

## Research Article

# Intelligent Garden Planning and Design Based on Agricultural Internet of Things

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As the application of the Internet of Things technology continues to deepen in various fields, it also continues to develop in the agricultural field and the agricultural landscape. This article uses the agricultural Internet of Things to conduct an in-depth analysis and research on the planning and design of smart gardens and combines field research and project practice on the basis of theoretical analysis. Through the combination of agricultural Internet of Things technology and agricultural landscape, the planning and design of smart gardens are studied. The theories used include Internet of Things technology, agricultural industrialization theory, sustainable agricultural development theory, new rural construction theory in agricultural disciplines, ecotourism theory, tourism psychology theory in tourism disciplines, landscape ecology theory, landscape aesthetics theory, and garden planning and design theory. From related theories to planning and design practice, a more systematic study of the smart park has been carried out to provide scientific guidance for the agriculture of the smart park. To provide scientific guidance for the planning and design of agricultural IoT of smart gardens, the theoretical system of planning and design of smart gardens based on the integration of agricultural IoT is proposed and systematically elaborated, including its concept, characteristics, related theories, and guidance methods.

## 1. Introduction

At present, some smart garden projects are reconstruction or transformation projects, and are traditional agricultural projects, aiming to survive in order to seek market stimulation for consumption and the transformation of the original leisure base. But in the end, due to the unscientific basic system planning and low level of operation and management, the transformation process did not introduce a scientific theoretical system for demonstration, resulting in the wisdom of garden project planning and transformation not being enhanced, and the development of the project industry was not improved [1]. Agricultural modernization continues to develop, and the application of the agricultural Internet of things is becoming increasingly extensive. From video monitoring to spatial perception and from an intelligent warning to environmental regulation and control, all show the superiority of the agricultural Internet of Things. The technology of agricultural Internet of Things itself is

constantly developing and improving, and the area involved is constantly broad, but there is no unified standard and system in the process of introducing the smart garden, which leads to the blind introduction of technology in the process of introduction and construction, construction out of actual production, bad operation condition, and poor overall security. There are various forms of specific development of wisdom gardens in different periods and regions, and increasing domestic research on wisdom garden and agricultural Internet of Things, but it is not common to combine agricultural Internet of Things and wisdom garden [2]. How to combine agricultural IoT in the planning and design of smart gardens in the era of the rapid development of modern agriculture, so that agricultural IoT technology cannot only play an important role in agricultural production but also bring new experiences in the entertainment and landscape of smart gardens, is an important issue studied in this paper.

With the development of geographic information technology, we have made promising achievements in

data collection and spatial visualization [3]. However, in the face of complex and dynamic big data, landscape planning lacks corresponding and advanced methods of data processing and analysis. On the one hand, the data collection is affected by the degree of data openness and is limited to a small range of fields, which are commonly used for researching the analysis of geographic information data, web text data, and communication location data. Due to the small scope of landscape planning and design, the quality of data is to be considered, and often the value of the research is lost due to the low precision or accuracy [4]. Moreover, the processing of data requires a certain mathematical basis, and the correction, fusion, and analysis of data will affect the quality of data. On the other hand, big data is not yet fully popular, and related education and training are not incorporated into the education system, which is a challenge for those who are engaged in planning and design. Big data-based planning is characterized by interdisciplinary use, and planners need not only profound professional knowledge but also other related knowledge backgrounds, such as geographic information knowledge, computer knowledge, and mathematical and scientific knowledge [5].

Under the background of a new period, agricultural IoT has become an important part of intelligent garden planning and design, and how to integrate and coordinate IoT planning with industrial planning, landscape planning, tourism reception, and farm life management planning is an urgent problem now. Therefore, the research of intelligent garden planning and design based on the integration of agricultural IoT has the significance of enhancing industrialization. The construction of smart garden projects based on the integration of the agricultural Internet of Things requires the coordination of multiple disciplines, relying on the support of high-tech agricultural Internet of Things and the scientific guidance of agricultural production planning, tourism planning, and landscape planning theory. The construction of such projects is still in the exploration stage, and the relevant theoretical system is not yet perfect. From the perspective of landscape architecture discipline, we analyze the intelligent garden project based on the integration of the agricultural Internet of Things and explore the relevant theoretical system to guide its construction, and the research of this paper has certain theoretical and guiding significance for the intelligent garden project under the background of the big data era.

## 2. Related Works

Big data in the foreign literature plays a prominent role in studying urban issues and is commonly used to study inner-city space, urban activity space, and city hierarchy [6]. For example, Kumari and Sahu used the number of domain names and users to rank the world's Internet cities based on the global Internet map [7]. Mabiletsa et al. used a Twitter security system cracking program to extract geographic coordinates and text data, combined with time-series models to analyze the keyword characteristics and distribution of

Twitter posts in different cities, and found that only a few cities could provide the information needed for multiple cities [8]. Mayub et al. analyzed the communication information of 25 million subscribers provided by Belgian cell phone operators, used the postal codes corresponding to subscribers' cell phone billing addresses to establish social networks, applied the gravity model to study the communication intensity, and finally obtained the communication links and hierarchy between cities [9].

