assemble

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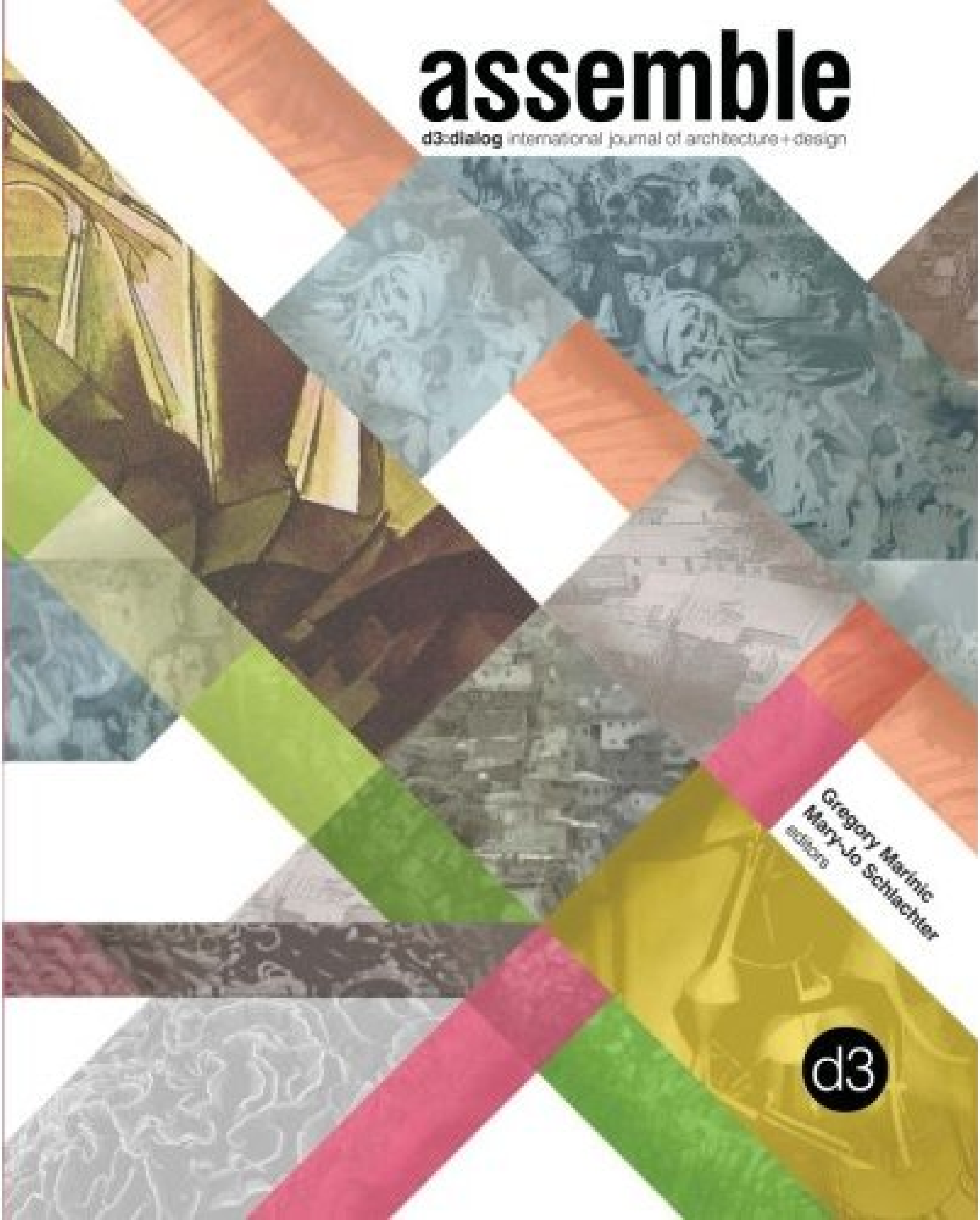

