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Significance of Spatial Decision Supporting System for Geographic Infrastructure

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ABSTRACT

Information is very crucial component on which the whole process of spatial decision making is based. Therefore, some relevant information is required in order to perform the decision making process. Similarly, to build geographic infrastructure, some relevant information is required so that the best output can be obtained.

There come many situations during an infrastructure development project when it becomes complex to take decision over some issues like space, height and comfortable surroundings. These kinds of situations can be easily handled with the help of a spatial decision supporting system which is computer based. The current article highlights the role of spatial decision supporting system for geographic infrastructure.

KEYWORDS:

Infrastructure, Decision, Spatial, Information

INTRODUCTION

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The spatial decision supporting system makes it easy to take complex decisions. This system helps in understanding the complex problem and choosing the best way to execute the task.

In the spatial decision supporting systems, first of all, the problem is defined then goals and objectives are set. The third step in spatial decision supporting system is to look at the alternatives to perform the task. After that the task of evaluation of each and every alternative way is done. In the next stage, the best suitable alternative is chosen to go further and finally, that alternative is implemented. The following figure shows the general process of decision making.

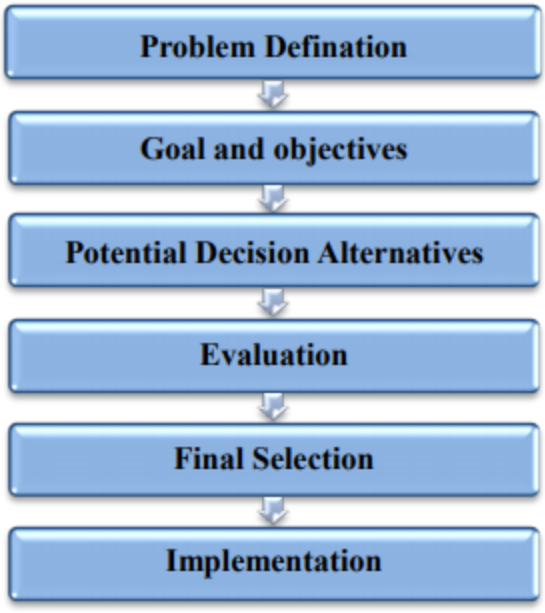

Figure 1: General spatial decision making process

GIS software is an important tool of spatial decision making system. Remote sensors provide useful data to GIS and spatial decision making system.

SDSS are integrated computer systems that support decision makers in addressing semistructured or unstructured spatial problems in an interactive and iterative way with functionality for handling spatial and nonspatial databases, analytical modeling capabilities, decision support utilities such as scenario analysis, and effective data and information presentation utilities.

By nature, spatial decision making situations are complex and ill-structured, thus humans individuals cannot process all the necessary collateral information present. Thus, in order to address complex spatial problems, support systems are often necessary, which can help in understanding the complex problem, from evaluation of the issue, provide formulation of possible actions, simulate consequences of decision possibilities and formulation of implementation strategies. The use of computer based tools for spatial decisions are necessary because complicated nature, requirement for accumulation, management, analysis of a variety of data sets etc.

During past two decades, a huge advancement in development and emergence of new technologies is observed. There are several tools,

technologies or systems available to support spatial decisions such as GIS, DSS, Expert systems, remote sensing and spatial decision support system. In its simplest form, GIS can be defined as "a computer based system for capturing, storing, querying, analyzing and displaying geospatial data.

SPATIAL DECISION SUPPORTING SYSTEM FOR GEOGRAPHIC INFRASTRUCTURE

DSS have been immensely developed over the course of last several decades with multidisciplinary aspect to support decision making. They include analysis along with DBMS and user interface. The number and diversity of DSS have grown significantly with greater computing power. The drawback of DSS is that, they often do not handle spatial aspects of Decision making, thus extension of concept of decision support system to spatial decision support system has been necessary.