With the rapid development of the modern economy and society, the process of industrialization and urbanization is gradually accelerating and people are enjoying the improvement of material living standards, while they continue to face the pressure of high-intensity work and fast-paced life [10]. Urban people are increasingly willing to spend their leisure time away from the cold jungle of steel and concrete, to go to the beautiful and quiet countryside to relax, adjust their bodies and minds, and return to the most natural and simple state of life [11]. This kind of elegant and natural rural beauty is important to restore the tired body and mind of urban residents, and the actual demand for rural tourism is growing, and rural tourism is gradually becoming an important new way of holiday leisure for urban residents [12]. To solve the long-term problem of agricultural development, we need to implement the strategic transformation of agriculture as soon as possible. The development of tourism and leisure agriculture not only allows rural areas to realize the multifunctionality of agriculture but also is an important way to solve the strategic transformation of agriculture [13]. This type of smart garden is different from traditional agriculture, forestry, fishery, and animal husbandry, as well as from general tourism, and it organically combines primary agriculture, secondary agricultural processing industry, and tertiary service industry [14]. The development of smart gardens not only increases the added value of agriculture but also increases the economic income of farmers, and its integration of tourism and ecological agriculture greatly improves the comprehensive economic benefits of rural areas and promotes the construction of a new socialist countryside [15].

The continuous in-depth research of the agricultural Internet of Things is an important measure to improve the comprehensive agricultural production performance and accelerate the development of modern agriculture. On the whole, my country's agricultural Internet of Things has entered a stage of rapid development, but it also highlights a series of problems such as nonstandard technical standards, unsound related laws and regulations, and lagging educational thoughts. Homogenization in the planning and construction of smart gardens is a serious phenomenon. The actual situation of many smart gardens in the planning and construction is simply copying other projects, such as picking and fishing, and the business content of the farm is the same, which is not very attractive. Based on the natural landscape with local characteristics, more local cultures can be tapped to expand and manufacture farming activities and tourist souvenirs with local characteristics to create a special brand of intelligent gardens.

### 3. Agricultural IoT Intelligent Garden Planning and Design

*3.1. Design of the Smart Garden Framework for Agricultural Internet of Things.* Agricultural IoT technology has been widely applied in the field of agriculture and is familiar to most farmers. At present, agricultural IoT technology in fine agriculture has realized the precise irrigation, precise fertilization, greenhouse environment precision control, and other facility control programs; intelligent agriculture has realized remote monitoring, intelligent warning, and other real-time information collection. In agricultural products, safety traceability realizes the transparency and traceability of information in certain process environments from planting to harvesting, from processing to consumers [10]. The agricultural Internet of Things technology makes the traditional agriculture move towards agriculture visible, agriculture can be felt, and can control the development of modern high-tech agriculture. Sending the development of these technologies to the planning and design of smart gardens provides new references and breakthrough directions, and promotes the development of agricultural industrialization. China National Nuclear Corporation is also a leading enterprise, but the development of leading enterprises must seek correct guidance from the government, and obtain support for policies and concessions in agricultural industrialization [16]. According to the principle of “supporting the best, supporting the big, supporting the strong,” the government should make reasonable arrangements for overall planning.

Enterprises should actively cooperate with universities and research institutes, focus on the promotion and application of new varieties and technologies of agricultural science and technology, and improve the independent innovation ability and nuclear energy is also the competitiveness of enterprises. Only through the means of science and technology can we achieve continuous innovation, and only through continuous innovation can agricultural industrialization develop comprehensively. The theory of agricultural industrialization mainly provides a new operating concept and mode for the agricultural production of wisdom gardens. The development and operation of wisdom gardens are based on agricultural production, so the planning and design of wisdom gardens should be combined with the theory of agricultural industrialization for industrial planning, to provide an industrial basis for the sustainable development of wisdom gardens.

The correct selection of radio frequency modules in specific applications can not only shorten the design time of system hardware nodes and save system development costs but also reduce the power consumption of each sensor node. The reduced power consumption of the transceiver chip will promote the system life extension because the energy consumed by the wireless RF module when operating accounts for most of the total energy provided by the sensor node.

The wireless chip selected for this system is a wireless communication chip from NORDIC, which uses FSK modulation and integrates NORDIC’s own Enhanced Short

Burst protocol internally. The wireless chip has low power consumption and low cost under the same operating conditions and can achieve high-speed data transmission at very low current consumption. Its transmission rate can reach up to 2 Mbps, which is significantly higher than other wireless RF chips, which makes the data transmission process occupy a shorter channel time, which will reduce the occurrence of data conflicts and also save sensor node energy accordingly, as shown in Figure 1.

