RESEARCH PAPER

Evaluation Index System of Green Public Open Space Based on Internet of Things and Mental Health

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ABSTRACT

With the emergence of the IoT era, wireless sensor networks will be more and more widely used. In addition to collecting, transmitting and processing simple data such as humidity, temperature and density of the dome, they can also provide multimedia information services such as video and images. It enables more comprehensive and accurate environmental monitoring. Therefore, MSDs have a huge demand in military, daily, forestry, biomedicine and other fields. The intensive city model has obvious advantages in meeting people's diverse needs and comfortable life. Most obviously, it speeds up the rhythm of life for residents, thereby increasing efficiency and saving time. Starting from this aspect, this paper conducts a research on the evaluation index system of public built on the following areas of open space IoT and mental health. In this paper, the GRNN neural network model is constructed, the mean condition is calculated, the density function can be estimated, the network output, and the schematic diagram of the generalized regression neural network is improved. Using the established system, the index in 2018 is selected as the base year, and after transformation, the standardized values of the past years are formed, which are substituted into the cells to form different matrices. The value of each cell is counted to obtain the subsystem coordination degree, and the global coordination degree is obtained through calculation. The evaluation results of ecological civilization construction and development in 2018 and 2019, 2020 and 2021 were compared. The experimental data shows that compared with 2018, economic development will change from 1 to 2.000, social harmony will change from 1 to 2.480, ecological health will decrease to 0.850, environmental friendliness will decrease to 0.750, and comprehensive evaluation will decrease to 0.513. This shows that while the economy is developing this year, the construction of ecological civilization has been gradually

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carried out, and good results have been achieved. This reflects the effectiveness of the system. The subject of the evaluation index system of green public open space based on the Internet of Things and mental health has been well completed.

1. INTRODUCTION

With the rapid development of urbanization, the buildings and population in cities are becoming more and more dense. The stressful and noisy city life has left residents in a state of psychological consumption that must be recovered in some way. Environmental psychology research has confirmed that if the environment has certain positive characteristics, it can bring a good restorative experience to individuals in the environment, otherwise it will increase people's consumption. The spatial characteristics of high-density cities determine the scarcity of high-quality restorative environmental resources. It is more realistic to improve the quality of environmental restoration of urban public open spaces. Whether and how to balance and improve the physical and mental conditions of residents by improving the quality of the living environment is a scientific issue of common concern to researchers. If the characteristics of the environment can meet certain psychological conditions, such as the existence of a certain visual focus, including natural landscapes such as green plants and water features, and the existence of individual favorite elements, etc., the individual's attention is easily attracted by this element, and the inner negative emotions can be relieved more quickly and effectively.

Abubakar A has carried out a work on the evaluation index system of green public open space. He aimed to identify the existing land use and assess the use of GOS in accordance with the provisions of the Banda Aceh Regional Spatial Plan (RSP) for potential development to enhance the use of GOS. The assessment started with an analysis of the existing ground use in the GSMOS determined by processing satellite images in the 2016 Banda Aceh City SRP, using a Geo-spatial info System application as an analytical tool [1]. Sulma S's research aimed to evaluate the application of Pleiades-1A images and object-based image analysis (OBIA) methods to extract urban green space information in parts of Jakarta, Indonesia. He believed that with the availability of high-resolution satellite data such as IKONOS, Quickbird, Worldview, and Pleiades, the use of remote sensing data in urban studies is also increasing [2]. Mareeva V M used urban renewal to tackle the central problems of cities and contribute to realizing durable growth. To put the durability tool to the test, the fellows used a native Qatari example, the neighborhood of the Old Ghanim, one of Doha's oldest districts [3]. The aim of the Hidayat J T study was to assess the quality of public GOS in the Tanasarel-Bogor city area. The analysis was performed using the 2015 Worldview 2 images by the NDVI method. Studies have shown that in the current GOS field, GOS is still compliant, but the quality level of the public (GOS) varies [4]. Most of the indicator systems developed by their research have no uniformity and cannot be applied to other open spaces. At this point, we can use the GRNN neural network model in the Internet of Things to optimize the system.

Many scholars have also conducted research on the Internet of Things and mental health. Gutierrez L J comprehensively surveyed the work being completed at the interface of IoT and physical illness in mental

