

Research on Smart City Construction based on Natural Technology

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Abstract. In the process of smart city construction and service, natural technologies such as big data, property networking and cloud computing play an irreplaceable core role. Therefore, it is of great significance to deeply study the natural technology of smart cities for the development of smart cities. Starting from the natural technology elements of smart city, this study first introduces the key natural technologies in the process of smart city construction and summarizes the framework model of smart city based on natural technology according to the connection and operation rules of various technologies. Secondly, this study analyzes the biggest dilemma faced by smart city construction led by natural technology, that is, the lack of social technology. Finally, the development countermeasures for smart city construction are put forward.

1 Natural technology of smart city

Driven by the current wave of new scientific and technological revolution, the concept of smart city has risen all over the world and become the general direction of future urban development. ^[1]Natural technology refers to the means, ways and methods used to transform the relationship between man and nature based on natural science. In the process of building a smart city, the infrastructure of the city not only provides intelligent services, but also needs massive natural technologies to support it. Here, this paper briefly introduces the common types of natural technologies in the current smart city construction process.

1.1 Property networking technology

At present, among the technical factors, the most important one is probably the property networking technology, which can be described as the core of a smart city. The new property networking application is driving the global smart city plan. Through information sensing devices such as radio frequency identification, infrared sensor, global positioning system, laser scanner, etc., any property goods are connected to the Internet for information exchange and communication according to the agreed protocol, so as to realize intelligent identification, positioning, tracking, monitoring and management. ^[2]

1.2 5G technology

The fifth generation wireless communication (5G) is a promising mobile communication technology, which is suitable for a wide range of application scenarios and promotes the effective dissemination of the concept of smart city. The 5G network is a digital cellular network, and the service area covered by each operator is called a small geographical area of the cell, which can digitize the analog signals of sound and images in a certain way. ^[3]With the addition of 5G technology, the government takes advantage of the characteristics of 5G technology, such as wide coverage and high speed, and draws lessons from the beneficial experience of foreign developed smart cities, and starts to promote the integration of urban infrastructure and urban governance with 5G technology as the core.

1.3 Cloud computing technology

Cloud computing is a kind of computing based on Internet mode, a further extension and development of distributed computing and grid computing, and gradually formed with the changes of Internet resource allocation. The construction of a smart city will inevitably lead to the influx of massive data

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from terminals such as sensors into the data center, which needs the data center to process it to realize the intelligence of various applications. Cloud computing platform is the central system of a smart city. It allocates and processes urban data resources through virtualization technology, realizes mass storage and resource sharing, and makes services more convenient and faster.

1.4 Big data processing technology

In the field of smart cities, data plays a very important role, including geospatial data, industry data, census data, sensor monitoring data, etc., which are the foundation of smart city construction. Big data technology mainly includes the following two aspects.

1.4.1 Data mining technology

Data mining uses computer science such as distributed technology, massive data processing technology, artificial intelligence, pattern identification, etc., and uses many methods such as information retrieval, evolutionary computation, on-line analytical processing, visualization and search algorithm to realize the application of intelligent data processing.^[4]

1.4.2 Data fusion technology

Data fusion technology uses infrared sensing, radio frequency acquisition, computational science, artificial intelligence, synthetic transmission and other technologies to extract the features of the acquired original data, compares and judges the spatial data or image data by using fusion algorithm, and then makes comprehensive analysis and processing together with the feature information, finally obtaining useful information accurately and timely.^[5] At present, the commonly used data fusion algorithms include TAG algorithm, PAGASIS algorithm and LEACH algorithm.^[6]

2 Smart city natural technology system model construction

Based on the above-mentioned natural technical elements, the city organizes people and properties in the city according to their geographical locations, acquires and transmits data and information through the property networking, hands over massive real-time operations to the cloud computing for processing, and feeds back the results to the control system for intelligent and automatic control through the property networking, so that the city can finally reach the state of wisdom. In all aspects of the construction and operation of smart cities, different functional layers composed of these key natural technologies play a vital role. Based on the relationship between the natural technology elements of smart city and the operation rules, this study constructs a framework model of smart city centered on natural technology as shown in Figure 1.