For the design requirements of each level of the agricultural IoT monitoring system, this section provides a detailed description of each layer design. The hierarchy of the agricultural IoT system is shown in Figure 1. The sensing layer is distributed with a large number of sensor terminal nodes responsible for the collection of environmental data. The terminal nodes of this system design are composed of STM32 main controller, various sensors (including sensors for atmospheric temperature and humidity, air temperature and humidity, and light intensity), power supply module, and wireless transmission module. Since the area of the shed is limited and the number of sensors may be large, the ZigBee module is a suitable choice for communication between the terminal node and the robot.

The network layer is responsible for sending the data collected by the perception layer and the information captured by the camera to the remote server and also for passing the information fed by the users in the application layer to the perception layer. The network layer can use different network protocols and technologies to connect the perception layer to different networks (LAN, WAN, or Internet), but considering the need to transmit picture or video information, low-speed network protocols are not applicable. The data processing layer contains various data processing algorithms and software, such as data preprocessing algorithms and data mining algorithms. At present, this topic is only implemented in this layer to process the collected data by using RBF neural network-based time series. The processed data can be used for further data mining and eventually forming information data with certain value to users. Users can log in to the remote monitoring platform via Web or cell phone to query data, issue commands, or perform application analysis according to different requirements to achieve monitoring and management of crops [17].

Visual agriculture means that users can watch in real-time through the network video, which is a new trend in the development of modern urban agriculture. Through the application of mature electronic monitoring technology, the whole process of agricultural production can be visualized, which can record the whole production process, improve the transparency of the production process, and, at the same time, attract users to participate in the experience.

*3.2. Smart Garden Planning Model of Agricultural Internet of Things.* Sensors sense physical information and generate measurable electrical signals, which are necessary devices for

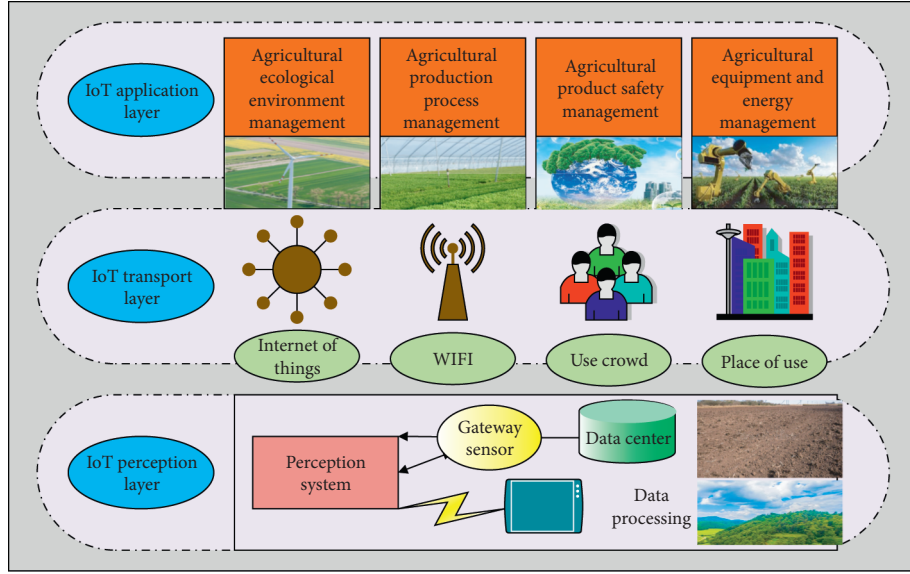


FIGURE 1: Agricultural IoT framework.

parameter detection in control systems. Though the sensor can obtain information of the parameters in the system, the accuracy of the information is directly related to the measurement accuracy and control accuracy of the whole system, in order to further control the growth parameters of plants according to the growth requirements of various plants reasonably, so that plants can grow smoothly. Choosing the right sensor is the premise and foundation for the realization of automatic control. The information to be collected by the home gardening maintenance system mainly includes light intensity, soil moisture, and temperature, and the information is collected through light-sensitive sensing resistors, temperature sensors, and soil moisture sensors. The selection of sensors at the collection end determines how the collection module is implemented, affects the complexity of the circuit and program, and also affects the overall performance of the system in operation.