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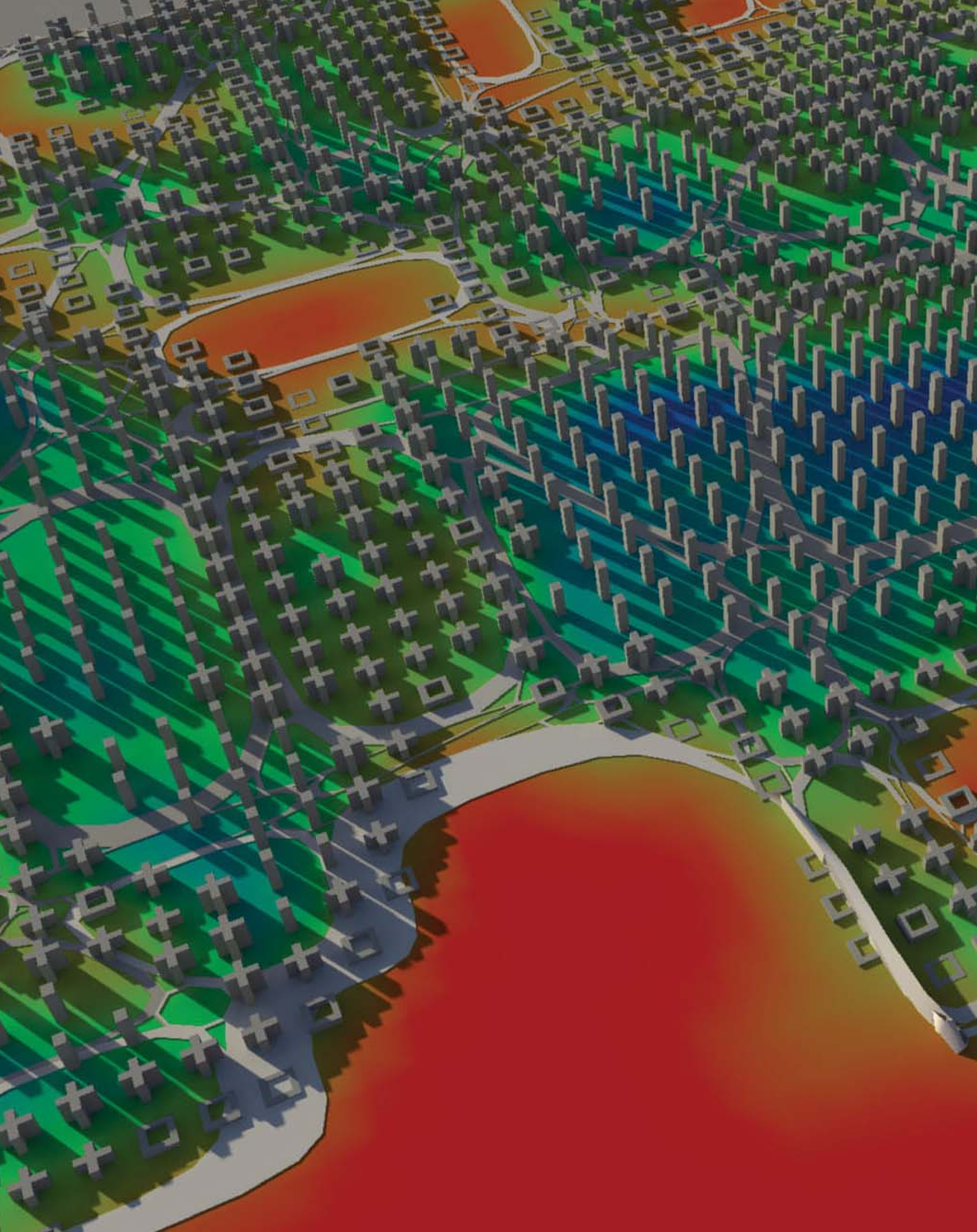


Visualizing GIS Information

Digital fabrication and 3D Diagrammatic Urban Models

Ming Tang

This article describes fabrication and parametric modeling as a new method to visualize none-geometric information from Geographic Information Model (GIS) database. Using projects produced in computer-aided Urban Design courses, and independent study taught in 2010, the faculty and a group of students present a study investigating the current constraints of information visualization within Urban Design field and described a procedure for exploring, collecting, analyzing, and 3D represention of urban information from the U.S. Census Bureau by diagrammatic digital model and fabricated physical model.

Either through digital rendering or physical prototyping, the goal is to visualize the quantifiable GIS data of Cincinnati, Ohio and Savannah, Georgia by computing political, social and economic data into the 3D topographic representation. In the physical fabrication method, the integration of non-geometrical parameters (i.e. age, gender, race, poverty level, education level, employment status, family income, and method to travel) into the urban form-seeking process resulted in a series of conceptual mock-ups of urban topography which were then fabricated by laser cutters and the CNC machine. In the digital rendering method, various GIS data themes such as zoning, transportation network, city blocks, and building types were visualized as a series of virtual cities, each exclusively responded to its GIS information input.

