

Integrating of Urban Growth Modelling and Utility Management System using Spatio Temporal Data Mining

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Abstract The proposed research focus on accomplish better Modelling methods and Classification technique to integrate urban growth and utility management with the help of Spatio-Temporal Data Mining. Now a days the urban growth increasing rapidly in other hand providing utility services to the society getting congestion and hassle. This research aid to classify urban growth level using Spatial-Temporal data and better utility service system is attain with the facilitate of Knowledge Based Integration (KBI). The broader concept of urban growth modelling provide the detail of Land cover/ Land use, Changes, Growth or Reduction of feature in area extract with the assist of Multiple Level Classification (MLC). In the province of urban growth modelling can be make use of scrutinize, estimate and forecasting urban systems to support Utility Management and Decision-Making process. In Remote sensing technique, modelling attains from the Spatial and Temporal elements obtain from Topographic Maps, Aerial Photos, Satellite Images, Several Databases and Statistical Information from Private or Government Organization. The proposed "Multiple Level Classification" (MLC) technique consists of Cellular Automata (CA) and Spatial statistics. Thus the hierarchy level of urban growth classification have to integrate among Utility Management with the facilitate of "Knowledge Based Integration" (KBI) includes techniques such as Artificial Neural Network (ANN) and Fuzzy Logic. In this utility covers the basic service such Electricity Transmission elements, Water supply system, Hospital/Emergency unit, Fuel /Gas link, Road Network and Telecommunication Network, etc. This research mainly helps to provide various utility services in efficient way to the developing urban and diminish the time span and cost for utility service.

Keywords *Multiple Level Classification, Artificial Neural Network, Fuzzy logic, Knowledge Based Integration, Cellular Automata, Remote Sensing, Geographic Information System*

1. Introduction

Now a days the urban growth increasing rapidly in other hand providing utility services to the society getting congestion and hassle [1]. The present research is to study exhaustively the integration of Urban Growth Modelling and Utility Management System. It is required to study the various

processing and modelling techniques in Remote Sensing and GIS [2-4]. The present research will suggest the system like Multiple Level Classification (MLC) and Knowledge Based Integration (KBI) technique intended for incorporate the Urban Growth Scrutinize and Utility Management System. The present work however may be confined to three steps, they are Determination of urban growth Level and categorize the area with the aid of Cellular Automata (CA) and Spatial Statistic methods, Determination of Utility Management System with the help of Artificial Neural Network (ANN) and Fuzzy Logic and Integration of Urban Growth Modelling and Utility Management System using Knowledge Based Integration (KBI).

2. Review of Literature

Jean (2008) cited that the Cellular Automata (CA) model developed to simulate land-use changes and analyze urban growth level. Historical Land-use Maps are read and factors responsible for driving the Land-use changes, such as the distance to the Road Network, are identified. A frequency histogram is produced for each combination of Land-use changes, neighbourhood configuration, and driving factor. This information is analyzed to automatically create the transition rules that can be applied for the simulation. Jeremy Mennis (2005) narrated that Multiple level association rule mining is supported by the development of a hierarchical classification scheme for each variable. Further research in Spatio-Temporal association rule mining should address issues of data integration, data classification, the representation and calculation of spatial relationships, and strategies for finding 'interesting' rules.

Clarke and Gaydos (1998) described the complexity of urban growth, first they principally touch on spatial and decision-making complexity, with little about temporal complexity. The former includes pattern-oriented growth simulation. Torrens and O'Sullivan (2001) narrated that CA models are constrained by their simplicity, and their ability to represent real-world phenomena is often diluted by their abstract characteristics. Z Shang (1998) says about ANN is composed of many non-linear processing units that are connected to each other and collectively perform a single task. One of the main properties of an ANN utilized in this study is the ability to learn complex relationships between input and output vectors which are very difficult to embody in conventional algorithmic methods. This task is carried out by a process of learning from examples presented to the ANN. During learning, known input-output pairs (e.g. historical data), called the training set, are applied to the ANN. The ANN learns by adjusting or adapting the strengths of the connections between processing units, by comparing the output of the ANN to the expected output. Larsen (1989) described that fuzzy Logic decision tool discussed here provides a mechanism to support systematic decision making in knowledge-based planning systems and decision aids. It has been applied to the process of knowledge acquisition in order to structure and build knowledge bases as well as construct user interfaces that support subjective decision making.

3. Outline of Methodology

The main goal of this research is to provide Urban Growth Modelling and Utility Management in efficient way with the help of Remote Sensing and GIS technique. The Spatio-Temporal Data Mining is the extraction of unknown and implied knowledge, structures, elements, Spatio-Temporal relationships, or patterns stored in Spatio-Temporal databases, it includes Spatio-Temporal forecast and trend analysis, Spatio-Temporal association rule mining, Spatio-Temporal sequential patterns mining, Spatio-Temporal Clustering and Classification [5]. In this research the urban development can be classify from high resolution Spatio-Temporal data. In this proposed research the new approach "Multiple Level Classification" (MLC) has been suggested to attain Level I (Residential, Population Density, and Natural System), Level II and III classification (Urban Land use change on the local/community level, socioeconomic variable) with the help of Cellular Automata (CA) [6–8] and Spatial Statistics techniques [9]. The Cellular Automata (CA) is highly effectual tool to study the dynamic of urban growth for the reason that it effectively encoding various spatial structures and

managing Spatio-Temporal dimensions [5,6] [4]. Here spatial statistics mainly help us to find the Topological and Geometric properties of an area. Thus the hierarchy level of classification helps to integrate the Utility Management for identify the basic service need for extend urban area. In this utility Management the various services are extracted from Spatial Temporal and non-Spatial temporal data [10,11]. Thus the “Knowledge Based Integration (KBI) assist to integrate the entire utility in single package for providing the service to the newly grow urban without any barrier with the aid of Data Base Management System (DBMS), Artificial Neural Network (ANN) and Fuzzy Logic techniques. The utility management system suggesting rank for selecting right and efficient way to provide service for the urban area.

4. Conclusion

This project mainly facilitate for Urban Planning and Development, the provisional level of this study majorly lend a hand to society for providing utilities without any barrier. The new approach Knowledge Based Integration helps to integrate urban growth modelling and Utility management System. In this proposed project majorly covers the basic utility service such Electricity Transmission elements, Water supply system, Hospital/Emergency unit, Fuel/Gas link , Road Network and Telecommunication Network, etc. The prominent growth of urban may analyse over a period and providing utility to the society is difficult and time consuming but in this planned level of study focusing on keen interest on computing the urban growth and utility management simultaneously. The various new conceptual used in this project overcome all barriers which all faced in conventional planning and management and its helps to study about developed urban and also newly grown urban. The work show that the available Remote Sensing satellite data and Geographical Information System in collaboration with various field survey data can be best utilized for planning and development of an urban area.

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