The coordinates of the three base stations and the distance of the mobile tag to each base station are known, and the location of the mobile tag can be determined by the trilateral localization algorithm. The coordinates of the three UWB base stations are known as A ( $x, y$ ), B ( $x, y$ ), and C ( $x, y$ ). The distance from the mobile tag to the three base stations is  $d_1, d_2$ , and  $d_3$ , respectively, and the distance to the mobile tag is the radius of the circle made with the three base stations as the center where  $d_1, d_2$ , and  $d_3$  can be calculated by formula (1), respectively. The system of equations can be obtained as shown in equation (1). The coordinates of the position nodes can be obtained by solving the system of joint cubic equations:

$$d = c \otimes T_{\text{prap}},$$

$$\begin{cases} (x_1 + x)^2 + (y_1 + y)^2 = d_1^2 \\ (x_2 + x)^2 + (y_2 + y)^2 = d_2^2 \\ (x_3 + x)^2 + (y_3 + y)^2 = d_3^2 \end{cases} \quad (1)$$

Equation (1) in the second line of the set of equations and the third line of the set of equations are subtracted from the first line of the set of equations to obtain

$$\begin{pmatrix} x_1 + x_2 y_1 + y_2 x_1 \\ x_2 + x_3 y_3 + y_2 y_1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} d_2^2 + d_1^2 - y_2 x_1 \\ d_3^2 + d_1^2 + y_2 y_1 \end{pmatrix}. \quad (2)$$

The equation can be solved in a linearized manner, and the expression can be simplified as

$$P \begin{bmatrix} x \\ y \end{bmatrix} = B. \quad (3)$$

For the equation to have a unique solution, it is necessary to ensure that  $P$  is invertible, i.e.,  $x_1 - x_2 y_1 - y_2 x_1 \neq 0$ . When  $P^{-1 \neq 2}$ , the solution of the equation is

$$\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} d_2^2 - d_1^2 + y_2 x_1 \\ d_3^2 - d_1^2 + y_2 y_1 \end{pmatrix}. \quad (4)$$

The gyroscope measures the angular velocity in three directions, and the attitude information of the agricultural robot can be obtained through attitude resolution. Since the accelerometer and gyroscope are used to obtain the position and attitude information of the carrier through position and attitude solving, the navigation coordinate system is usually used in the actual positioning process, and it is necessary to convert the coordinate system from the carrier coordinate system to the navigation coordinate system.

**3.3. Research on Planning and Design of Smart Garden Based on Agricultural Internet of Things.** For example, if you enter the garden information database page through the navigation portal, click on the more button below the general introduction of parks to display the list of all parks, click on the recommended images of city parks, forest parks, and scenic parks to enter the park details page, and click on the



more button behind the category parks to display all parks in that category [18]. Users can also search for parks directly by filtering (district and county to which the park belongs, park category) or by keywords.

The pest information table is associated with the plant classification table and the pest identification information table. Since the names and classifications of pests and diseases are unfamiliar to the general public, if users are allowed to filter by the classification of pests and diseases directly, it will be inconvenient for them to use the more specialized classification. Therefore, considering that pests and diseases are mainly attached to various types of plant diseases and the public is relatively familiar with plant classification, the platform adopts the screening of pests and diseases through the classification of plants at all levels so that users can quickly and accurately target the pests and diseases. According to the prominent features of pests and diseases, fields such as plant parts, causes of disease, and pest habits are filtered to form a pest and disease information table, and the detailed fields are shown in Table 1.

The smart garden system architecture consists of five major parts: smart garden infrastructure, smart garden perception platform, smart garden cloud platform, smart garden data platform, and smart garden application system, which can strengthen the wisdom of the garden design and improve the depth of human-environment interaction and perception through digital technology. The infrastructure in a smart garden should include wired network systems, wireless network systems, etc.; in terms of intelligence, the garden perception platform can collect perception information through the Internet of Things system, including soil environment perception, atmospheric environment perception and other perception functions; the cloud platform includes smart garden cloud data storage and cloud computing application support; the smart garden data platform includes smart garden data storage, data services, and data management. In the smart garden data platform, there are three main parts the wisdom garden application system includes an intelligent ecological environment monitoring system, intelligent security control system, and wisdom garden big data analysis system.

This part focuses on the specification and elaboration of the detailed functions of the intelligent garden application system, using the analysis method of case-by-case analysis and horizontal reference comparison, to achieve the digitalization, informatization, networking, and intelligence of garden green space management as the goal is to determine the specific functional requirements. For example, the intelligent ecological environment monitoring system should include real-time and remote monitoring of the garden ecological environment, realizing the functions of automatic acquisition, real-time display, processing, and analysis, and record storage of the garden ecological environment factor information, realizing the functions of garden air quality monitoring, water quality monitoring, microclimate monitoring, and wildlife protection monitoring. In the analysis of specific functions, the relevant practices in the field of agriculture and the standards achieved by the current better

TABLE 1: Information sheet.

Field name ID	Constraint	Type of data	Value
Disease name	Primary key	Int	1
Disease type	Nonempty	Int	2
Disease part	Nonempty	Int	3
Discus encamp	Nonempty	Var	4

environmental monitoring work are referred to, and the functional requirements are further determined, as shown in Figure 2.

