

The Impact of Database on Geographical Information System and Smart Cities

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Abstract The research discusses the substantial influence of databases in smart cities, affecting various facets and people's lives. It emphasizes the impact on Information Technology (IT) spending and database features, allowing access from anywhere at any time. Key elements crucial for smart city implementation include sustainability, adaptability, governance, improved living conditions, resource management, and city amenities. The research highlights defined components of smart cities and their applications, such as healthcare, mass transit, education, and energy services. It also focuses on how integrating Geographic Information Systems (GIS) aids decision-making. The study emphasizes the use of cloud computing for smart city database systems, outlining its benefits in data collection, storage, and analysis across various cloud nodes and facilities. It also highlights industries such as health insurance, public transportation, smart buildings, and energy that benefit from these technologies in decision-making processes. The paper's objective is to review database applications in smart cities and explore the potential use of big data.



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Keywords: Database (DB), Geographical Information System (GIS), Cloud Network, Big data, Decision making.

1. INTRODUCTION

Geographical Information System in traditional multiuser, (GIS) applications, maps, zoning plans and other going to plan maps, income tax data, and connectivity data can be related, updated, and queried. GIS database creation techniques are evolving, and big data must be used in smart city applications. Decision makers should determine which data types and innovations are required in smart city applications based on the target application domain. Text, images, and real-time sensor data should be processed in database-compatible applications when using a relational database structure on Urban GIS software. For urban analytics projects that involve geographic information or parallel processing capabilities, the Hadoop ecosystem and its components, as well as similar platforms, should be tested. Leadership of Geographic for Smart City Applications have enforced many governments to be begun to use databases to aid in the sustainability and implementing Cities were capable of maintaining standards, principles, and smart city characteristics as the primary smart city. Conservation, endurance, good governance, a higher standard of living, and wise management of the environment and the city amenities are among these characteristics.

Mobility, governance, the environment, and people Applications and services such as healthcare, transportation, environment, and energy are defined

components of the smart city. (Khan Z et al. 2013). Big computational and storage facilities are being built. required to support such applications and services. One important method of providing of this kind systems will depend on cloud computing and profit from the many benefits of employing cloud services to support database administration and apps for smart cities. The collection, storing, and analysis of data across cloud nodes and facilities can be aided by cloud technology, as shown in Figure1. This article's major contribution is a review of database applications in smart cities, as well as an exploration of the advantages and disadvantages of using big data.

2. DEFINITION OF SMART CITY

There have been numerous definitions proposed for the concept of a smart city. Vary in nomenclature as well, with terms replacing like "intelligent", "digital." Some definitions use the term "community" instead of "city." The term "smart city" can be perceived as a vague concept and is not always applied consistently.

Urban area (possibly encompassing various areas and city weights - street, plaza neighborhood, or eventually) energy. energy that collects electronic data from sensors installed in infrastructures, buildings, automobiles, institutions, and devices (Internet of Things (IoT)) must provide actual facts about operating systems of major cities (AL-Hamami & Alkhashab 92014)).

The Smart City (SC) notion has grown in importance on lawmakers' agendas as a part of enhancing citizen life quality. However, there is no universally accepted definition of SC, trying to identify common global trends. (Moura & de Abreu, 2019).

3. DATABASE (DB) CONCEPTS.

A dataset is a storage facility for large amounts of data that needs to perform a number of common processes. Dataset can store any kind of data organized that stored in tabular format (Relational Database) and have many such tables, each of which stores data of a certain kind the function of database. A database:

- Allows concurrent use by multiple users at the same time.
- Provides a variety of data storage techniques and allows for the use of the most efficient one; it also supports storage optimization.
- Enables the enforcement of rules on store data, which are instantly enforced. Enforced after each update to the data, thereby ensuring integrity.
- Provides any simple data A data transformation language that enables the execution of all types of data harvesting and analysis of the information. and includes a query facility.
- Attempts to execute each query in the data manipulating language in the most efficient way with its effort query optimization.