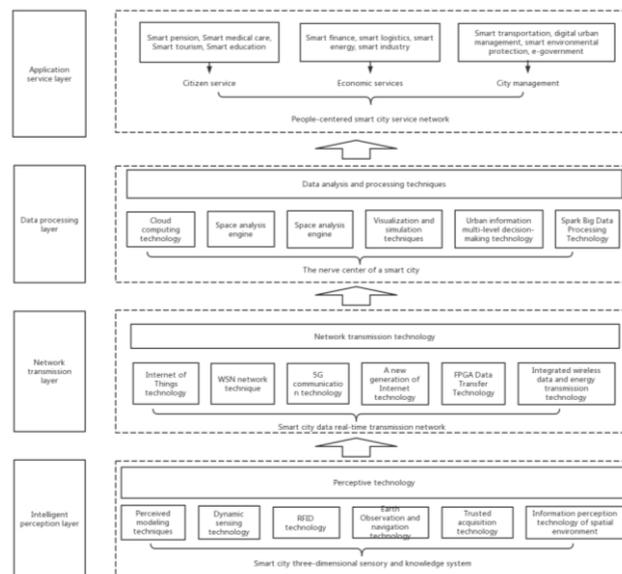


Fig. 1. Framework model of smart city centered on natural technology

The framework model of smart city centered on natural technology is divided into four layers: the first layer is intelligent perception layer, the second layer is network transport layer, the third layer is data processing layer, and the fourth layer is application service layer. The intelligent sensing layer adopts various sensors, relying on sensing modeling technology, dynamic sensing technology, RFID technology, earth observation and navigation technology, trusted acquisition technology and space environment information sensing technology. The network transport layer includes property networking technology, WSN network technology, 5G communication technology, new generation Internet technology, FPGA data transmission technology and wireless data and energy integrated transmission technology. The data processing layer is to systematically sort out, analyze and process all kinds of information collected through the transmission layer. It mainly relies on cloud computing technology, spatial analysis engine, data description and cognition technology, visualization and simulation technology, multi-level decision-making technology of urban information and Spark big data processing technology, etc. The application layer is guided by citizen service, economic service and urban management, builds a digital public service platform, and combines practical needs such as people's livelihood, social management, transportation, medical care, environmental protection and safety with intelligent technologies to form intelligent industry application service systems such as intelligent transportation, intelligent medical care, intelligent finance and e-government.

3 Predicament of smart city construction based on natural technology-lack of social technology

At present, the natural technology framework of smart city is a narrow technical framework in essence, because it only contains the natural technology elements necessary for smart city construction and ignores the important role of social technology in smart city construction. If social technology is not used to guide the operation of natural technology, it is easy for natural technology to get out of control in the process of building a smart city.

3.1 The legislative system of smart cities needs to be improved

The emergence of smart city provides a brand-new model for this kind of change, which gives the city outstanding wireless communication ability and scientific computing ability through new technologies such as property networking and big data. However, the best technology, without reasonable and effective legal support, is just a castle in the air. Smart city construction is a huge systematic project,

and legislation is an important part of it. So far, China lacks a central legislation to regulate smart city construction. Existing local laws and regulations are only formulated by each region according to its own specific management scope, lacking a systematic, guiding and forward-looking law and regulation.

3.2 The moral hazard of smart cities is improved

Smart city construction weakens the binding force of traditional morality. Smart city construction must include the content of virtual society construction, and virtual society has a strong weakening effect on traditional moral binding force, which is mainly manifested in: lower moral cost. The characteristics of the Internet society such as discreteness, openness, isolation and anonymity still exist in the property networking world, which will lead to moral problems such as information pollution, information hegemony and information fraud, which will directly plague the construction of normal social order in smart cities. [7]

3.3 The policy design of smart cities needs to be optimized

Smart city construction involves a huge amount of content, including urban economic development, cultural tourism, scientific and technological innovation, social management and many other aspects. This project has a long front and a large amount of construction. Therefore, it is necessary to have a scientific and practical policy design and overall deployment and promote the construction step by step. This is the premise idea. With the increasing number of smart city pilots, the central and local governments have issued a series of relevant rules and regulations, which have optimized the policy environment of smart city construction in China. However, although many cities have formulated corresponding policies and requirements according to the development needs of smart cities, there are incomplete and inaccurate factors in the content.