Through the analysis and research of the components and functional requirements of the smart garden in the standard, it provides a solid theoretical foundation and basis for the research and construction of the service platform of smart garden construction [19–23]. The main function of home gardening is decoration, and landscape lighting is also an important part of the decoration, so the control of landscape lighting is also a part of home gardening control. However, the landscape light control is different from the control of humidity, light, and temperature, which does not relate to the growth condition of plants, so there is no need to control according to the environmental parameters. The switch of the landscape light is determined by the individual needs of the user, when the user wants to turn on the landscape light to create a lively and beautiful atmosphere, it can be turned on wirelessly through the upper computer; when the user wants to save electricity to turn off the landscape light, it can be turned off in the upper computer. The landscape light control switch is integrated into the maintenance system, which is convenient for users to control and help create a more beautiful and comfortable environment.

All industrial planning in the farmstead shall be based on the basic principle of ecological and environmental protection, considering economic and social benefits, constantly improving the industrial chain, realizing the multiple values of products, promoting their synergistic development, and maximizing overall benefits. Industrial planning should make all industrial projects have a certain correlation, to realize the diversified development and multichain combination of the farm as a whole and enhance the ecological benefits of the farm. Reasonable industrial development is closely related to the local natural resources, social environment, and policies. Therefore, localized industrial planning needs to take advantage of local advantages, determine suitable industrial projects, and reasonably formulate development planning measures. Based on local conditions, we will fully exploit the advantages of local resources, highlight the characteristics of local industries, develop products and projects with special features, and enhance the unique attractiveness of wisdom gardens.

Environmental capacity refers to the number of people who can be accommodated for normal activities within a certain time space. Environmental capacity reflects the carrying capacity of the ecological environment for tourism activities and is an important basis for determining the construction of many things such as transportation, water

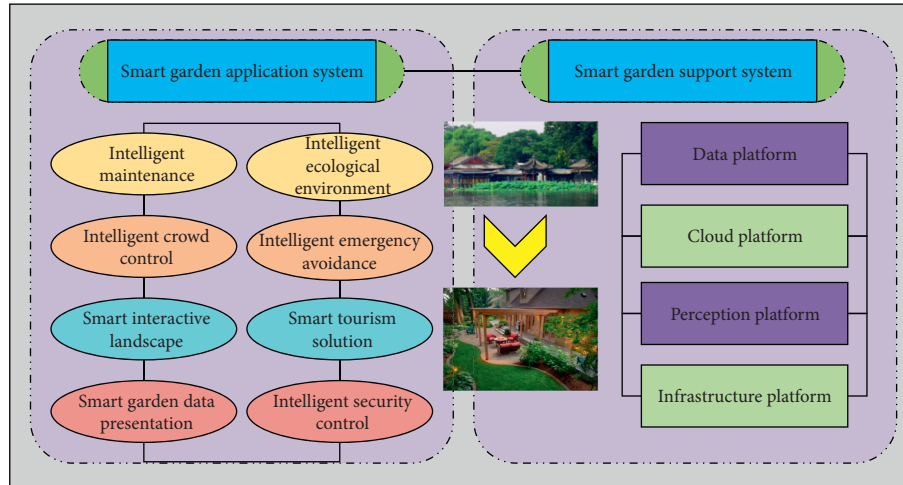


FIGURE 2: Hierarchy diagram of smart garden construction specification.

supply, drainage, telecommunication power, and service supply for the smart garden. There are usually three methods to measure the environmental capacity: the area capacity method, the capacity method, and the chokepoint capacity method. Combined with the topography, traffic conditions, and landscape resource distribution of the smart garden, the area method and the chokepoint capacity method are used to calculate the environmental capacity for this planning, respectively. The orchard planting industry is the largest and most dominant industry in the smart garden area, close to three-fifths of the total area of the site. The orchard is mainly divided into the famous grapefruit and orange-picking garden, the famous beautiful berry-picking garden, and the famous flower and fruit-tasting garden. Species selection considers the mountain topography, soil conditions, and north-south orientation and selects high-quality varieties suitable for planting under the leadership of the scientific research team.

## 4. Results and Analysis

**4.1. Performance Analysis of the Smart Garden System.** This system has a high degree of automation and can achieve fully automated management. It only needs the user to set parameters such as environmental parameters, sampling period, and equipment address to manage automatically. It automatically collects parameters and transmits them to the upper gateway and the host computer, and the gateway and the host computer can automatically send control commands after judging by themselves. Theoretically, the environmental parameters can be controlled within the range suitable for the growth of home gardening plants. The high degree of system integration is reflected in the variety of acquisition parameters and the variety of control terminals. Three sensors, soil moisture sensor, temperature sensor, and photosensitive sensor, are integrated into the collection side and can be processed and sent so that the parameters collected on the collection side are comprehensive and can provide a better and comprehensive basis for maintenance management. The control terminal integrates four aspects:

watering control, spraying control, light supplement control, and landscape light control, which break through the single watering control and can provide more comprehensive maintenance of home gardening plants and a better growing environment. Although the IoT experience project is a new type of project in the leisure farm, in the comparison of the average time, due to its high technological content, participatory and experiential, it is more likely to be noticed by visitors, and the length of stay of visitors is longer, as shown in Figure 3.

