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Design of an Internet of Things Data Collection and Computing-Based Decision Support Framework for Educational Management for Smart Campus

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ABSTRACT

Smart campus relies on IoT technology to realize teaching management, location monitoring, business processing and other teaching and management activities, this paper draws on the characteristics of the development of smart campus, and builds a decision support system for educational management of smart campus by applying the conditions of IoT technology. The IoT multi-sensor is used to collect educational management data, and the Grobes criterion is applied to exclude the data with too large an error, and the consistency test is performed on the collected data. The least squares method and variance calculation are combined to process the multi-sensor data to optimize the data fusion accuracy. Comparison tests were conducted to analyze the fusion accuracy and variance of the observed data under different methods. Distribute questionnaires online and offline to analyze the feasibility of the construction of IoT in smart campus. Collate the ratings of teachers and students on the educational management decision support system of the smart campus, in which the ratings of teachers and students on the educational management decision part of the school are concentrated in the range of 0.7 to 0.8, and the overall rating of the educational management decision support system of the smart campus is 86.453 points.

Keywords: internet of things (IoT) technology, least squares method, data fusion accuracy, educational management decision making, smart campus

1. Introduction

With the rapid development of information technology, smart campus has become a hot topic in the field of education [1]. Smart campus is a school management and education teaching service system based on information technology, which is integrated in order to a variety of technological means, including the Internet of Things, cloud computing, big data analysis, etc., in order to provide

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comprehensive education and teaching services and efficient management tools [2-5]. In this context, the importance of high-quality education for the society is becoming more and more prominent. School education management is an important part of education, and the quality of its decision-making is directly related to the smooth progress of all school work. In order to improve the efficiency and quality of school education management, it is crucial to design a suitable decision support framework [6-9].

Educational management involves numerous aspects, such as student management, teacher management, curriculum management, financial management, etc. Before designing a decision support framework, it is necessary to comprehensively analyze these aspects and determine the appropriate management strategies [10-11]. For example, in student management, management strategies based on student performance can be used to develop targeted management measures by analyzing student learning. And since educational management decisions need to be based on reliable data support, well-designed data collection and analysis systems must be designed. These systems can include student information management systems, teacher information management systems, and course management systems [12]. Collecting data from different sources through these systems and analyzing these data to provide scientific and accurate data support for decision makers can help improve the precision and efficiency of decision making [13-15]. In educational management, assessment is an important basis for decision-making, and when designing a decision support framework, it is necessary to establish a scientific indicator assessment system, which can be based on a number of aspects such as student educational outcomes, teaching quality, and staff performance [16-19].

This paper analyzes the main applications of Internet of Things (IoT) technology in the field of education, and points out the technical support role of IoT networking technology for the construction of smart campus. According to the main features of the smart campus and the Internet of Things technology environment to build a multi-level smart campus system. Combined with the design objectives of the educational management decision-making system, a smart campus educational management decision-making support framework is constructed on the basis of the smart campus system. The Grobes criterion criterion is used to detect the consistency of IoT collected data, and the least squares method is combined with variance to process multi-sensor data. The data fusion accuracy of the least squares method is analyzed to score the smart campus IoT building equipment. Statistics of faculty and student ratings of smart campus educational management decision support system.

2. Smart campus construction supported by IoT technologies

2.1. Internet of Things (IoT) technology

The Internet of Things (IoT) is an emerging information technology that realizes the interconnectivity between things and objects, and between things and people through sensing devices, network communications, and data processing [20-22]. The wide application of IoT technology is driving changes in all industries, and the field of education is no exception. The application of IoT in education continues to deepen, providing new technical support for education informatization and having a profound impact on education teaching mode, learning mode, and management mode. Therefore, it is of great significance to study the current status and development trend of the application of IoT technology in education to promote the innovative development of education.

