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Smart City Construction Based on Urban Information Model

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Abstract: Since the implementation of smart city construction in our country, smart city development has been flourishing across various regions. However, in practice, certain deficiencies have been identified in the smart city construction model, such as the occurrence of "data silos" and redundant construction. The development of City Information Modeling (CIM) presents new opportunities for refined urban governance and smart city construction. This article analyzes the origin and connotation of CIM, explores the meaning of the CIM model, and explains the essence of CIM from the perspectives of its foundational nature and constituent system. Furthermore, it discusses the application value of CIM in smart cities and elaborates on the assistance provided by CIM and smart cities in achieving refined urban management.

Keywords: Urban information model, Smart city, CIM, Urban governance.

1. Introduction

At present, the world is in a new round of industrial revolution and urbanization transformation. This transformation is to meet the needs of urban development in the new era. China has put forward smart cities in the 14th Five-Year Plan, and as an important content to cope with this transformation trend. "The use of big data, cloud computing, blockchain, artificial intelligence and other cutting-edge technologies to promote innovation in urban management methods, management models and management concepts, from digitalization to intelligence to wisdom, to make the city smarter and more intelligent, is the only way to promote the modernization of urban governance system and governance capacity, and has broad prospects.[1]"

The government is the leader in smart city planning and policy formulation [2], In March 2021, the 14th Five-Year Plan for National Economic and Social Development of the People's Republic of China and the Outline of the Vision Goals for 2035 proposed: "Improve the urban information model platform and operation management service platform, build the urban data resource system, promote the construction of urban data brain, and explore the construction of digital twin cities."[3]"Urban Information Modeling (CIM) is a new technology supported by the integration of geographic information systems (GIS), Internet of Things (IOT) and building information modeling (BIM). This comprehensive technology application helps to optimize urban management, help people integrate the city's multi-source data and the city's development and operation law, so as to promote the construction of smart cities.

2. The Status Quo And Problems of Smart City Construction in China

2.1. Concept of smart city

As a multi-disciplinary complex system, smart city covers various aspects such as urban intelligent transportation, security management, land planning and application, and municipal facilities management, and the amount of information contained is huge and complicated. The City Information Model (CIM) itself is a complex, integrating hundreds of millions of city data from social, economic, humanistic and other fields. Some scholars try to define smart cities from their functions, pointing out that smart cities need to realize smart economy, smart government, smart citizens, smart travel, smart life and smart environment, etc. Only when they fully cooperate and promote each other can they realize the construction of smart cities[4].

2.2. Problems in the construction of smart cities

Nowadays, smart city has become a new hot spot and trend, and the construction of smart city is also hot, but there are also some problems in the process.

(1) At the level of information technology, there are phenomena of information silos and repetitive construction. Smart city is a complex system composed of interconnected physical and virtual services.[5]Due to the huge volume of data and information in many fields need to be integrated, but in actual operation, data formats and interface standards are not uniform, which leads to a lack of impetus for data integration and a waste of a lot of human and material resources.

(2) At the level of ideological understanding, there are problems of unclear thinking and blind construction. Up to now, almost all provinces, autonomous regions, municipalities and special zones in China have smart cities and communities being piloted[6],However, some decision-makers lack a deep understanding of the technical complexity of smart cities, and blindly formulate promotion plans while ignoring key factors such as local urban development level, talent structure and industrial model. As a result, the city does not match the real needs of the public. This has turned smart city construction into formalism and window dressing.

(3) In terms of information security, with the development of smart cities and the gradual deepening and application of urban information models, information security has become an increasingly prominent focus [7], How to ensure information security under the huge role of information integration and coordination is a practical problem that has to be considered and solved.

3. Basic Connotation of Urban Information Model (CIM)

3.1. CIM Origin

The CIM(campus intelligent model) was proposed in 2010. As the chief planner of Shanghai Expo Park, Wu Zhiqiang proposed the CIM intelligent model, which was gradually extended to comprehensive urban management after its application in the Expo site. The CIM technology comes from the building information model (BIM). BIM integrates building information in the whole life cycle of building design, construction, construction, operation and maintenance into a 3D model information database, facilitating information sharing. Design team, construction unit, facility operation department, owners and other personnel can work cooperatively based on BIM[3].Based on the application of BIM in the field of construction, a city information model (CIM) is proposed.

3.2. Basic Connotations of the CIM

In September 2020, the Ministry of Housing and Urban-Rural Development issued the Technical Guidelines for the Urban Information Model (CIM) Basic Platform, which clearly put forward the definitions of "Urban information Model" and "Urban Information Model basic Platform". From the connotation, CIM can be interpreted as both a model and a platform.

(1) "Twin city spatial information model" in CIM connotation. In a sense, the urban information model (CIM) can be understood as corresponding to the urban theory, in the context of the information technology era, the theoretical test of the urban theory, such as simulation experiments. However, because the city involves many elements such as population, land and infrastructure, making the city itself a complex giant system and a huge open system, the digital city model is still being explored.

(2) "Urban lifecycle Management platform" in the connotation of CIM. CIM gathers and integrates high-precision data in the whole urban space into a unified platform, which is the basic platform for constructing an "information space" that manages and is twin with urban space[3].The CIM platform is capable of processing massive, multi-source heterogeneous data, including but not limited to data aggregation, fusion, processing, and distribution. It can also use BIM technology to upgrade the traditional geospatial information platform supported by GIS technology to a more detailed micro-platform.

4. The Significance of CIM For the Construction of Smart Cities

As a basic platform for smart city construction, the significance of CIM lies in integrating city data, providing data processing and analysis capabilities, and realizing information sharing. The importance of CIM in promoting the construction of smart cities is self-evident, and its significance is as follows:

1) CIM is conducive to promoting urban business collaboration. The traditional urban management theory divides urban management too carefully, and the work content is scattered in different functional departments. In the process of construction of smart cities, there are problems such as large differences in development levels, information islands and repeated construction. The CIM platform enables different project participants to participate simultaneously, communicate information in real time, and follow the progress of the project together. This improves work efficiency, reduces costs, and effectively avoids the emergence and repeated construction of information smokestacks and data islands.

2) CIM promotes the aggregation and sharing of data in various industries of urban management. It can realize data sharing in a variety of software formats, and carry out open applications in many fields, thus greatly reducing the technical threshold of information sharing between departments and industries.

5. Future Trends of CIM

The promotion of the construction of smart cities in China not only stems from the progress of a new generation of information technology, but also is driven by the internal needs of the development of new urbanization in China. The COVID-19 outbreak in 2019 has revealed problems in China's traditional urban management. To cope with the unpredictability of natural disasters, cities need better governance, greater safety, and greater resilience. As a basic platform, City Information Model (CIM) provides a unified, authoritative and open data platform for urban construction by opening up cross-industry and cross-department information data channels.

6. Conclusion

With the continuous development of digitization, informatization and intelligence, the construction of smart cities is ushering in a new technological revolution, which will further accelerate the integration of informatization, urbanization, industrialization and agricultural modernization. However, there are still some technical problems to be solved, such as multi-source heterogeneous data fusion and information security. These issues need to be addressed to further improve and optimize the performance of CIM and its platform to better contribute to the realization of smart city goals. At present, we have solved the problem of "from nothing to something" for CIM, and the next step will be to focus on "from something to the best", that is, to improve and optimize the performance of CIM and its platform. This will help better support the goal of achieving a "smart city" and provide stronger support for urban development.

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