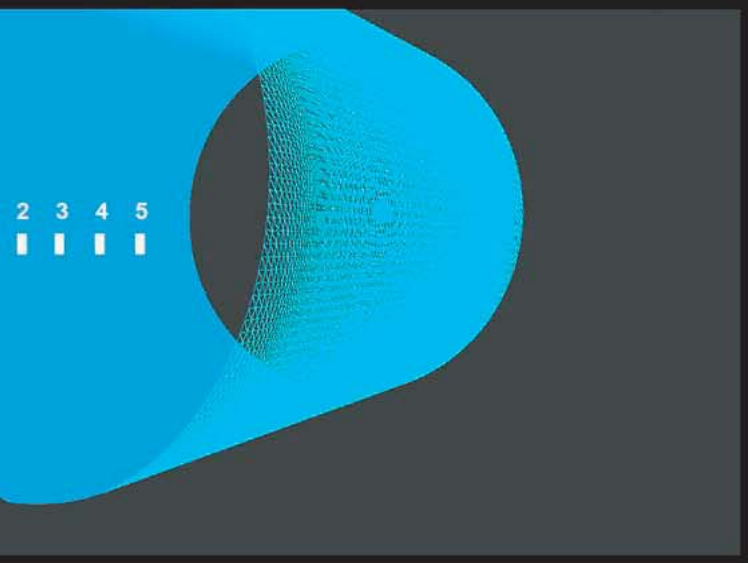
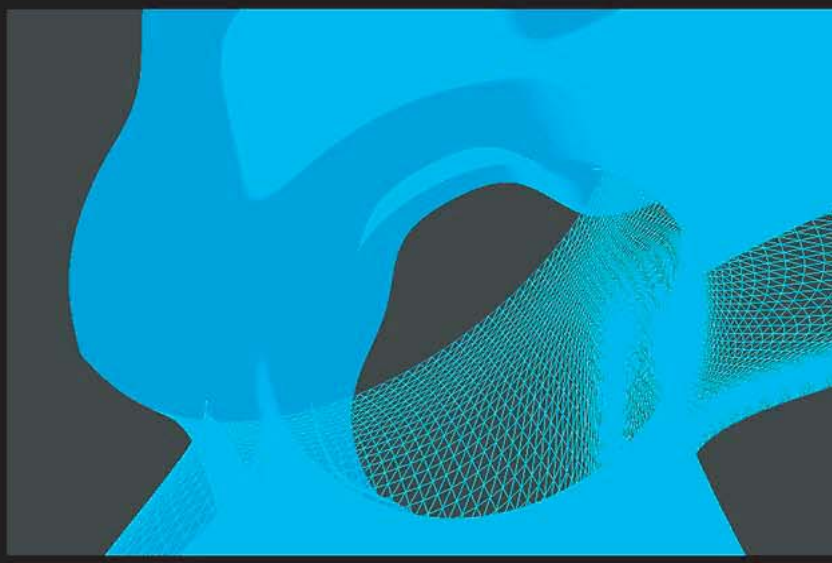
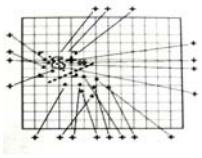




SYSTEM-EMBEDDED INTELLIGENCE IN ARCHITECTURE

H. Bier: Founded on the imperative to understand, evaluate and consciously decide about the use of digital media in architecture this research not only aims to analyze and critically assess computer-based systems in architecture, but also proposes evaluation and classification of digitally-driven architecture through procedural- and object-oriented studies. It, furthermore, introduces methodologies of digital design, which incorporate Intelligent Computer-Based Systems proposing development of prototypical tools to support the design process.

SYSTEM-EMBEDDED INTELLIGENCE IN ARCHITECTURE



Proefschrift ter verkrijging van de graad van doctor aan de Technische Universiteit Delft, op gezag van de Rector Magnificus Prof. dr. ir. J. T. Fokkema, voorzitter van het College voor Promoties, is het openbaar te verdedigen op woensdag, 21 mei 2008, om 12:30 uur door Henriette Hildegard BIER, Diplom-Ingenieur TU Karlsruhe, geboren te Arad, Roemenie.

Dit proefschrift is goedgekeurd door de promotoren: Prof. ir. S. U. Barbieri en Prof. ir. K. Oosterhuis

Samenstelling promotiecommisie:

Rector Magnificus, voorzitter
Prof. ir. S. U. Barbieri, Technische Universiteit Delft, promotor
Prof. ir. K. Oosterhuis, Technische Universiteit Delft, promotor

Prof. dr. T. Knight, Massachusetts Institute of Technology
Prof. dr. A. D. Graafland, Technische Universiteit Delft
Prof. ir. L. van Duin, Technische Universiteit Delft
Prof. dr. R. Oxman, University of Salford
Ass. Prof. dr. L. Sass, Massachusetts Institute of Technology

1. Tools and Processes:

1.1 Digital Design
1.1.1 Computational Tools: Topological Spaces, Isomorphical Surfaces, Motion Kinematics and Dynamics, Parametric and Generative Designs 1.1 - 1.6
1.1.2 Computational Processes: Collaborative Systems, Building Information Modeling 1.6 - 1.7

1.2 Digital Fabrication 1.7 - 1.12
1.2.1 Computer-Numerically Controlled Processes: CAD-CAM

2. Concepts and Methods:

2.1 Typology 2.1 - 2.2
2.2 Morphology [of the Double-Curved]
2.2.1 De-Formation and De-Construction: F.O.Gehry and Coop Himelblau 2.2 - 2.2
2.2.2 Software-Intrinsic Morphogenetic Features: Digital Design Strategies - The Curvilinear and the Facetted 2.2 - 2.6
2.2.3 Architectural Avant-Garde: Curvilinearity as Negation of the Past - Euclidean and Non-Euclidean Geometries in Architecture 2.6 - 2.9

2.3 Methodology
2.3.1 Diagrams > Patterns > Computations 2.9 - 2.10

2.4 Ideology
2.4.1 Principles of Digital Media Revisited 2.11 - 2.14
2.4.2 Hyper- and Super-Modernity: Digitally-Driven Architecture 2.15 - 2.22

3. Visions and Perspectives:

3.1 Organic-Inorganic Relations
3.1.1 Machinic Reasoning: Artificial Intelligence, Human-Computer Interaction 3.1 - 3.2
3.1.2 Cybernetic Organism 3.2 - 3.2

3.2 Semi-Automation
3.2.1 Semi-Automated Design and Fabrication Processes in Architecture: Spacecustomizer - Geometry Triangulator and Unfolder 3.2 - 3.10
3.2.2 Robotics

3.3 System-Embedded Intelligence 3.10 - 3.12
3.3.1 Software Prototypes: SpaceCustomizer - SpaceGenerator, SpaceInteractivator, GeometryVoxelizer, FunctionLayouter 3.12 - 3.44
3.3.2 Spatial Prototypes: Motion, Interactive, Mass, and Functional Spaces 3.44 - 3.48