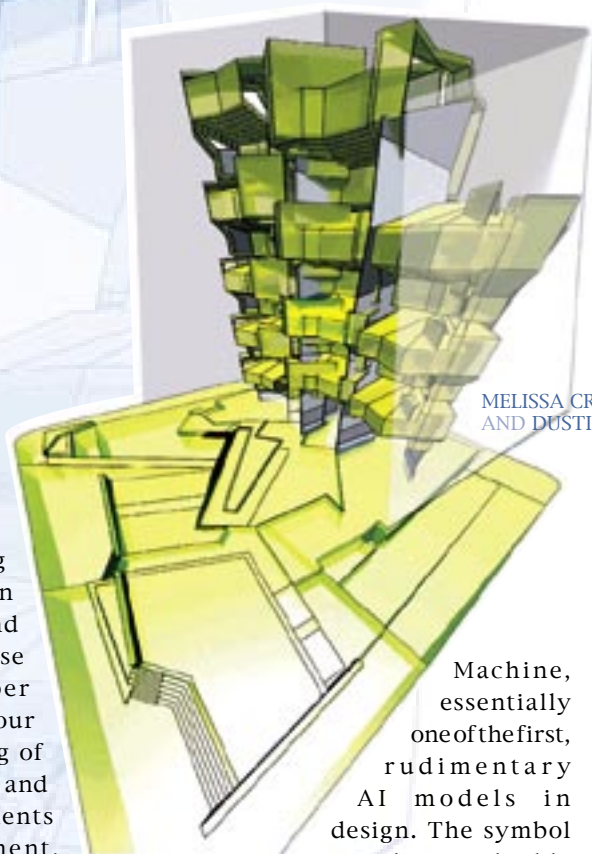
New developments in computer-aided design and manufacturing technologies are dramatically reshaping design thought and practice. The fast evolving digital design and digital production technology has deeply affected the way architects and designers work and collaborate with engineers; new forms and structures are being explored, the gap between design and production closes, complexity and standardization are dealt in new ways. The medium that founds and supports these links is computation: computer-controlled design algorithms visualize designs that would be difficult or even impossible to be described otherwise. Similarly, computer-controlled fabrication machinery produces designs that would be very difficult or even impossible to be produced otherwise. Our romance with drawings or even traditional models is attacked on both fronts: drawings can not begin to capture the complexity of some of the digital designs and alternatively drawings may be forever uninformed and asymptote with specific discourses suggested by materials and technologies at hand.

The College of Architecture at Georgia Tech has taken several initiatives to explore these new interfaces of design thinking and making; these initiatives include a new MS/CCC program in Computation, Composition and Construction, a new Interoperability Lab, new classes in Digital Fabrication, and a reconstruction and rethinking of the course on fundamentals of Design Computing. Various areas of studies are explored and currently include formal models of composition,

parametric modeling, shape grammars, building product models, design for fabrication, and building information modeling. All initiatives collectively provide an overview of these existing trends, critically reflect on the discourse produced, and engage into research in these new trajectories. The paper here sketches one of these four initiatives, the restructuring of the Design Computing Course, and outlines the major components of a networked environment, codenamed [n]DM, that was designed to facilitate design inquiry in these new areas of discourse. Illustrations from the first run of the experiment are interspersed in this text and they all show how digital modeling technologies, especially **form-Z**, were used creatively to support evolutionary, collaborative design.