4 Countermeasures of smart city construction based on natural technology

Compared with natural technology, social technology refers to a systematic knowledge system based on the development of social science to regulate social relations and deal with social contradictions, which mainly includes a certain social political system, laws, economic means, cultural system and guidelines, policies, customs, ethics and so on. With the continuous improvement of China's smart city construction level, some unnatural technical problems are constantly exposed, and social problems such as information security, citizen privacy, epidemic prevention and control seriously hinder the improvement of China's smart city level. Therefore, the construction of smart city must be based on natural technology and social technology, formulate diversified safeguard measures and optimize relevant laws and policies to meet the development needs of smart city.

4.1 Strengthen the research and development of core technologies

The core support of natural technology act smart city construction should be taken seriously in any case. Therefore, the construction of smart cities should constantly strengthen independent research and development of core technologies, rely on information technology to foster the development of related industries, strengthen exchanges and cooperation between government, academic and research enterprises to jointly promote high-tech research and development, and provide intellectual support for the construction of smart cities. To establish special funds for smart city technology, the state should organize relevant departments to invest in infrastructure construction fields such as key technologies, public technology service platforms, research and development of all kinds of software and hardware in a planned way on the premise of limited funds, so as to avoid repeated investment and capital break. [8]

4.2 Improve top-level design and planning guidance

Smart city construction should formulate and improve the top-level design in advance according to the characteristics and advantages of the city, rationally plan the short-term, medium-term and long-term

development goals according to the task, and establish the institutional guarantee for long-term development. Moreover, it is necessary to establish a global concept, take public interests and people's needs as the starting point, and attach importance to the design and planning of the structural system of each supporting element of a smart city, so as to establish a more scientific and systematic top-level design scheme. Each city needs to base itself on reality and adapt to local conditions, and formulate a top-level design and planning system for smart cities that conforms to the law of development. Construct a horizontal coordination mechanism and a vertical penetration mechanism linking various departments of the city.^[9]

4.3 Integrate information resources and improve sharing mechanism

Influenced by many factors, all information systems in China's current cities basically exist and operate independently. ^[10]These independent information systems divide the city's information resources and form "information islands", which hinder the intelligent process of the city. Therefore, it is necessary to integrate the fragmented information resources of cities and establish a stable information sharing mechanism. Establish a unified standard and connect all kinds of "information islands" under the leadership of the government to realize information sharing among different systems.^[11] At the same time, we should pay attention to overall planning, carry out scientific and rational top-level planning and design in the early stage of smart city construction, clarify the rights and obligations of relevant government departments and other social organizations in smart city construction, and facilitate overall management and command.

4.4 Improve the information security laws and regulations system

The development of smart cities puts forward new requirements for China's information security laws and regulations. Administrative departments should have laws to follow when collecting data, and enterprises should pay attention not to infringe citizens' privacy when collecting data. Individuals not only have the right of privacy but also fulfill their obligations under special laws and regulations. Only by forming policies and rules, when using data resources, it is not easy to have loopholes, and it will not give some lawless elements an opportunity. In addition, organizations and individuals who misuse data resources need to be held accountable, and those who cause adverse consequences should be punished by relevant laws. Therefore, on the basis of promoting the research and development of core technologies, we should also strengthen the legislation of information security.

5 Conclusion

To sum up, in the process of building a smart city, in addition to using advanced natural technologies to construct the basic modules, various social technologies are needed to guide and standardize the operation modes of various natural technologies, so as to inject humanistic connotations into the construction of smart cities from the moral, ethical and institutional levels. Therefore, by choosing a construction path that integrates natural technology and social technology, we can systematically and dynamically identify kinds of problems in smart city construction, which is of great significance for improving the theoretical system of smart city and improving the level of smart city construction.

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