The main applications of IoT technology in the field of education include:

1) Smart Campus Construction. IoT technology provides a new solution for campus management by deploying various sensing devices, such as temperature and humidity sensors, cameras, RFID readers, etc., inside the campus to realize all-round sensing and monitoring of various aspects of the campus

environment, security and assets. In addition, IoT technology can be seamlessly integrated with the campus management system to realize automatic data collection, transmission and analysis.
2) Learning analysis and personalized education. The combination of IoT technology and big data analysis provides powerful technical support for learning analysis and personalized education. Some schools are using IoT technology to build learning analytics systems, which collect students' learning behavior data in an omni-directional and real-time manner, including class attendance, classroom interactions, and completion of homework, by deploying a variety of sensory devices, such as smart bracelets and learning terminals, in the campus environment.
3) Campus Life Management. IoT technology can also be applied to all aspects of campus life management to enhance the convenience and quality of campus life. Among them, the campus card system based on radio frequency identification (RFID) technology is a typical application scenario.

Some schools have developed smart campus card systems using RFID technology to realize automated management of students' dining, book borrowing, access control and other behaviors by deploying RFID readers inside the campus.

2.2. Intelligent Campus Construction

2.2.1. Intelligent Campus Concept. Smart campus mainly relies on IoT technology to interconnect different intelligent mobile devices, as well as information sensing devices and data processing devices on campus, to complete teaching and management activities such as intelligent voice recognition, intelligent object recognition, location monitoring, and business processing.

Therefore, under the development situation of university education teaching and management informatization, strengthening the application of big data and Internet of Things technology can construct a perfect campus website, teaching resource base, education and student information management system, teaching and personnel management system and so on through the integration of most of the data and information resources and campus business functions. Intelligent teaching services and management services are provided for different subjects, thus realizing the exchange and sharing of diversified information.

2.2.2. Key Features of Smart Campus:
1) Environment perception and Internet of Things technology. Environmental sensing refers to the environmental sensing technology formed by the application of sensor technology, intelligent control technology, and graphic recognition technology, which has the ability to collect, semantically express, semantic query parse, and semantic reasoning of the surrounding environmental parameters. IoT technology scans the target object by utilizing infrared sensors, sensors and other sensing devices, acquires useful data and information, connects them in series with IoT, and implements the interaction between objects and the Internet.
2) Realize efficient network interoperability. The smart campus service platform integrates wireless network, campus network and other networks to realize efficient network interoperability and form an integrated campus environment and network application environment.
3) Powerful data processing capability. The smart campus construction incorporates the application of cloud computing technology, and its core part is the cloud computing platform. The cloud computing platform has a very powerful data processing system, which is capable of analyzing and processing huge data and information, guaranteeing the accuracy of the processed data, and returning the processed results to the users, with high efficiency, intelligence and other advantages. The cloud computing platform has a powerful data processing capability, which helps teachers and students to be able to query the required curriculum resources and realize the sharing of curriculum teaching resources and data.
4) Provide an environment for independent learning. The application of cloud computing and Internet of Things technology can strengthen the construction of smart campus, so that the campus is covered

by wired and wireless networks, providing students and teachers as well as other staff with an independent learning environment. Through the cloud computing platform to query relevant materials and information, online learning, communication and cooperation, analysis and solution of problems can be carried out anytime and anywhere, to realize the integrated campus environment of the smart campus and the personalized service of online learning. Teachers and students can access a large number of course resources through the cloud computing platform, expanding the knowledge of teachers and students. It can be seen that the construction of the intelligent campus integrated service platform greatly facilitates the learning of teachers and students, thus realizing intelligent information services.

2.3. Smart campus system design in the environment of Internet of Things (IoT) technology

2.3.1. IoT networking technologies. IoT networking technology includes two aspects of overlapping method networking and gateway networking. First overlap networking is the fusion of different network protocols, and then through the wireless sensor ports, IP protocol layer of node support, the formation of multiple data systems in the network connection. For example, the communication data transmission between the operation command server, client nodes, need to allocate the IP protocol, IP address of the node, to complete the remote control of different equipment systems, information transmission. After that, the wireless sensor network clustering algorithm and routing protocol, mainly using the cluster head coordination, the data processing, information fusion, etc. of each node in the network. And through the construction of different packets of IP addresses, the formation of wireless sensor networks, IP networks between the data communication channel, to ensure that different IP sensing nodes of information transmission, load balancing.