2. FRAMEWORK

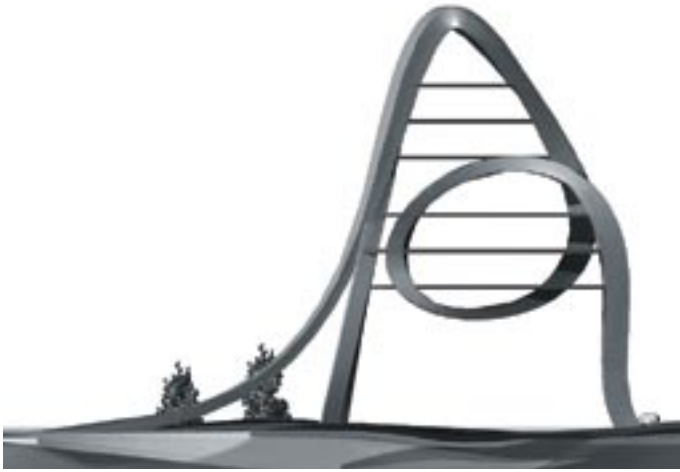
[n]DM is a collaborative design environment for teaching formal theory of composition in architecture using CAD tools. The whole project has been built up from scratch for the teaching of the introductory course to Design Computing at the College of Architecture at Georgia Institute of Technology. The project is based on two key ideas: The Design Machine as an algorithmic structure for design (Stiny and March, 1981) and the Meme Machine (Blackmore, 1999) as an evolutionary model for design. The title is derived from the concatenation of the terms [n] and DM: The symbol DM stands as an acronym for Design



MELISSA CRUISE
AND DUSTIN FIKE

Machine, essentially one of the first, rudimentary AI models in design. The symbol n stands in a double referential manner as an arithmetical quantifier denoting the chain relation of several design machines but also as an index of the collective authorship that emerges out of the continuous reshuffling of rotating authors-designers and the continuous reworking and transformation of some initial design ideas.

The project applies and extends the structure of the Design Machine in a two-fold way: All original components of the initial model, the Receptor, Effector, Theory and Language are still used to model design activities and processes, and they all combine with one-another in a recursive manner to account for the multiplicity of the authors-designers (design machines) in the networked environment. The structure is also used to model the virtual representation of the environment itself by mapping one-to-one key parts of the collaborative space (briefs, lectures, software tutorials, architectural languages, threaded discussions, vote, agora, and so forth) to the components of the model themselves.

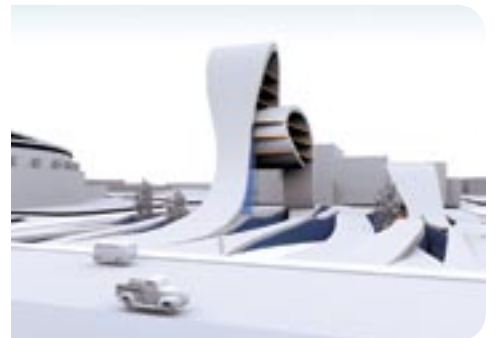
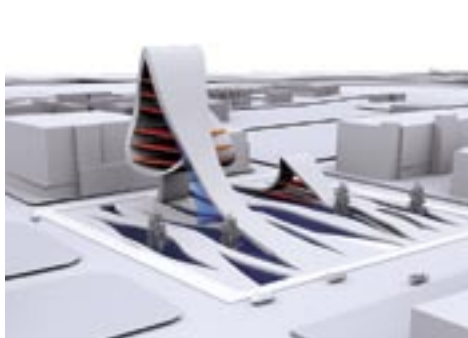
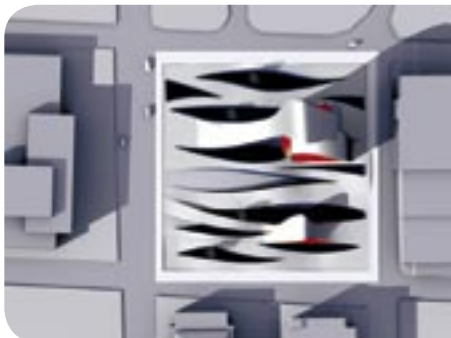
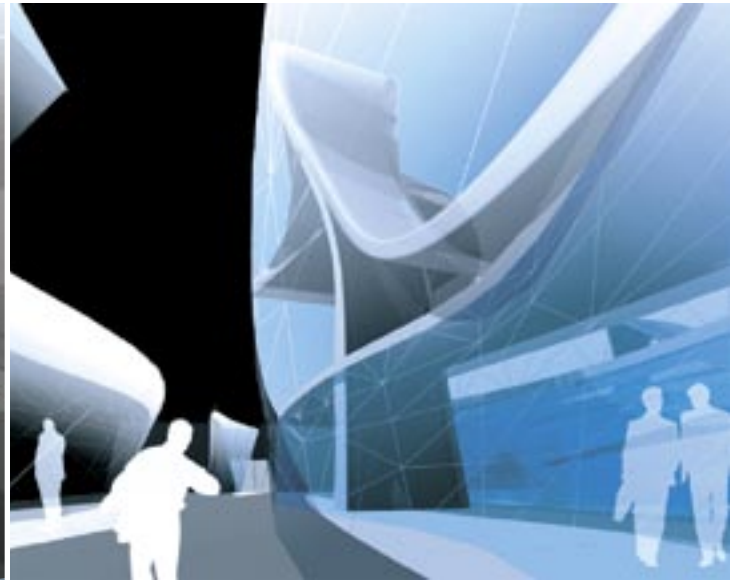
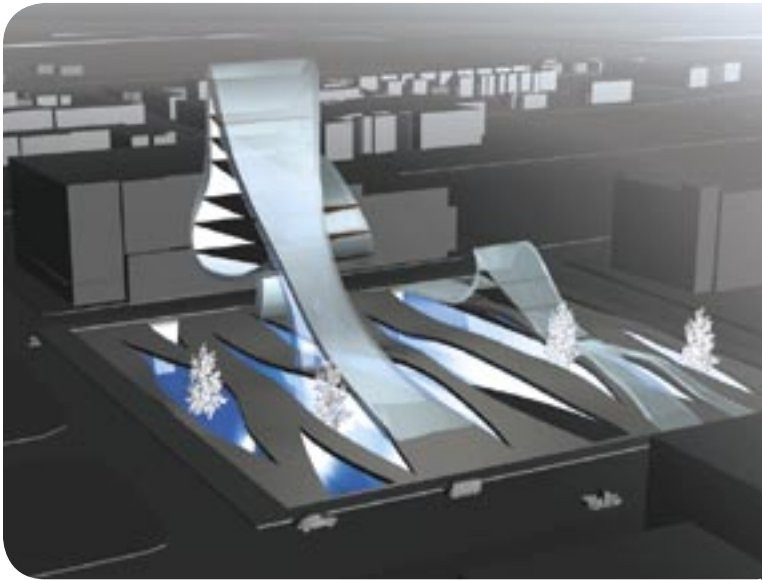