Remote sensing is extremely valuable way of developing usable geospatial data for GIS and SDSS application. The main platforms for data collections in remote sensing are satellites and airplanes. Remotely sensed imagery benefits includes manual interpretation by mapping features on earth's surface, repeated temporal recordings of the Earth's surface for time-series analysis of changes, recording of meteorological

conditions across large areas and over short time periods, and recording of wavelengths invisible to the human eye. As with GIS, the number of remote sensing instruments and use of imagery have grown significantly over the last few decades.

All of these technologies can play a crucial role in the development of SDSS. The GIS software often plays a fundamental and central role in SDSS. However, in order to truly support the spatial decision-making process, GIS functionality must be extended or joined with other technology, such as DSS and ES, in order to form true spatial decision support systems.

A key to any successful SDSS is the development of effective mechanisms for user interaction with software components. These mechanisms are termed the dialog management component (DMC). The DMC provides the interface between the user and the rest of the components of any SDSS. It provides mechanisms whereby data and information are input to the system from the user and output from the system to the user. As mentioned earlier, spatial decision-making processes involve iterative, interactive, and participative involvement of a decision maker or end users. The user interface components of an SDSS provide these functionalities and act as a channel through which the user connects to

the computer system to generate and compare different solutions to a problem and to view potential outcomes from decision alternatives.

The importance of user interfaces has gained much attention in the past two decades, mainly because there has been a realization that usability is a key for the success of any software product. One can build an advanced SDSS that might solve complex problems, but if the user interfaces do not allow easy use, there is a high possibility for failure of the system. Some of the following characteristics should be considered during user interface design.

DISCUSSION

A region's infrastructure is a collection of public assets that can be managed to maximize public profit. It is diverse and distributed throughout the region, interacting in complex ways with the region's people and landscape. Both private and public institutions have responsibilities for the system's management. In other words, we can say that, Public and private agencies have always tried to maintain their infrastructure assets in good and serviceable condition at a minimum cost; therefore, they practiced infrastructure management.

However, as most of the nation's infrastructure systems reached maturity and the demands placed on them started to rapidly increasing,

infrastructure agencies started to focus on a systems approach for infrastructure management. The management task is beset by difficulties of data collection, measurement, and evaluation. This process has lead to today's Infrastructure Management concept. In continuation to this, intricate collections of materials, infrastructure, machinery and people, with countless spatial and temporal relationships and dependencies, require progressively more sophisticated tools to design and manage them.

One milestone in the development of engineering management systems is the concept of integrated infrastructure management systems. This type of system is complex and mandates a need for integration and consideration of data sharing and security. The existing databases and data management system design traditionally have not been effective at allowing division within the departments of infrastructures to use or share data as extensively or as easily as should be the case.

Spatial decision support systems (SDSS) are designed to help decision makers solve complex spatially related problems. The use of SDSS in various domains of Infrastructure like transport, utility, academic, construction, business analyses, public health, and hazard analysis is increasing tremendously. For example, businesses are using sophisticated SDSS to analyze customer information for marketing,

customer relationship management, and generating business intelligence to gain competitive advantage. Strategic Infrastructure Development is a necessary Component of economic development and vitality. For the same, requirements should be as effective and as efficient as possible in the Planning, Construction and Operation of Strategic Infrastructure investment.

GIS have emerged to meet ever-increasing demand of precise and timely information. GIS specifically would be best to be used in the present study for integration of various data sets and conducting spatial analysis for decision making.

CONCLUSION

More recently, much attention has been paid to spatial analysis due to merging of geographic information system (GIS) and satellite images for designing and analyzing electrical distribution network. The conventional means are however, not only difficult and time consuming but also laborious.

Spatial Decision Support Systems are designed to help decision makers solve complex spatially related problems and provide a framework for integrating (a) analytical and spatial modeling capabilities, (b) spatial and

non-spatial data management, (c) domain knowledge, (d) spatial display capabilities, and (e) reporting capabilities.

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