To verify the effectiveness of the improved combined UWB/IMU localization algorithm in this paper, a simulation on Matlab is required. The three UWB base stations are fixed at position coordinates  $(0,0)$ ,  $(200,0)$ , and  $(0,200)$ , and the UWB mobile tag is fixed on the mobile robot, whose initial position is  $(50,50)$ , and the robot moves at a speed of 1 m/s along the rectangle with vertex coordinates  $(50,50)$ ,  $(50,150)$ ,  $(150,150)$ , and  $(150,50)$ . The number of sampling points of the reference path  $k=400$ , and the UWB performs localization estimation for each preset path sampling point, adding NLOS interference at  $k=10$  and  $k=120$ . A comparison of the UWB localization, Kalman filter localization, and the modified Kalman filter localization trajectory is shown in Figure 4.

**4.2. Analysis of the Smart Garden Planning Model.** This is further analyzed by the error comparison plot of positioning in Figure 5. Due to the accumulation of IMU positioning errors, individual IMU positioning is rarely used in indoor positioning and is usually used as a secondary positioning. Therefore, the focus here is on comparing the errors of other positioning methods. The graph shows that the overall UWB positioning error is relatively small, but there are two large deviation points. The overall combined positioning error curve is below the UWB positioning error curve, which is smaller than the UWB positioning error. The overall UIPIK positioning error curve is smaller than the UWB positioning error curve, and the error curve is more evenly distributed.

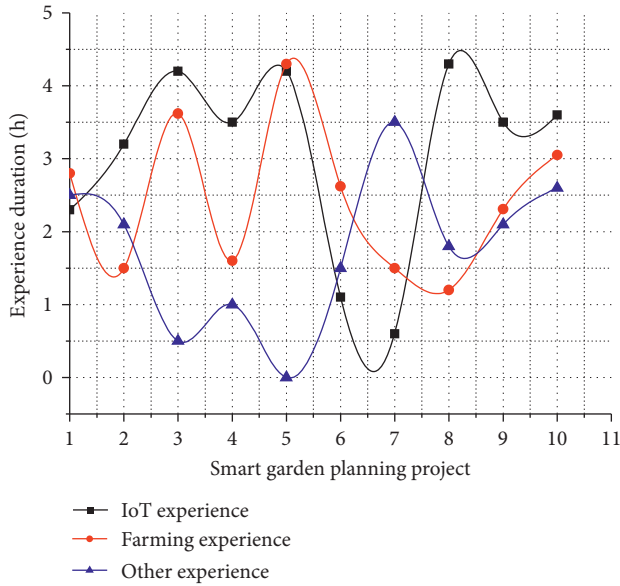


FIGURE 3: Analysis of different types of experiential activities' settings.

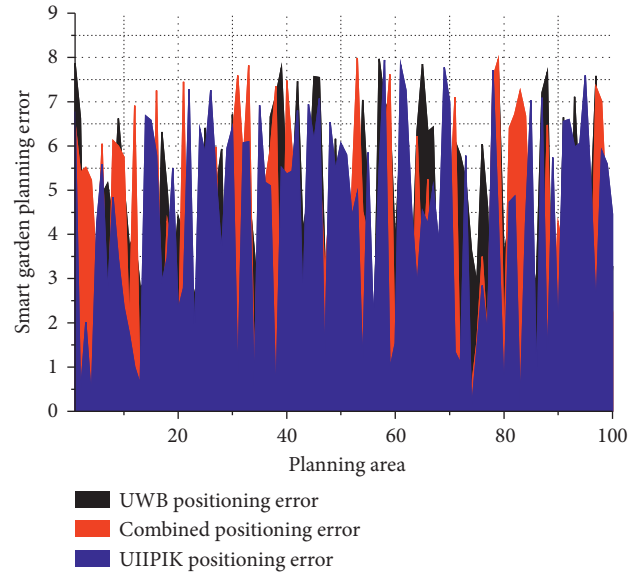


FIGURE 5: Comparison chart of positioning distance error.

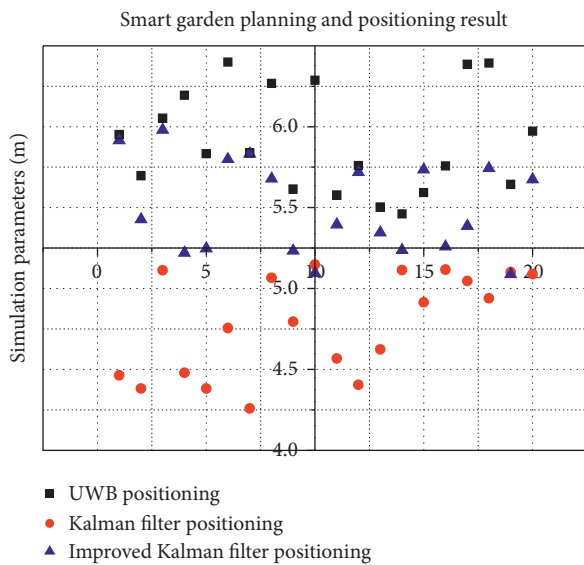


FIGURE 4: Positioning trajectory map.