EHRET TOUATI, 2nd Year, M.Arch
 In-between Earth and Sky

"I've been told that the justice should be accessible to anybody, says the man....Do not attempt to enter without my permission, says the guard. I'm very powerful." (Kafka, The Trial)

This position statement drove us to the idea of having a courthouse treated as an manifest accessible space. Against the typical typology of the block inserted in the center of the site, we experimented with the different ways of having spaces underground, spaces hovering above and in-between spaces. This allows us then to get closer to the idea of the public plaza, a gathering space in reference to the old Greek agora. The ground, or the plinth, is the interface between the public,

circulating on the plaza and the courthouse services underground. The visual interaction is introduced by several patios bringing in the necessary light to the underground offices. The offices have been designed as longitudinal cuts on the plinth, appearing as dramatic urban gestures. The result is a series of bands along these patios. The courtrooms are growing from the topology of the ground, distorting, stretching and bending it, generating a loop and warp in the air. This relentless sculptural ribbon expresses the critical value of the interface between the state and the citizen.





KIM SIEBIEDA, 2nd Year, M.Arch
Absolute | Relative

..Roe vs Wade. Marbury vs. Madison. Plessy vs. Ferguson. Brown vs. Board Education. Dredscot vs. Sanford. It was Self-defense. Constitutional amendments. Innocent Until Proven Guilty. There are two sides to every story...

The Courthouse is organized by a public ramp that interweaves the cross-section of the building and alludes to a “cross-section” of justice. Each landing becomes a destination where the public can

interact with certain restricted/working functions of the program (i.e.: libraries, clerk of courts office, record files, etc). The ramp keeps a secure control over the public, but at the same time allows a freer movement of the people (not just restricted to elevators and small gathering places outside the courtrooms. The front skin becomes an area for the public to occupy, an interstitial zone that balances the interior space of the courthouse with the outside city and celebrates the public as the joint between the two spaces.