4. BIG DATA CONCEPTS

It is a data collected from various sources, including transportation, public health, economic development, various government agencies, education, and other techniques, are combined to form massive amounts of data Smart city technologies have distinguishable effect of obtaining large amounts of data in a variety of formats (Neirotti et al. 2014). This information is produced collected in huge volumes and on a regular basis, providing a real-time depiction of the city's activity at any given instant. critical Effective big data management solutions are required to ensure accurate and practical statistical calculations in smart cities, must be in place. Implementations (Batty M. 2013). Big data management entails the creation and implementation of behaviors, policies, and architectures, must carry out its analytics, which generally necessitates humongous processing capability. As a result, scalable as well as dependable software and hardware technologies are necessary. Big data refers to larger, more complex data sets, particularly from new sources. Conventional data processing software simply cannot handle these massive data sets. The five primary and inherent characteristics of big data are as follows Vs (velocity, volume, value, variety, and credibility).

Recognizing the 5 V's allows data scientists to obtain more value from their data while also allowing the scientist's institution to become much more client-centric.

5. GEOGRAPHICAL INFORMATION SYSTEM (GIS)

Information gathering and preparedness, data management (including storage and management), data manipulation and analysis, and data presentation are all aspects of data management. are a handled this computer-based system. GIS users can expect assistance in analyzing data and creating presentations (including maps and other types) from the data. As a result, it supports a variety of coordinate systems and evolutions between them, as well as data analysis options (Ji C et al. 2012). Data from various topics and sources is expected to be integrated into modern GIS. The inclusion of multiple data sets, which is often represented as multiple data layers, is expected to have a synergic activity and lead to improved decision-making knowledge. Typical file-oriented storage is also incapable of meeting this requirement. Geographic information systems are made up of a number of interconnected parts. We must address organizational, software, and hardware issues in order to create computerized GIS.

6. CLOUD COMPUTING AND GIS

Cloud computing is a concept in the computing industry which is mean the amount of large computing materials that we need and are available somewhere outside in the cloud of computers that we will connect to and use when needed it, which leads to the development of service called information technology (Al-Hamami & Alkhashab. 2014). Cloud computing allows Advanced GIS It is predicted that it will be able to incorporate data from a variety of topics and sources. The inclusion of multiple data sets, often represented as different data layers, is expected to have a synergic activity and produce better decision-making information. Conventional file-based storage (Husain Absar et al. 2020). Internal and external factors must be considered when evaluating land parcels on a large scale, such as a city or district. This requires numerous analyses, data processing, and a lengthy operation time. Geographic Information Systems (GIS) can assist in the storage, display, analysis, and sharing of real estate data and maps in order to carry out his procedure objectively and scientifically.

7. THE PROPOSAL OF SMART GIS

To introduce the proposal of Smart GIS ideas and big data prerequisites in support of a smart city to achieve the level of sustainable development and improve living standards Smart cities use a wide range of technologies to improve health, transportation, energy, and education achievement, People, Security, Government, Environment, Economy and Mobil

their constituents This includes lowering costs and consumption of resources, and more fully engaging citizens, each technology contains a large number of data that send

from database of GIS to cloud GIS which data become a big data in the cloud as seen in the figure 1. The data update over time.