After debugging, the system can realize the collection of three sensing signals of light intensity, temperature, and humidity and send the collected information wirelessly to the host computer and display. After the comparison of the upper computer to derive the control command, the wireless gateway sends to the controller with wireless transceiver technology to realize the control and receive the controller status. The system can perform four types of control watering, spraying, fill light, and landscape light control. Although the controller has the same circuit structure, the internal code and address setting can be different so that the user can flexibly choose the control function and the number of control points. Overall, the system was able to achieve the expected functions and reach the expected level of

automation, and it also applied the latest wireless sensor network technology to put the theory into practice. However, due to the limited time and resources in the graduation project research, the system is only a preliminary implementation, and there are more details and functions to be further improved and developed. The positioning performance of several approaches is compared in terms of the average error in  $x$  and  $y$  directions, the maximum error in  $x$  and  $y$  directions, the average distance error, and the variance of the distance error, as shown in Figure 6.

Figure 6 shows that UIPIK positioning has the smallest error in each index. The average error of UWB positioning and the maximum error of combined positioning in  $x$  and  $y$  directions are much larger than that of UIPIK positioning, and the error of UIPIK positioning is the smallest. The average distance error and distance error variance of UWB positioning are significantly larger than those of the other positioning methods, and the combined positioning reduces the values of these two error indicators to a certain extent, while UIPIK positioning further reduces these two errors indicators. The comprehensive comparison shows that the UIPIK positioning proposed in this paper is more accurate and stable than the other positioning methods, which reflects the superiority of this method.

The combined UWB/IMU positioning algorithm based on an improved Kalman filter is designed. The respective positioning principles of UWB positioning technology and IMU positioning technology and their problems in positioning are analyzed, and the traditional Kalman filter fusion method is improved to achieve an efficient combination of the two positioning technologies, UWB and IMU. Simulation experiments are conducted to test the performance of the proposed algorithm in the presence of interference, and the experimental results verify that the algorithm can effectively suppress the influence of abnormal positioning information, thus improving the positioning accuracy of the system and enhancing the stability of the positioning system.

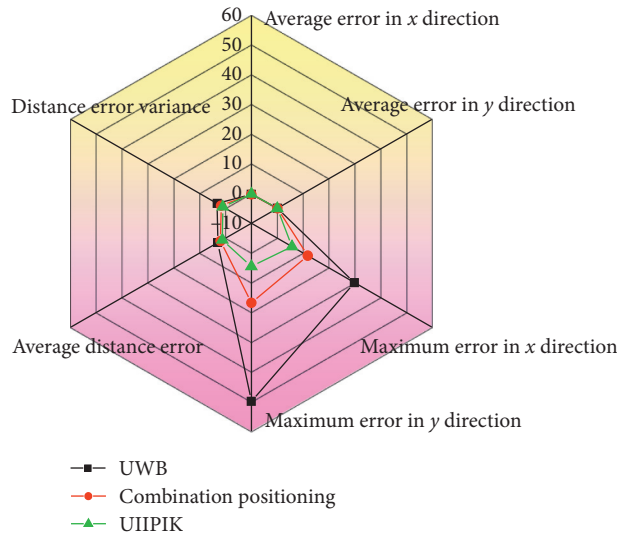


FIGURE 6: Statistics of positioning error indicators.

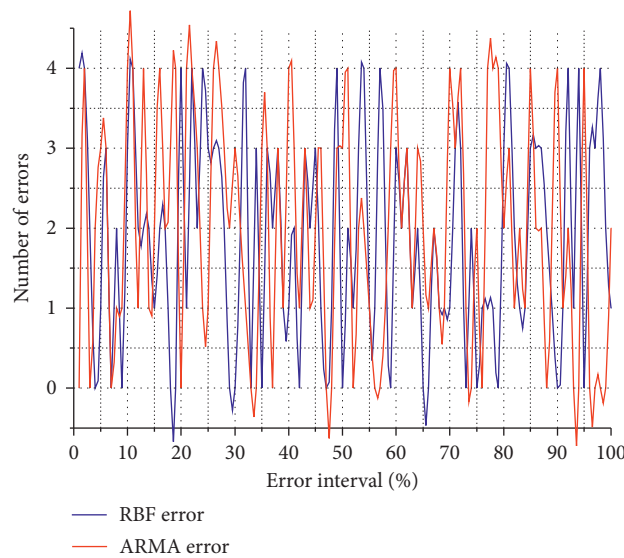


FIGURE 7: RBF and ARMA error distribution.