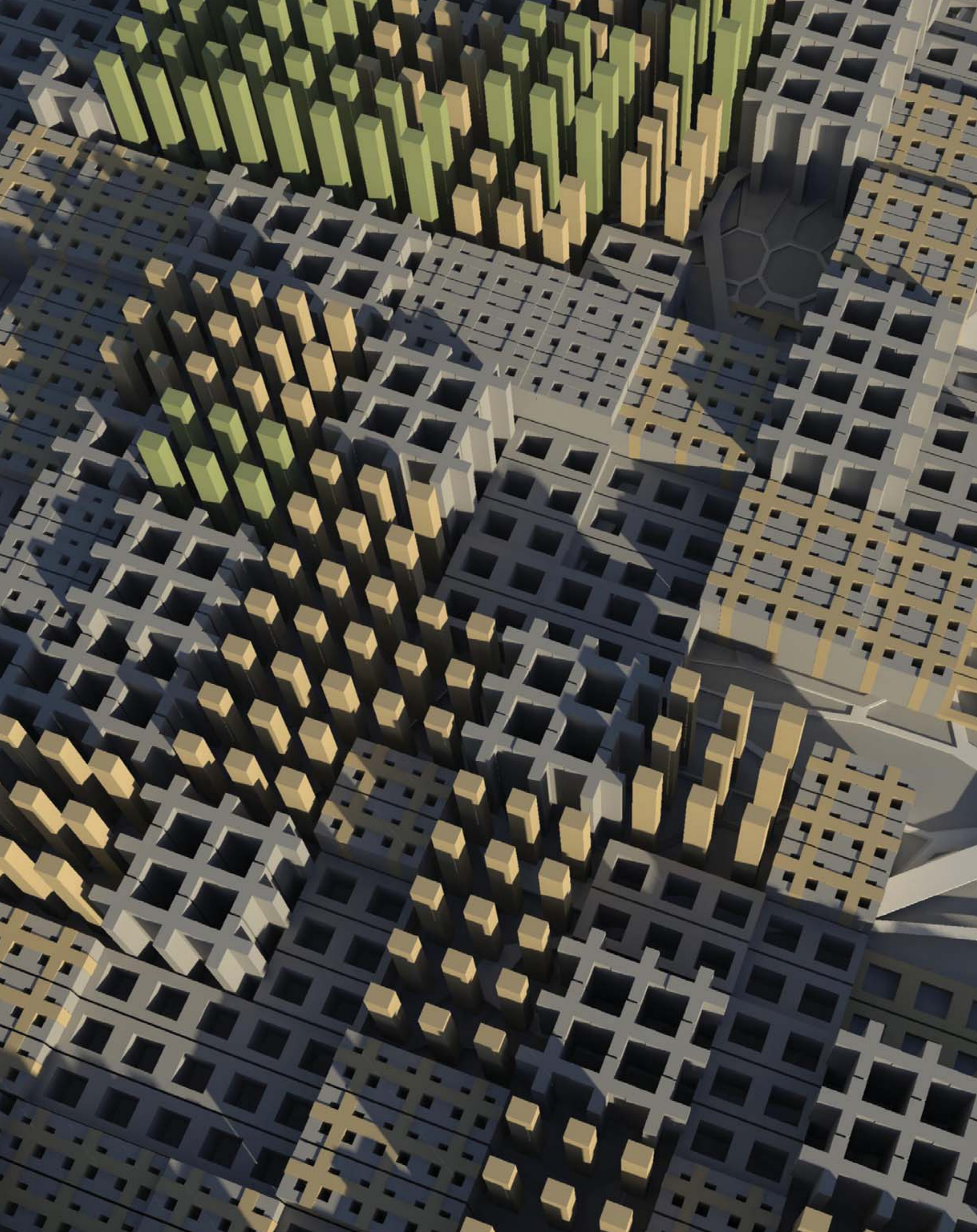
Process

Data of Cincinnati, Ohio and Savannah, Georgia from the U.S. Census Bureau was used first to develop a demographic study on the geospatial information. With this data the faculty and the students created physical models using the CNC router and laser cutter. The information model of none-geometric data created physical objects that the students can hold, test, and observe their findings. Information modeling comprises infinite possibilities with controllable variables. These variables are then run through a series of alterations to morph into abstract urban forms. This process started with information from the local census report and GIS data sets. Once the geospatial information was collected, it was then filtered and selected based on its significance in term of spatial pattern recognition. Some students created White, Black, Hispanic, and Asian population thematic maps and studied these patterns overlaid with the railroad system to explore correlations. By taking this information into a program to manipulate selected filters, the students could mix, eliminate, move, and separate their findings. (image at left)

The newly filtered data was then taken into 3D software which allowed the faculty and students to further manipulate and control the spatial pattern. A new method to convert image-based data into a tessellated 3D polygonal mesh was developed. These data-driven poly shapes allowed for automatic surface tessellation, and the generation of the mutating areas within a generic grid system. (Figure 2) Finally the faculty and the students took the newly generated patterns and exported them into a flat vectorized set of lines to allow for a transfer of the data into the laser cutter.

Fabricating, assembling and holding a physical model is the unique experience that designers cannot achieve from a virtual GIS model. The marriage of GIS with fabrication technologies stimulates a different mindset and design thinking process. A dimensional physical model is an object that not only activates the senses of touch and sight but also sparks creativity.

1_*The Savannah project (left)*



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2, 3, 4_*GIS mappings (previous spread and left)*