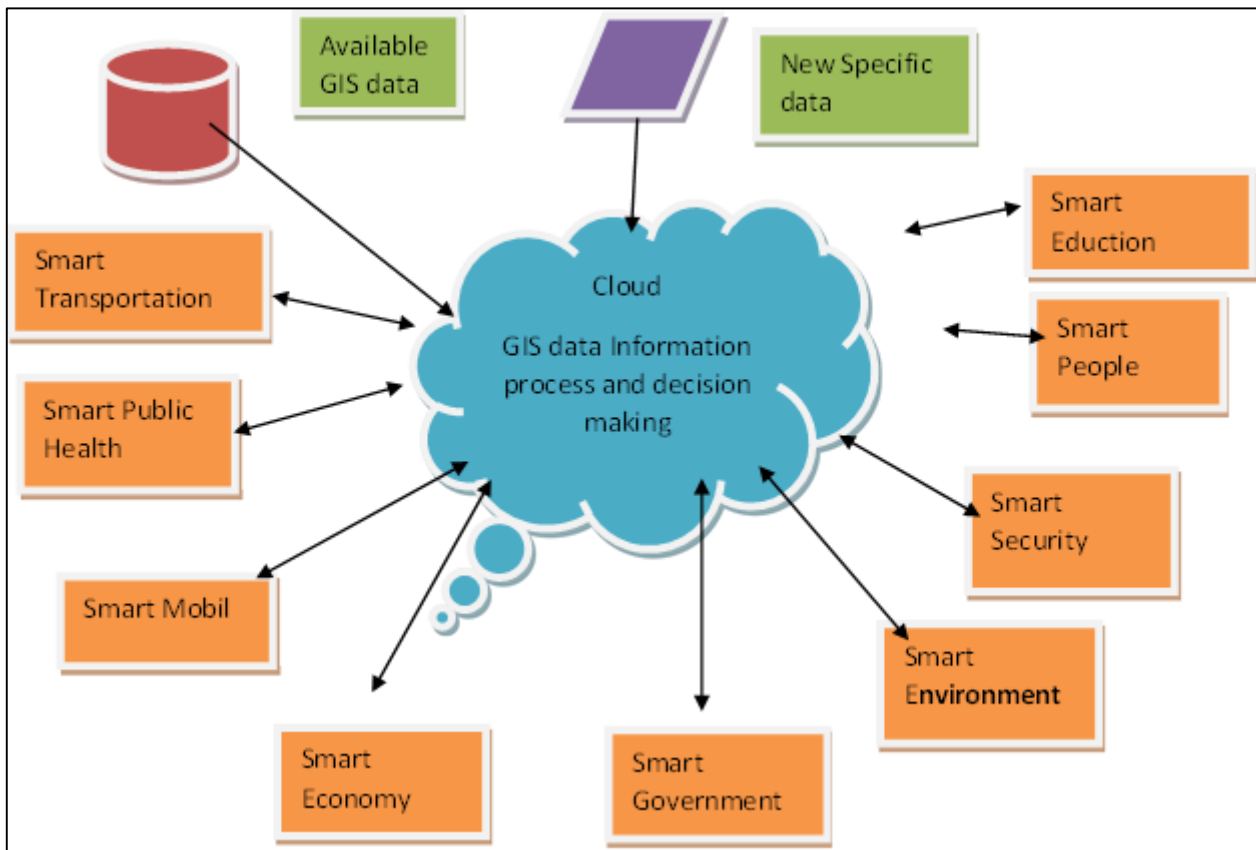


Figure1. Proposal of GIS and Smart City

8. SOME TECHNIQUES FOR SMART CITIES

8.1. Smart Transportation.

In modern environment, any activity that advantages from technological tools gets worth by using the adjective smart. As a result of this rapid development, Interaction, an essential category of transportation, has evolved into a service within itself. Because communication is common to all modes and stages of transportation, a new category of transportation has emerged over time.

8.2 Smart Public Health

Smart medical technology will assist in scaling the healthcare system's rapid response and improving the operation of health facilities. The Smart System of Public Healthcare Provision (SSPHD) includes Smart Surveillance Activities (SDS), Medical Emergency Responders (MES), Smart Hospital System (SHS), Moms and Immunization Coverage (MCH), and Chronic Disease Management (CDM).

8.3 Smart Mobil

Devices, particularly smart phones and tablets, are becoming increasingly ubiquitous among variety peoples, educators and students. Increasing data volume with time and need advances in mobile technology, wireless communication networks will cause colleges.

9. SMART ECONOMIC CITY

Economic growth tailored to specific Cities, nations, and continents Every Additional obstacles to the economic progress of a city in a given nation or continent may exist. Smart city economic development will take place as the rural economy gives way to the urban one, which makes up a significant portion of the country's GDP, emerges.