health. Multiple computing strategies, approaches, and equipment were evaluated, along with research findings and potential open questions for the effective use of IoT systems in mental health. In particular, open challenges related recommendations for using current IoT systems for building psychological wellness care are addressed[5]. Stellbrink A found that biomarkers are associated with more than 12,000 epigenetics in recent techniques. About 970 metabolomics related, 515 genome-wide association studies (GWAS) related, 486 bionics related, 497 patent applications. Patent filings related to the diagnosis and prognosis of mental illness peaked in 2008. Before 2016, there was an overall downward trend, and in 2013, it was a local peak. This trend persists despite the added value brought by the latest technologies such as machine learning, big data and the Internet of Things [6]. Jalali N evaluated the massive utilization of data for intelligent household circulators by conducting a pilot study. His research aimed to protect the physical and mental health of older adults while supporting their independence and privacy. On the other hand, in order to better provide these individuals with essential medical services in emergency situations, their daily activities are monitored [7]. Morr C E discussed the opportunities and challenges that virtual communities, machine learning, and the Internet of Things bring to mental health research. Healthy Virtual Communities (VCs) are an emerging model. Mental health interventions that have been shown to be effective in providing people facing mental health challenges with self-management and diagnosis and access to treatment. However, the existing wellness venture capital applications are limited. They cannot provide access to coordination services, nor can they streamlined way to keep gathering and consolidating information from various appliances [8].

On the basis of the definition of the Internet, one of the network definitions that expands and extends its user end to all items, and thus develops information communication and exchange, is the concept of the Internet of Things. The Internet of Things is the Internet of Things, which includes vehicles and natural persons with wireless terminals, all assets (affixed with RFID or barcodes), a home appliance, mobile terminals (commonly used), sensors (industrial production tools) and other items that are already available under the current conditions. Through all types of communication channels, the SaaS operation mode (for the Internet of Things), application integration, and interconnection are completed. Based on the Internet, private network or intranet, it provides guarantees for controllable and safe real-time decision support, work collaboration, linkage alarm, traceability and positioning, online monitoring and other services and management functions. It can realize the integration of "management, control and operation" of "high efficiency, energy saving, safety and environmental protection" of all things. In this paper, the green public open space evaluation index system is integrated with the Internet of Things to establish a more complete open space evaluation index system.

2. METHODS OF EVALUATION INDEX SYSTEM

2.1 Information Flow

Information is an indispensable and important basic element of the information age. Information flow is the nervous system of the normal functioning of society, and plays an important role in the process of commodity circulation [9]. In the Internet of Things system, a new meaning is given to information flow,

and information flow is one of the important conditions for the existence of the Internet of Things system [10]. There are many kinds of information, but the information we describe is aimed at market information in economic relations. It refers to "information about the situation and characteristics of various sectors and industries of the national economy, as well as the influence and constraints of various industries on each other.

It includes business scale, natural resources, material sources and consumption, equipment and investment, cost and price, personnel and organization, production methods and production management methods, laws and regulations on economic policy, and the impact of natural disasters and data [11]. Economic information can be transmitted through multiple channels and in a short period of time through the current communication technology. This provides a strong basis for decision-making in the formulation of economic plans in modern economic development [12]. The effective and orderly development and operation of any organizational form in society must rely on the efficient and sufficient exchange of information. Information is the basis for effective management of plans from execution to implementation, and it is an irreplaceable factor that directly guarantees economic operation [13]. Economic information itself does not generate any profits, but it can provide a strong guarantee for the acquisition of profits. Through the transmission and utilization of economic information, management efficiency can be improved, labor productivity can be improved, and the economic benefits of enterprises can be increased [14]. On the other hand, it can adjust the link of availability and requirement of the market and save unnecessary waste and losses. It can promote the good operation of the whole society, and then generate huge overall economic benefits [15]. Theoretically, the value of the product is determined by the function of the product and the cost of the product. In the information society, the information itself has value, so if the information can be used well, the cost of the product can be reduced, and the value of the information will be realized through the transfer [16]. The four key technologies of the Internet of Things are shown in Figure 1:

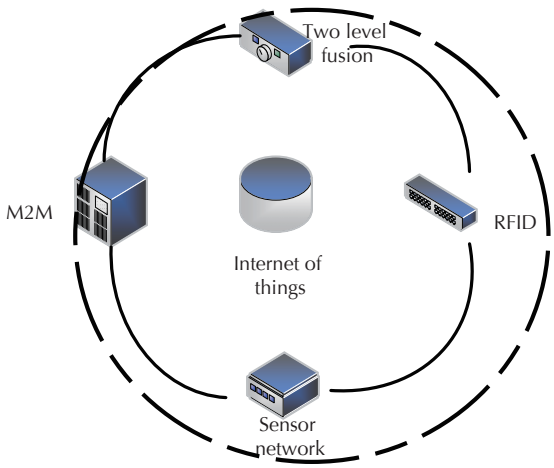

Figure 1. Four key technologies of IoT.