The gateway-based IoT networking technology, on the other hand, integrates IP protocols, common gateway interface protocols, including protocol conversion at the layers of physical layer, data link layer, network layer, transport layer, session layer, representation layer, and application layer, to realize information control and data transmission at different layers. Among them, the network firewall is usually at the application layer level, which is used to isolate and access control the information queried and transmitted. Then the format of data signaling is converted by control circuits to facilitate the free dissemination of data in different protocol networks. Among them, delay tolerant network firewalls, which can cache delayed data in case of perceived network outages, in order to reduce the problem of failures during data querying, forwarding and storage. The gateway networking structure of IoT delay tolerant network is shown in Fig. 1.

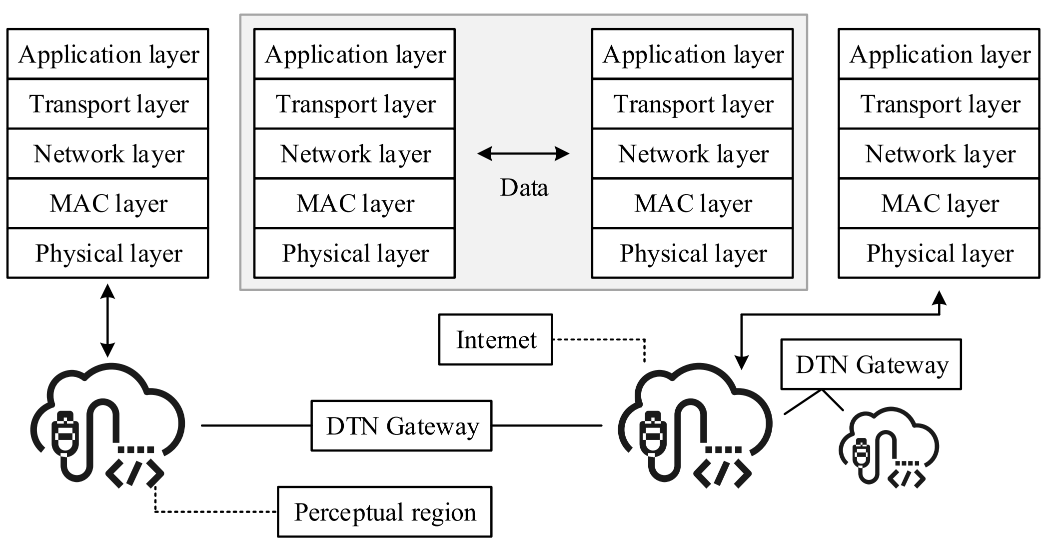

Fig. 1. The gateway structure of the Internet of things

2.3.2. Smart campus system framework based on IoT technology environment:

1) Intelligent perception layer is used to intelligently perceive the campus environment and refine, recognize and filter various types of data. Therefore, the smart campus system based on IoT technology needs to apply intelligent sensing technology.

The arrangement of sensor nodes should be based on the campus environment, management needs and the needs of various business activities. Usually, sensor nodes can be arranged in student and staff dormitories, teaching buildings, hospitals, libraries, cafeterias, stadiums, etc. to ensure the comprehensiveness of information acquisition.

2) Network Convergence Layer. Currently, wireless networks and LANs on college campuses generally have different communication protocols, data formats and networking modes, which are not conducive to the transmission of information. For this reason, it is recommended that colleges and universities build an IPv6 IoT network based on 6LoWPAN, which has the advantages of low energy consumption, high transmission efficiency, scalable nodes and unlimited addresses. Its network layer can also support 128-bit IPv6, which enables large-scale network deployment. IPv6 IoT network based on 6LoWPAN can realize full coverage of the campus environment, ensuring that the key management content and business carried out by the school has no loopholes, and that there is no omission of information services.

3) Hardware Support Layer. The smart campus system based on IoT technology generates massive amounts of data. In order to get in-depth mining and maximize the application of these data, it needs the support of hardware such as switches, servers and storage facilities.