4.3. *Analysis of the Effect of Smart Garden Planning.* The prediction errors of the 200 data predicted by the two models were calculated concerning the real data. The relative errors of the RBF neural network-based time series models were less than 0.2%, while the relative errors of the ARMA (2,12) model were less than 5% for half of the predictions, and a very small percentage of the relative errors were greater than 10%. The left pie chart shows the error distribution of the ARMA model, and the right pie chart shows the error distribution of the RBF time series model. It can be learned that the overall error distribution of the time series model of the RBF neural network designed in this paper is much smaller than that of the ARMA model, as shown in Figure 7.

The middle display includes other display page entrances, which can be jumped to the corresponding page by

clicking; for the normative documents related to the smart garden, the normative documents are sorted by clicking the number of hyperlinks on the back end, and the list is sorted back to the front end; after clicking the name, it will jump to the standard download page or the specific content page. The right side of the display includes ecological indicators' data display, and the public is more concerned about the light intensity, ultraviolet intensity, temperature, and humidity value display; individual indicator changes display through the line graph of the most frequently queried indicators of the day to display the daily value changes; park classification accounted for the statistics, and the back-end of the number of various types of parks returned to the front-end, and the percentage is calculated and used. The progress bar component progresses to show the percentage of each type, as shown in Figure 8.



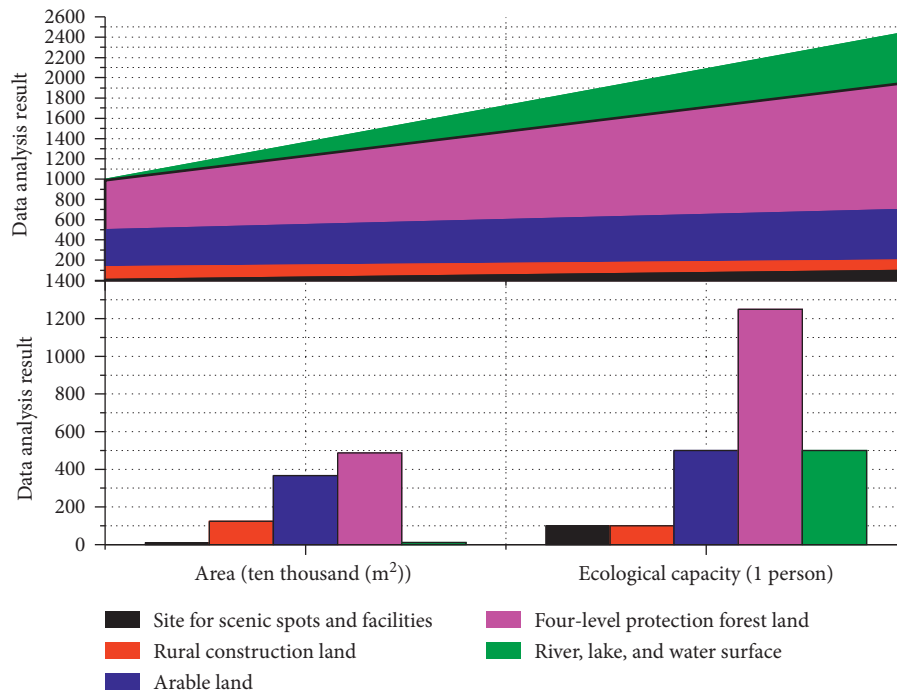


FIGURE 8: Summary of land area and ecological capacity of the project site.

## 5. Conclusion

Through the study of the composition and functional requirements of the two parts of the standard smart garden, the platform functional architecture of the public service subsystem, environmental monitoring subsystem, management command subsystem, and statistical analysis subsystem is established, and the framework is selected to develop the system in the mode of front- and back-end separation, and visualization tools are introduced to display information intuitively, and various environmental index data are acquired and stored through sensor technology. Under the interactive guidance of the relevant theories of the Internet of Things, agriculture, tourism, and landscape, this paper combines agricultural production, agricultural landscape, agricultural tourism, and agricultural Internet of Things to improve the overall planning and design level of smart gardens and realize the development of smart gardens. Sustainable development is thereby promoting the development of agricultural tourism and modern agriculture based on smart gardens, improving the informatization management level of smart gardens, and realizing a better experience for tourists in modern informatization agriculture. This paper introduces big data and big data technology into landscape planning, constructs the theoretical framework of landscape planning methods based on big data, defines the planning contents of production planning, leisure, cultural tourism planning, habitat planning, and management planning of field and garden complexes, and applies big data to the planning of field and garden complexes to guide participatory planning. The investigation, analysis, and construction research of the project in the article can provide reference for the construction and

development of smart gardens. The planning and design of smart gardens in the context of the agricultural Internet of Things involves many subject theories and technologies. Due to time, conditions, and personal abilities, the views and theories in the article are not comprehensive and need to be improved. I hope that more scholars will participate in the research.

## Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

## Conflicts of Interest

The author declares that there are no conflicts of interest.

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