2.1 Receptor

The receptor component of [n]DM is comprised by a list of briefs specifying various design tasks and a list of student teams rotating in a bi-weekly fashion. Team formations are done once briefs are given within the area of the receptor and no author is allowed to stay within the same team formation or the same project. Several components have been designed to automate the process: electronic forms for submission of author-ID, tokens of personality, representative work, checks for compliance with the rules, and so forth.

2.2 Effector

The effector component of [n]DM is the graphical representation of the design process followed within the course of the semester: paths of processes, evolution of designs, hybridization of rules and so forth.

2.3 Languages: -neo, -post, -meta

The language component of the [n]DM is the list of design solutions generated by the design teams during each study. One of the most important aspects of [n]DM is its claim in structuring languages of designs (sets of designs) in four phases,

each related to some first language in a hierarchical way; these four phases are denoted here as languages, neo-languages, post-languages, and meta-languages. The transformations involved in the generation of these types of languages sometimes nicely parallel the rising complexity of the hierarchy of geometric transformations (March and Steadman, 1974, Mitchell, 1992) with its corresponding entries of isometries, affinities, linearities, topologies and destructive transformations, while other times linkages with other formal systems including shape grammars and transformational grammars (Stiny, 1990, Knight, 1994) are preferable. And still new interpretations that explain spatial transformations involving hyperbole, ellipsis, metaphor, allegory, and irony are introduced and cast in a constructive manner. The initial language for the first run of the experiment was selected from the early work of NY5 (Eisenman et al, 1975).

2.4 Theory

The theory component of [n]DM is a series of lectures on digital design media, tutorials on specific software packages, and a public domain involving

a threaded discussion generated by the participants of the environment that questions, interrogates, and reflects on the subject-matter of the course. Ideas of fitness of program to the existing designs populating the language part are tested here. The lectures provide a framework for a systematic presentation and understanding of a variety of digital design media and their applications in architectural design and production. The lectures and tutorials component is divided in three sections, with the outer two extremes providing the introduction and a reflection on the field, and the middle one tackling systematically a variety of different digital design media and their applications in analysis and synthesis in architectural design and production. This middle body of lectures and tutorials is further differentiated in three sub-sections, the first (media) being a systematic exposition of spatial systems starting from three-dimensional media, to two- and one-dimensional spatial media, the second integrating these spatial media with temporal media and behaviors (multimedia), and the third (hypermedia) introducing agency to the user that experiences and evaluates the design world.



AMICHANDWALA RANGWALA, 2nd Year, M.Arch
Symbolic Revelations

“Today technology destabilizes and transforms the modern age...caught in this endless upheaval, technology can be used to positive ends—to advance one of modernity’s greatest ideals; and that is social justice.” – Richard Rogers

The proposed Federal Courthouse at Charlotte, North Carolina, is a civic building which surpasses national boundaries. Here, literal and metaphorical transparency and structural ingenuity are synthesized into a dignified yet accessible expression of the law’s role in the modern American society. Through the process of design, an attempt is made to recast a major institution into accessible yet appropriately monumental expressions of justice—it intends to be a “non-monumental” monument. The proposed courthouse is organizationally dynamic, spatially dramatic, technologically innovative and institutionally imposing. With the courtroom devised as the identity generator of the courthouse, the building seeks to reflect not only the values of technological progress and civic renewal wall but all in all, the process of justice.

3. Discussion

An educational paradigm for collaborative design studies has been briefly introduced. The series of software tools used in this experiment privileges three-dimensional digital design media with the rest of digital media supporting the creation and interpretation of the three-dimensional spatial constructs. The design loop starts with the construct of three-dimensional spaces using **form·Z** in the first part of the course and ends using the Unreal Engine Runtime, a game engine authoring environment. The management of the course, the synchronous and asynchronous collaboration between the members of the teams, email, chat, threaded discussion, bulletins and so forth, is done with Lotus QuickPlace 3.0. A detailed description of the experiment and a complete documentation of the evolutionary paths of designs executed during the course can be found at: www.coa.gatech.edu/~economou/digital.

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