The development and evolution route of the Internet of Things is shown in Figure 2:

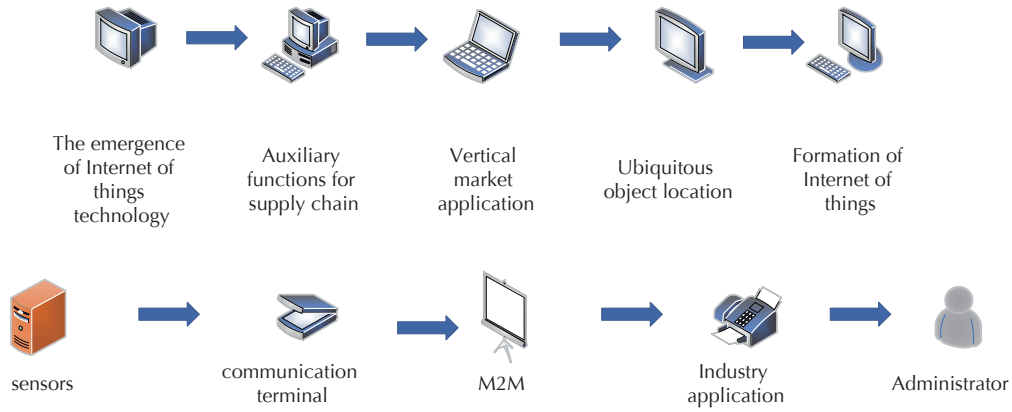

Figure 2. Development and evolution route of the Internet of Things.

2.2 LoRaWan Terminal Device Class.

The LoRaWan protocol divides the types of devices into three types according to different IoT applications: Class A, Class B, and Class C. The class A terminal is studied in this paper [17]. In order to solve the contradiction between high power consumption and long-distance communication, designers proposed Low Power Wide Area Network (LPWAN) technology. It maximizes long-distance communication and keeps power consumption relatively low. It has a long communication distance and a wide range of coverage. Depending on the surrounding environment, a gateway can ensure communication from a few kilometers to more than ten kilometers in the vicinity. LoRaWan is a set of communication protocols and system frameworks launched by the LoRa Alliance, specially designed for LoRa long-distance communication networks.

ClassA: LoRa terminal device with two-way communication. The principle of this type of terminal to achieve two-way communication is: after each data transmission, the device will open two short-duration receiving windows, the purpose is to accept the downlink data, so as to achieve the effect of power saving [18]. Its transmission time interval is determined by the base time interval of the terminal equipment. Usually a random time is added based on a random time base (ALOHA protocol) [19]. Class A terminals have the lowest power consumption in practical applications, receiving data can only wait until after sending data, and only for a small period of time. Therefore, the downlink data of the server at all other times must wait until the terminal sends the next data before continuing to send it, that is, the downlink communication on the server side must be carried out after the uplink communication occurs [20]. It is stipulated in the LoRaWan protocol that since class A is the lowest class, the functions of class A are also the most basic for subsequent expansion and backward compatibility of other advanced classes. All terminals must be implemented.

Since LoRa gateways are usually arranged in the wild, it is inevitable to encounter damage to the gateway device itself caused by wind, rain, thunder and sunlight. In order to reduce the hardware damage of the

device from the natural environment as much as possible, it is decided to protect the LoRa gateway with a housing. The principle of two-way communication for type A terminals is that each time the device sends data, it will open two short-duration receiving windows. The purpose is to accept downlink data, so as to achieve the effect of power saving.

2.3 GRNN Neural Network Model

GRNN is called generalized regression neural network. It has been proved that GRNN is very suitable for solving problems with nonlinearities because of its very strong nonlinear mapping capability and versatile network architecture with strong fault resistance and rigidity. In addition, GRNN has stronger advantages than RBF neural network in function approximation and learning speed. The network finally converges on the optimized regression surface with a large number of samples, and the most important thing is that the prediction effect is also very good when the sample data is small. Even if it encounters unstable data structure network, it can perform better analysis and processing.

The mean condition is:

$$\hat{y} = E(y / x) = \frac{\int_{-\infty}^{\infty} y \cdot f(X, y)dy}{\int_{-\infty}^{\infty} f(X, y)dy} \tag{1}$$

Density functions can be estimated:

$$\hat{f}(x, y) = \frac{1}{n \cdot 2\pi^{\frac{p+1}{2}} \cdot \sigma^{p+1}} \cdot \sum_{i=1}^{n} exp\left[-\frac{(x - x_i)^T \cdot (x - x_i)}{2\sigma^2}\right] \cdot exp\left[-\frac{(x - y_i)^2}{2\sigma^2}\right] \tag{2}$$

After finishing the calculation, the network output can be obtained as:

$$\widehat{y(x)} = \frac{\sum_{i=1}^{n} Y_i exp\left[-\frac{(x - x_i)^T \cdot (x - x_i)}{2\sigma^2}\right]}{\sum_{i=1}^{n} exp\left[-\frac{(x - x_i)^T \cdot (x - x_i)}{2\sigma^2}\right]} \tag{3}$$

The schematic diagram of the generalized regression neural network structure is shown in Figure 3:

The next thing to do is to improve the Formula for calculating the MIV value:

The Formula for calculating MIV is as follows:

$$MIV_i = \sqrt{\left(y_i^{0.9} - y\right)^2 + \left(y_i^{0.95} - y\right)^2 + \left(y_i^{1.05} - y\right)^2 + \left(y_i^{1.1} - y\right)^2} \tag{4}$$

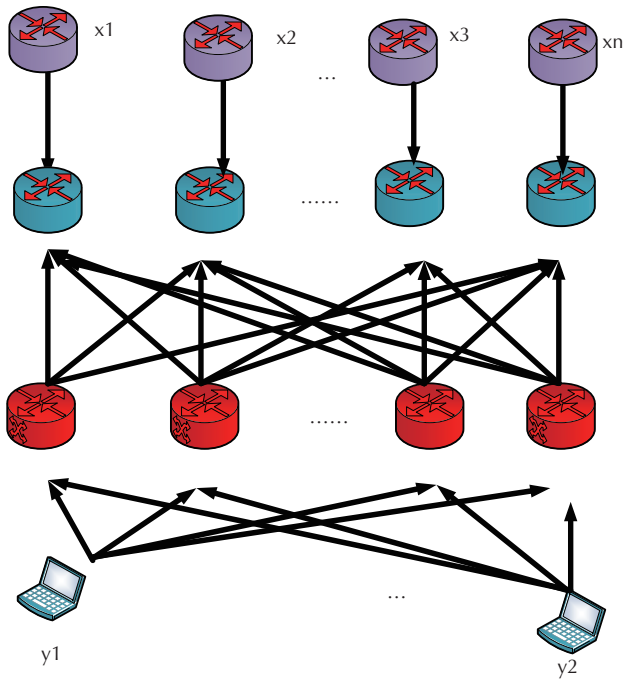

Figure 3. Schematic diagram of generalized regression neural network structure.

The degree of independence between indicators can be expressed as:

$$a_{ij} = 1 - r_{ij} \tag{5}$$

Then the rank correlation coefficient between elements x and y is defined as:

$$r_{xy}^{'} = 1 - \frac{6\sum_{i=1}^{n} d_i^2}{n\left(n^2 - 1\right)} \tag{6}$$

The entropy weight method determines the weight calculation Formula of each index as follows:

$$R_{ij} = \frac{x_{ij}^{'}}{\sum_{i=1}^{n} x_{ij}^{'}} \tag{7}$$

$$e_j = -\frac{1}{lnm}\sum_{i=1}^{m} R_{ij} lnR_{ij} \tag{8}$$

The Formula for calculating the weight ω_j is:

$$\omega_j = \frac{g_j}{\sum_{i=1}^{n} g_j} \tag{9}$$

The comprehensive evaluation model of the spatial evaluation index system is shown in Formula (10):

$$E = F\{f(a), f(b), f(c), f(d)\} \tag{10}$$

The degree of contact is:

$$\mu = \frac{S}{N} + \frac{F}{N}i + \frac{P}{N}j \tag{11}$$

It can be abbreviated as:

$$\mu = a + bi + cj \tag{12}$$

The interval length of the sequence is the length of the sequence on the coordinate axis. According to the mathematical concept, it is expressed as:

$$L = \max C - \min C \tag{13}$$

The interval average interval of the sequence is the length of the interval length equally divided, expressed as:

$$D = L / P = (\max C - \min C) / p \tag{14}$$

To sum up, the correlation degree of each level can be expressed as:

$$\mu_p = \sum_{j=1}^{m}\sum_{k=1}^{n}\mu_{ijk} \tag{15}$$

2.4 Internet of Things and Mental Health

The communication technology of the Internet of Things mainly includes two types: short-distance communication technology, such as RFID, NFC, Bluetooth, ZigBee technology, etc. Long-distance communication technology, such as optical fiber, network cable, telephone line and other wired communication technology, and wireless communication technology, mainly including 2G, 3G, 4G and other technologies. The amount of interneurons in the closed layer of a model plays a critical factor in the training effectiveness of its model. LPWAN is a low-bandwidth, low-power, long-distance, wide-coverage, and multi-connection IoT technology. It has become a new hotspot in the IoT field, meeting the needs of long-distance, wide-coverage terminal equipment connections. If the number is too small, the neural network cannot receive enough information from the input samples and cannot learn well, therefore, it is necessary to increase the training time of the model. If there are too many neurons, the training process may be very long and the training results may be "too consistent". So far, there is no uniform standard for

determining the number of neurons in the closed layer of the model. We can only refer to certain empirical formulas to determine the approximate range. If the number of layers of the neural convolutional layer determines the quality of machine learning, then the construction of theoretical algorithms such as BP neural network determines the response speed of the system, the carrying capacity and the level of action. The CBOW model describes this process in detail. The CBOW model is shown in Figure 4:

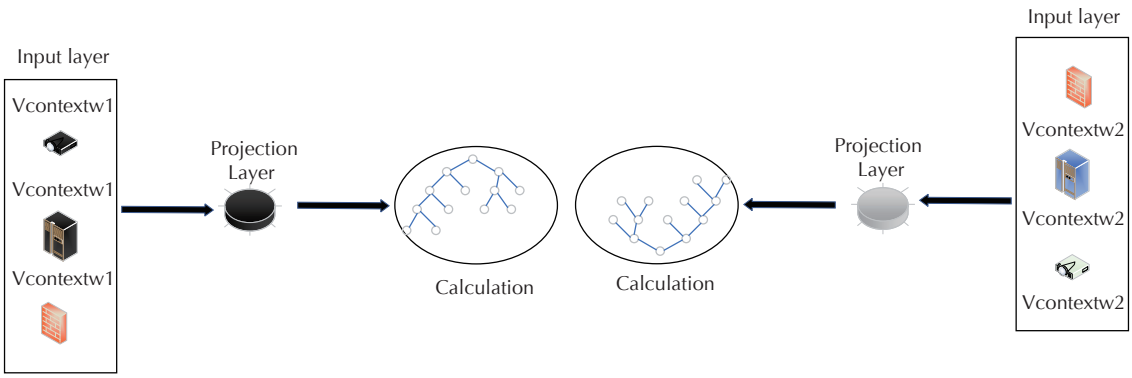

Figure 4. Schematic diagram of the CBOW model.

Urban density is an objective, quantitative, and neutral spatial indicator, which is generally measured by population density and building density. At present, with the deepening of ecological civilization construction, many ecologists have turned their research angle to the vitality of outdoor area. With the penetration of ecology and geography in the urban green space system planning discipline, the green space planning scope in western countries is no longer satisfied with the traditional urban area, and gradually expands to the macro area. More and more countries connect urban agglomerations through linear greenway recreational spaces through greenway planning, focusing on the continuity of green space. The vitality of outdoor area refers to the ability of various types of elements related to public space to attract people to perform high-frequency and long-term activities, and to maintain the vitality of public open space only if they can be used continuously. At present, the research on a single direction of public open space has become more and more mature, such as the function, planning and design of public open space. Therefore, relevant scholars gradually evaluate the public open space from the overall scale, which mainly focuses on the evaluation of the outdoor area. Plotratio is also an indicator of building density. It refers to the ratio of total building area to building site and is generally considered to be the most accurate measure of density.

For most of the sample cities that are still in the stage of larger cities and megacities, the green coverage area of built-up areas has not increased due to the expansion of urban built-up areas. In the case of very limited urban land resources, it is often given priority to meet the basic purposes of production and life, such as residence, office, commerce, industry, transportation, etc. The content of land use that is used to improve the quality of human settlements is relatively neglected, especially the lack of ecological green space.

3. EXPERIMENT ON THE EVALUATION INDEX SYSTEM OF GREEN PUBLIC OPEN SPACE

3.1 Sample Collection

Relatively speaking, there are few studies on the impact of urban environment on residents' mental health. With the development of society, city managers and designers are more and more aware of the impact of the environmental experience the city brings to residents on their health and well-being. The urban environment needs to play an active role in promoting public health. Urban green space system planning is the main way to provide assessment basis for government decision-making of urban greening construction, and establishing corresponding measurement standards and evaluation indicators can make the planning scheme more reasonable and applicable. The frequency of papers on urban green space system planning evaluation research from 1978 to 2015 is shown in Figure 5:

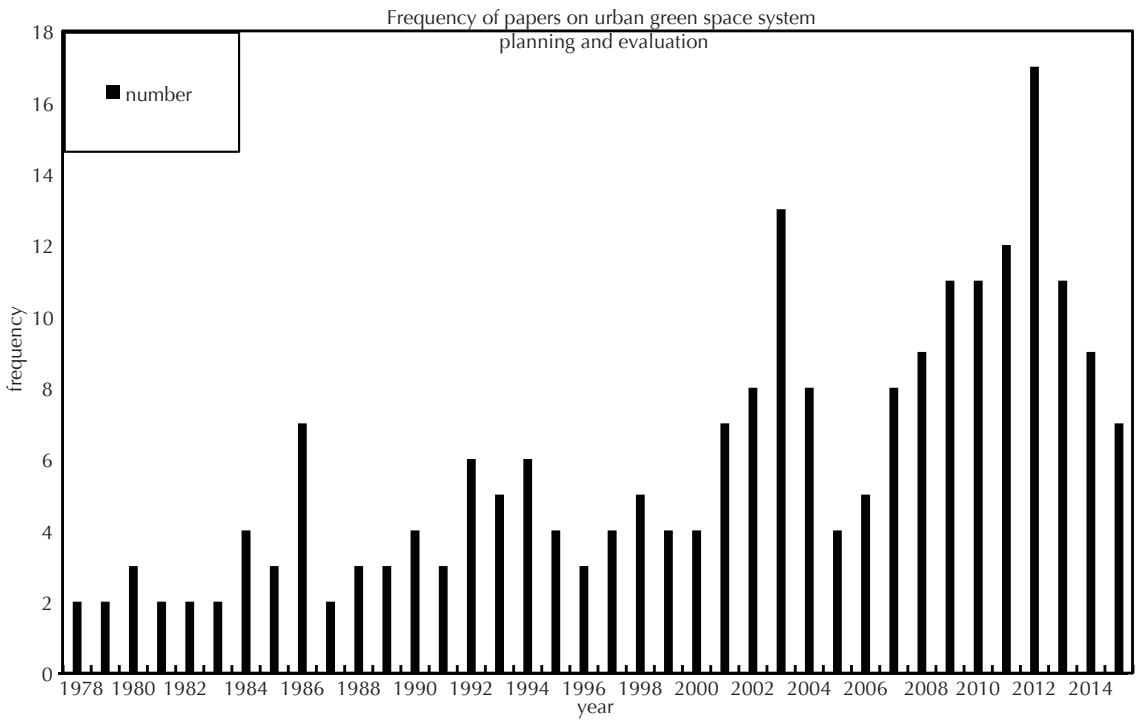

Figure 5. Paper frequency of urban green space system planning evaluation studies from 1978 to 2015.

It can be seen from the figure that more and more scholars in China are conducting evaluation research on urban green space system planning, and the frequency of papers is also generally rising in a step-like manner.

3.2 Setting of Indicators in Cell Space

In order to simplify the calculation, the evolution rules use a simple cell rule table, and the coupling relationship between the subsystems is established through a simple mapping relationship. The 2018 indicator is selected as the base year, and after transformation, the normalized values of the past years are formed, which are substituted into the cells to form different matrices. The value of each cell is counted to obtain the subsystem coordination degree, and the global coordination degree is obtained through calculation. A, B, C, D, E are used to represent economic development, social harmony, ecological health, and environmental friendliness, and comprehensive evaluation of five items.

Figure 6 shows the evaluation results of ecological civilization construction and progress in 2018 and 2019.

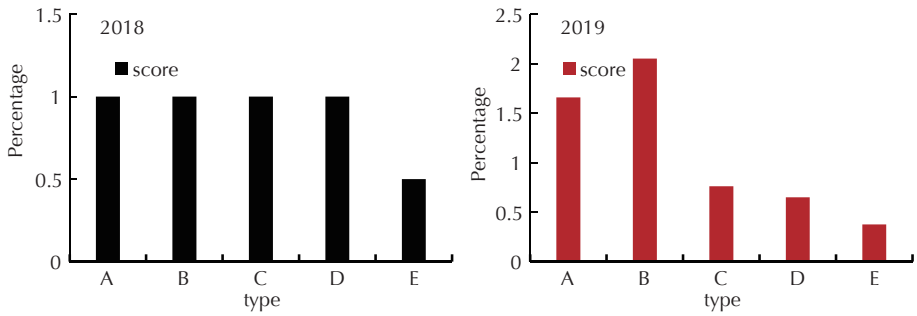

Figure 6. Evaluation results of ecological civilization construction and progress in 2018 and 2019.

As can be seen from the figure, compared with 2018, economic development has changed from 1 to 1.658, social harmony has changed from 1 to 2.050, ecological health has dropped to 0.760, environmental friendliness has dropped to 0.650, and comprehensive evaluation has dropped to 0.375. It shows that this year neglected ecological civilization while economic development.

Figure 7 shows the evaluation results of ecological civilization construction and progress in 2018 and 2020.

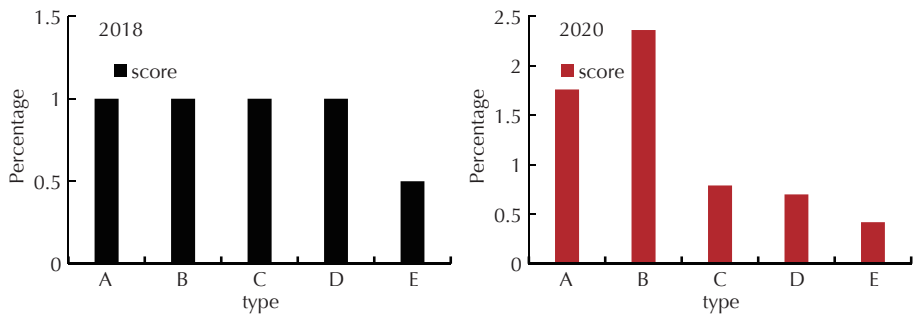

Figure 7. Evaluation results of ecological civilization construction and progress in 2018 and 2020.

As can be seen from the figure, compared with 2018, in 2020, economic development has changed from 1 to 1.760, social harmony has changed from 1 to 2.360, ecological health has dropped to 0.790, environmental friendliness has dropped to 0.700, and comprehensive evaluation has dropped to 0.420. It shows that while the economy is developing this year, the construction of ecological civilization is gradually being carried out.