4) Support Platform Layer. The support platform layer of the smart campus system based on IoT technology includes an information integration platform, which cleans and integrates data with data sharing as the core. The application integration and development platform is used to support various management activities and business development in universities, including unified identity authentication platform, unified information portal platform, application integration framework, smart campus platform and enterprise service bus.

5) Business application layer. Specifically, it includes: students (enrollment management, orientation management, teaching management, academic management, employment management, etc.), scientific research (personnel management, project management, funding management, results management, etc.), teachers (collaborative office, personnel management, job transfer, annual assessment, salary management, etc.), finance (financial management, salary management, fee management, etc.), assets (asset management, equipment management, logistics management), Campus life (school website, mail, one card, library management, network billing, etc.).

6) Integrated Service Layer. Specifically, it includes Management Decision Center (financial analysis, reward and punishment analysis, crisis analysis, recruitment analysis, orientation analysis, university analysis), Independent Learning Center (independent selection of courses, submission of assignments), Communication Center (scientific research application, faculty-student interaction, student-student interaction, teachers' Black Tiger Cave, academic forums, campus activities), Business Center (scientific research application, loan application, one-card, school leaving process, year-end summary, billing center).

3. Design of an Internet of Things-based decision support framework for smart campus management

3.1. System objectives

This system is oriented to the school teaching management personnel, providing them with the relevant basis for decision-making. The main functions of this system are to accomplish: information management and query, management and query of teachers' information, students' information, courses' information, classrooms' information, faculties' information, classes' information and so on.

Indicator Compliance Query: Compliance with basic school conditions indicators, monitoring school conditions indicators, undergraduate teaching work level assessment monitoring points and other higher level requirements on school running.

Alert Function: For the situation that the standard is about to be reached or has been exceeded, a pop-up alert window will be displayed in time for decision-makers' reference.

3.2. *Teaching management support system architecture*

The architecture of the teaching management support system based on the smart campus is shown in Figure 2.

The whole teaching management decision support system is designed into four layers: data source layer, data service layer, application service layer and user layer. The basic functions of each layer are as follows:

Data source layer: the data source is the source of the data warehouse, which is a variety of teaching teaching system databases and external files. A data warehouse often contains multiple data sources, which can have many different data structure types. The data for the instructional management data warehouse comes mainly from the data in the faculty management system and office data.

Data service layer: the function of the data service layer is mainly responsible for completing data extraction, cleaning, conversion and other work. And the converted data is loaded into the education management data warehouse to provide data preparation for the front-end analysis tools, and at the same time, it should have the management and processing functions of the data warehouse data.

Application Service Layer: The application server layer is the logical connection bridge between the user service and the data service layer. The OLAP server responds to the user's service request and accesses the data warehouse server, thus obtaining the data and returning it to the user service layer. In the application service layer to complete the definition and maintenance of multi-dimensional analysis model.

User Layer: The user layer provides users with an interactive system with a visual interface. Academic management personnel can perform multidimensional analysis and management operations, such as mining and optimization, on the multidimensional data sets on the server through the visual interface. The data in the data warehouse is directly accessed through the auxiliary decision-making module.

