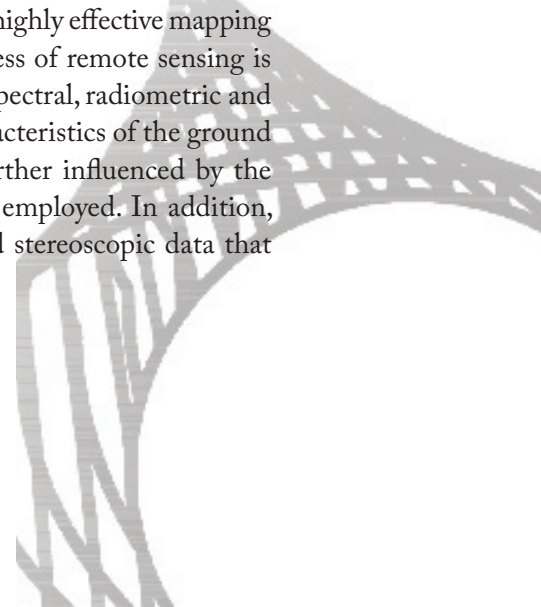# EDITORIAL

Urbanization and Geo-Informatics

Urbanization generically implies urban sprawl that represents expansion of the existing urban area over a period of time and is therefore recognized as a spatio-temporal process. Urbanization involves expansion in both vertical and horizontal dimensions i.e. vertical expansion of the existing built-up and horizontal expansion that comprises both filling up of the open spaces within the existing urban landscape and also, expansion of the existing urban area into the peri-urban area that is dominantly covered with agricultural land, woodland and barren areas. It is predicted that by the year 2050, more than 64 percent and 85 percent people of the world will live in the developing and developed nations respectively (Wikipedia). However, the process of urbanization is more scientific and planned in the developed nations whereas it is found to be haphazard and unsustainable in the developing countries.

In conjunction with the economic prosperity that urbanization normally endows with the urban dwellers, it also brings about significant transformation in the various social, ecological, structural and functional attributes and characteristics of the city. These comprise transportation network, parking space, pedestrian pathways, utilitarian infrastructure such as recreational parks, restaurants, lodges and hotels, cinema halls, health amenities like hospitals, nursing homes and pharmacy, educational amenities like colleges, schools etc., service sector comprising post office, telecom etc., commercial infrastructure such as supermarkets, malls, local markets, residential such as new satellite colonies and vertical expansion of the existing buildings, industrial zones i.e. small scale factories, vehicle service centers and fuel charging stations in addition to the solid waste disposal site selection. These attributes are invariably associated with various menaces such as heat island effects, malaria facilitated by increasing breeding sites, traffic noise and pollution, and crimes and accidents. In view of the above, the vastitude of urban agglomerate needs to be realized in terms of both magnitude and heterogeneity of the different attributes.

Several models have been developed to investigate and understand the characteristics of the urban attributes, the intrinsic relationship existing among them and for forecasting urbanization. Since urbanization is a spatio-temporal process, the technology of geo-informatics can be conveniently integrated with such models. Geo-informatics comprises two major domains of study i.e. remote sensing and Geographical Information Systems (GIS). Remote sensing can be perceived, in the context of urbanization, as a highly effective mapping and monitoring tool for the various urban features. The effectiveness of remote sensing is measured in terms of the four resolutions of the sensor i.e. spatial, spectral, radiometric and temporal that play the key role in determining the biophysical characteristics of the ground features and facilitating discrimination among them, which is further influenced by the type of the image processing and pattern recognition techniques employed. In addition, the strength of remote sensing is augmented by LIDAR data and stereoscopic data that

facilitate 3-D visualization and mapping, thermal data that determine heat island effects and micro-meteorology, hyperspectral data that captures the subtle variations of the biophysical characteristics of the urban features, and microwave data that provides subsurface information. Different advanced computing techniques that are employed to obtain improved accuracy of remote sensing data analysis are namely cellular automata, texture based analysis, soft computing techniques, object oriented analysis, spectral mixture analysis, genetic algorithm, and syntactic and contextual pattern recognition techniques. Geographic information system (GIS) is a system designed to capture, store, manipulate, analyze, manage and display all types of geographical data (Wikipedia) that also includes remote sensing data and remote sensing derived information. GIS encompasses a vast number of geo-statistical tools and techniques such as landscape ecology, ontology, topological and network modeling, hydrological modeling, map overlay, 3D visualization, Spatial Decision Support System (SDSS), Multi-Criteria Decision Making (MCDM), genetic algorithm, web-GIS and cognitive GIS that together constitute Urban GIS.

There exist several commercial and educational software with different capabilities for performing remote sensing and GIS based analysis. Lately, the advent of freely available open source software has led to increased interest, use and application of geo-informatics techniques for improved understanding of the characteristics of the various features of urban agglomerate, determination of the intricate relationship among the features and forecasting of urbanization and also, various activities of urban landscape. Overall, the methods and techniques of geo-informatics have proved to be indispensible tools in studies and investigations pertaining to urbanization and associated activities.

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