Figure 8 shows the evaluation results of ecological civilization construction and progress in 2018 and 2021.

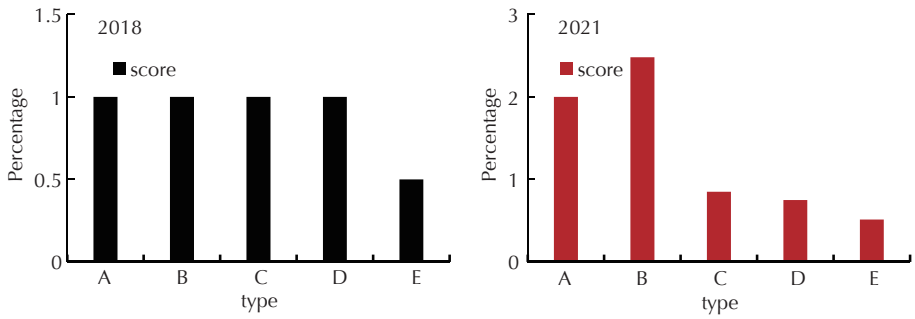

Figure 8. Evaluation results of ecological civilization construction and progress in 2018 and 2021.

As can be seen from the figure, compared with 2018, in 2021, economic development will change from 1 to 2.000, social harmony will change from 1 to 2.480, ecological health will decrease to 0.850, environmental friendliness will decrease to 0.750, and comprehensive evaluation will decrease to 0.513. This shows that while the economy is developing this year, the construction of ecological civilization has been gradually carried out, and good results have been achieved. It reflects the effectiveness of the system.

3.3 Test Results

Debug the board, the results are shown in Table 1:

Table 1. Hardware Test Results.

Test point	Design expectation	Measured value
Vin test point voltage	11.5V-12 V	11.7 v
3v3m test point voltage	3.13-3.47 V	3.32 v
5vrf test point voltage	4.75V-5.25 V	4.93 v
Whether debugging can be downloaded	Able to download and debug	Can download and debug normally
Operating current during equipment sleep	-	0.2 mA
Operating current when equipment sends data	-	0.5 mA
Operating current when equipment receives data	-	0.2 A

ACK stands for message acknowledgement bit. If the message type is Confirmed, the receiver must reply with a message with ACK set to 1, which means that the confirmation bit is set for the message, and the receiver needs to return the message. Each gateway should be arranged at the corresponding location, and then the PC side should be arranged to start the test, and each test 100 pieces of data. When a test is completed, the gateway as the data source continues to increase the distance, and starts the next test, the distance starts from 1km, until the data is greatly lost. The specific results of the test are shown in Table 2:

Table 2. Gateway communication distance test results.

Number of tests	Communication distance	send data	Accept data	Packet loss rate
1	1.0 km	100	100	0
2	2.1 km	100	100	0
3	3.0 km	100	100	0
4	4.2 km	100	100	0
5	5.1 km	100	100	0
6	6.2 km	100	100	0
7	7.0 km	100	83	17%
8	8.1 km	100	55	45%
9	9.3 km	100	38	62%

If FPort is 0, it means that the frame load (FRMPayload) is full of MAC commands, other values (1-253) are formulated by the application, 254 represents the MAC layer test protocol, and 255 is a reserved field. It can be seen from the table that as the distance increases, the packet loss rate continues to increase, the transmitted data remains unchanged, and the received data becomes less and less. When the distance reaches 9.3 km, only 38% of the data is received, and the packet loss rate is as high as 62%.

The gateway communication rate test results are shown in Table 3:

Table 3. Gateway Communication Rate Test Results.

Number of tests	Communication distance	Send to receive time (s)	Rate (kbps)
1	1 km	57.6	2.78
2	1 km	58.2	2.75
3	2 km	63.2	2.53
4	2 km	62.3	2.57
5	3 km	72.4	2.21
6	3 km	72.7	2.20
7	4 km	94.7	1.69
8	4 km	93.1	1.72
9	5 km	129.0	1.24
10	5 km	128.1	1.25

As shown in the table, the communication distance is from 1 km to 5 km, and the communication rate is from 2.78 kbps to 1.25 kbps, which generally meets the communication transmission requirements of the system.