10. SMART GOVERNMENT

Endorse the consolidation or simplification of numerous government agents' processes, as well as their integration and cooperation This will lead to efficient operations, enhanced data handling capabilities, and stronger regulatory managerial staff and regulation. smart cities' use of modern technologies by their local governments with the aim of enhancing e-services and facilitating citizen engagement in decision-making in the political square.

Example (1) of Security and privacy: The security and privacy concerns with a The use of big data in smart cities. Databases may contain information about the government and people, so they require stringent Security policies and processes are in place to prevent unwanted access to sensitive

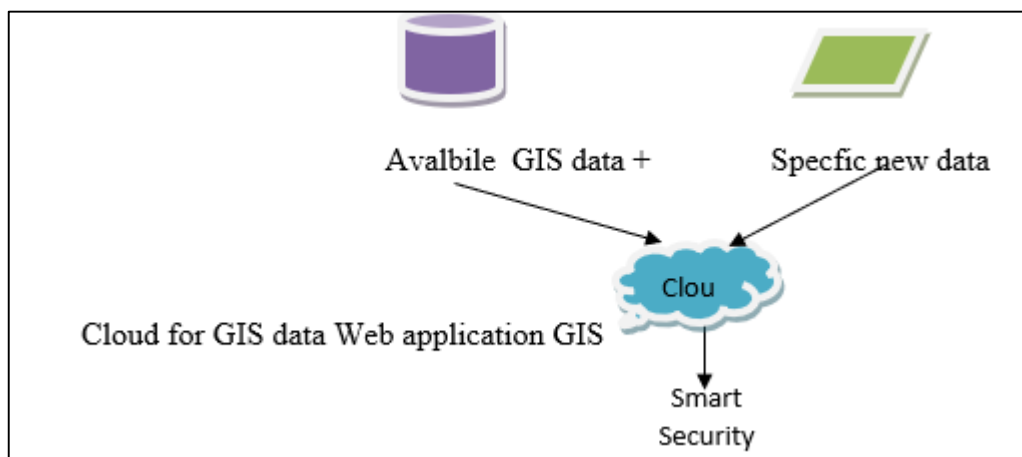
data and malicious code. Data travel across various types of networks, smart applications that are incorporated all over agencies require high safety. The fact The fact that most big data technologies are now cloud-based convolutes makes a difference even more, necessitating sufficient security. Although the most of big data can be claimed by specific smart city organizations, much of it includes personal and private information about individuals (Lopez Quiles & Manual Boliva. 2019). Medicine and wellness records, financial and bank records, retail history, other applications, and a wide range of other data all give personal insights into the people they stand for. Many people think that a person's legal right to privacy is violated by access to this kind of data. Make sure that there are strong privacy policies in place and enforced properly is a majo. There are many steps uses and transmits big data by the cloud and use of the geographic information system.

1. One have availabee data and new specific data collected to implement our straegy put this data in a

GIS cloud system to create something based on GIS used by people and upload data.

2. Use Web application based GIS data make possible to interface of the data to a general audience. GIS Web service uses data related function to complet basic geoprocess task. Develop and appliction can share data from differmnt data source and forms and have combied in a single applicvion. Regardlls of differmnt data sources or laction. This allows groupproess and retuen the result, Figure 2.

Example (2) of GIS: If an accidet occurred, it was an explosion in one of the streets in the smart city, the information is send from a number of different sources, civil defence, blockage of roads, traffic ligts to blocke another roads, people mobiles, government intervention and hospitals. Database is collected in the form of big data to cloud computing via geographic data (GIS) companionship and then through the Web application of the concemed authorities witen smart city see figuer 2.



Figuer2. Transmets big data by the cloud

11. CONCULATION.

A smart city is a technologically advanced urban are data is collected using various electronic methods and sensors obtained from different techniques such as Transportation, Public Health, economic development, different so government agencies, education and other techniques which combined into big Data is being used to successfully handle

assets, resources, and assistance; in turn, that information is used to improve operations throughout the city. In paper we use proposedsmart city as seen in Figur 1 which contains data technqie of databas of GIS that send to the cloud GIS city to make big data. There are numerous examples of how to transmit large amounts of data by the cloud and then using of the Geographic Infoermentation System.

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