A SELF-ORGANIZING NEURAL SYSTEM FOR URBAN SIMULATIONS

Ajith Rao, Brian Lonsway

School of Architecture, Rensselaer Polytechnic Institute, Troy, NY 12180
Tel: +1 518 3216892; Email: mulkya@rpi.edu

BIOGRAPHY

Ajith Rao: PhD Student, School of Architecture, Rensselaer Polytechnic Institute; Research interests in Complexity Theory, GIS, Urban Design

INTRODUCTION

The dynamics of urban systems are characterized by complex non-linear relationships between socio-economic attributes of land use and spatial interactions. Traditional urban models have had many limitations in simulating these urban dynamics. However, the last decade has seen a rise in a new class of models, which aim at overcoming the shortcomings of their predecessors. These models are primarily computer-based, and include cellular automata, evolutionary models, artificial neural networks, etc. This paper examines a neural network based approach for simulating the interaction of the various components in an urban design proposal. The system incorporates Kohonen's self-organizing map (SOM) algorithms within an existing GIS application to function as a design and decision support system. Urban data of a simulated region is embedded in the neural net and correlated, in varying degrees, with data obtained from case studies and/or other local regions. This allows the user to visualize and understand the impacts of the proposal, which is otherwise difficult to envision because of its complexity.

IMPLEMENTATION

This system models the current state of a problem as the designer chooses to frame it, and works in conjunction with him/her to evaluate, contextualize, and visualize design solutions (within this chosen context). It relies on an unconventional application of the SOM algorithm (implemented in MatLab using the SOM Toolkit), employing the SOM both to model the designer's context and to simulate the interactions of a given proposal with it. These interactions are then visualized for the designer as real-time feedback which can in turn be interactively manipulated. This latter step is accomplished using MapInfo's MapBasic scripting extension to their MapInfo software. We are working with a rich dataset of Troy and Albany New York which includes traffic pattern, land use, zoning, environmental toxicity, and landmark proximity data. To date, we have developed the functional core of the system and are currently experimenting with visualization and user interface frameworks.

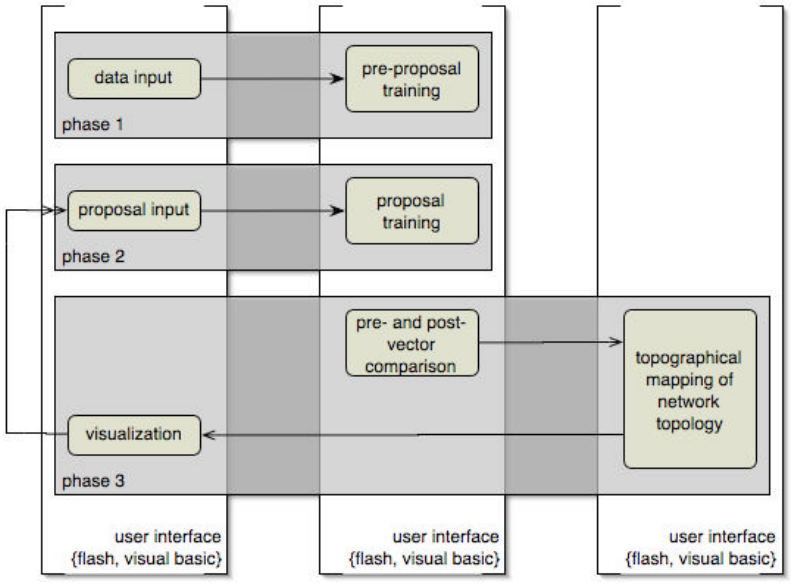

Figure: System Implementation

REFERENCES

Kohonen, T. (1984) Self-organization and Associative Memory Berlin, Springer-Verlag.