For the mental health analysis below, a linear classifier logistic regression was chosen to classify positive and negative emotions. Aiming at the three types of features of speech, behavior and environment after dimensionality reduction, we first use a single feature to classify positive emotions and negative emotions. Then two kinds of features are fused for classification, and finally, the same classifier is used to fuse three kinds of features to classify positive emotions and negative emotions. The classification of positive and negative emotions by a single feature is shown in Table 4:

Table 4. A single feature categorizes positive and negative emotions.

features	Accuracy	recall	F1
Phonetic features	0.81	0.81	0.77
Action characteristics	0.87	0.8	0.86
Environmental characteristics	0.67	0.64	0.62

The two feature combinations to classify positive and negative emotions are shown in Table 5:

Table 5. Two feature combinations to classify positive and negative sentiment.

features	Accuracy	recall	F1
Voice + action	0.92	0.88	0.92
Voice + Environment	0.75	0.71	0.72
Action + Environment	0.75	0.73	0.71

As shown in Tables, the accuracy data of the fusion result of speech feature and action feature reaches 0.92. However, after the speech features and action features are fused with the environmental features, the accuracy is lower than that of a single feature. Integrating three types of features of speech, action and environment, the accuracy rate is 0.81. It shows that the state of physical and mental health is closely related to the multi-sensing characteristics. The evaluation of physical and mental health by fusing different categories of features will improve the evaluation system to a certain extent, but it is not that the more features are fused, the better the effect. For the evaluation of positivity and negativity, combining speech and behavioral features can get better results.

In this case, the wake-up is mainly realized by the Timer function of the MCU, or the external RTC module on the device board. Once the set alarm value is reached, the device will wake up automatically. Then the data is transferred to the upper-layer node, and after the transfer is completed, it enters the sleep mode and waits for the next wake-up.

4. INTERNET OF THINGS AND GREEN PUBLIC OPEN SPACE

4.1 Threat of Potential Entrants

Before the introduction of industry standards, because the entry threshold of the market segment is still relatively low, there will be a large number of potential entrants following the trend, which will form competitive pressure on enterprises. Potential entrants can participate in cultivating the market when the market segment is still in the introduction period, which is beneficial to the overall growth of the industry. Although potential entrants have diverted part of the market demand at this time, it seems to be unfavorable for existing players in the industry from an intuitive point of view. As overall demand grows rapidly and cannot be met by existing production capacity in the industry, new entrants just fill the gap, reducing the likelihood of finding alternatives for unmet demand. It avoids the disruption of existing industry demand due to the activation of alternative industries, and then maintains the continued profitability of the industry.

4.2 Indicator System Design Process

Substitutes are those other products that perform the same function. The theory of "Five Forces Model" tells us that for two independent enterprises, they belong to different industries. Since their respective products or services may have alternative functions, they will also form cross-industry competition between them, thus affecting the setting of the existing enterprise's competitive strategy in the industry. The intensity of competitive pressure of substitutes is closely related to its price, quality, and user switching costs. The evaluation index system needs to use systematic thinking to consider many factors, and it is unnecessary and unrealistic to accurately measure the importance of each factor. In the process of index system design, in order to make it have good operability, it is necessary to follow certain principles. Under the premise of conforming to the characteristics of project evaluation, the key points should be highlighted as much as possible, and the main factors should be grasped to make the index system simple and clear.

4.3 Restorative Environment

According to the core theory of restorative environment, if the environment has certain positive characteristics, it can promote the individual to have restorative experience in it. That is to say, the stress is relieved or the attention consumed in work and life is restored, which has the corresponding restorative effect.

According to the principles of ecology, the ecological planning of urban green space macroscopically studies the rules of the combination, structure, process and pattern among corridors, patches and substrates, and recombines its space according to this law. The adjustment of this combination and space should not only serve human beings, but also consider non-biological factors, and also serve the living things in nature.

5. CONCLUSION

An important issue in the study of environmental protection theory is how to judge the status and degree of the development and implementation of green public open space. That is to say, which indicators should

be used to represent the green public open space based on the theory of circular economy, and the ways to rate development degree of healthy public outdoor space area in a certain area through such indicators. The formulation of green public open space based on circular economy is not only the basic work to quantify the development of green public open space, but also the basic content of its theoretical research. It is the main basis for judging the development quality and level of green public open space. If there is no specific, systematic, complete and comprehensive measurement standard for the construction and development of green public open space, then its operation and development will lose its meaning. Therefore, it is very important to establish the evaluation standard of green public open space development under the guidance of circular economy theory. However, there are few achievements in the theoretical research in this area. Therefore, this study expects to introduce the theory of Internet of Things and mental health into green public open space, and conduct a more in-depth exploratory research on the evaluation index system of green public open space from a comprehensive and extensive perspective. Further verification by empirical analysis and calculation of relevant weights can eventually form a relatively complete comprehensive evaluation method for green public open space under the circular economy.

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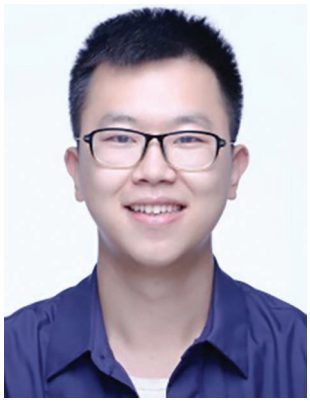

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