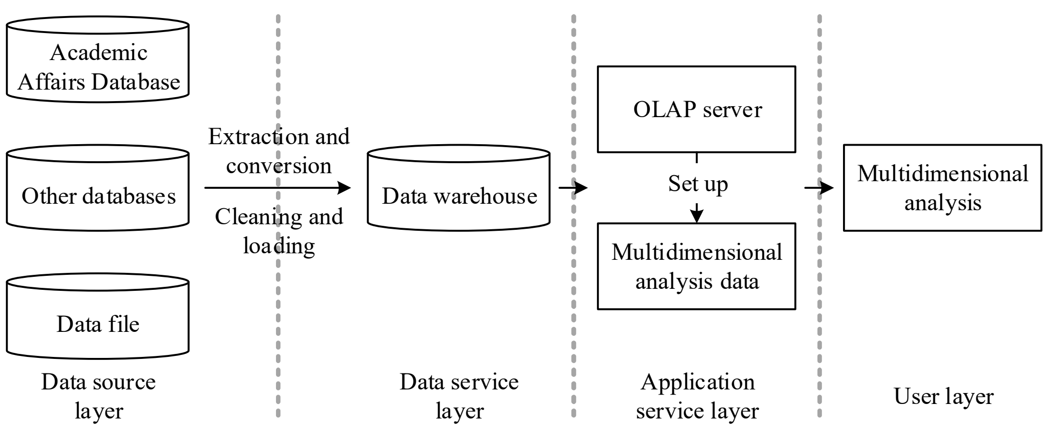

Fig. 2. The teaching management support system architecture of intelligent campus

3.3. *Multi-sensor data fusion methods*

Multi-sensor data fusion technology is the use of multiple sensors to collect data on the same target, the collected data is analyzed and synthesized using computer technology to form data with high accuracy and low redundancy to support the decision making process.

There are many nodes in the Internet of Things that are made up of sensor networks, which have a large number of sensors working together, which deal with different information, and likewise they have different data structures and information representations. If you want to utilize this information or utilize the laws and connections between them, you need to delve into data fusion technology.

Data fusion technology provides the possibility of utilizing higher precision data, data in various forms, data volume, real-time response to the actual situation, these data difficulties also become solved in the case of multi-sensor data fusion. Its practical significance has a variety of practical significance: for the expansion of the system's time and space range. Fault tolerance is improved. System content utilization improvement. The number of sensors used can be greatly reduced through the increase in system content utilization, which saves the cost of the system to a large extent. Multi-sensor fusion algorithm makes the system avoid the influence of noise to a certain extent, which is of great significance for the improvement of data accuracy and data precision.

3.3.1. Sensor data preprocessing. In the actual monitoring of education management, there is bound to be error, the system will be collected data preprocessing can be detected in time to detect the error is too large, the wrong measurement results and to be eliminated, in order to increase the reliability of the data, so it is proposed to use the Grobes criterion for the consistency of the data detection.

Assuming that a certain collection node i is independent of each other for a specific teaching data measurement, the measurement results collected in a certain cycle are $x_i = \{x_{i1}, x_{i2}, x_{i3}.......x_{ik}\}$ and the measurements follow a normal distribution, where k is the number of sensor measurements over a period of time.

1) First, the measurement data in a period are arranged in the order of $x_{i1} \le x_{i2} \le x_{i3} \cdots\cdots \le x_{ik}$ from smallest to largest.

2) The arithmetic mean and standard deviation of the measurement data x_{ik} are then calculated as in Eq:

$$\overline{x}_i = \frac{1}{k}\sum_{j=1}^{k} x_{ij} \tag{1}$$

$$\varepsilon_{ij} = x_{ij} - \overline{x}_i \tag{2}$$

$$\varepsilon^{'} = \sqrt{\frac{\sum_{j=1}^{k}\varepsilon_{ij}^{2}}{k-1}} \tag{3}$$

The exact distribution of the Grobes statistic can be obtained from the Grobes criterion statistic:

$$g_{ij} = \frac{x_{ij} - \overline{x}_i}{\varepsilon_i} \tag{4}$$

At a given level of significance α, it usually takes values such as α=0.05, α=0.25 or α=0.01. The critical value of Grobes $g_i(k,\alpha)$ can be determined by the look-up table method. It is obtained because the measurement sequence x_i conforms to a normal distribution:

$$P\left[g_{ij} \ge g_i(k,\alpha)\right] = \alpha \tag{5}$$

It is known that this event has a very small probability of occurring, is not reasonable in the current event, and needs to be screened out. It can also be understood as when any $j \in [1,k]$, if there exists $g_{ij} \ge g_i(k,\alpha)$ holds, using the Grabes criterion to preprocess the measurement data of a single node sensor for a certain period of time to sieve out outliers. This criterion is utilized to screen out sparse errors and effectively solve the interference of anomalous data on the monitoring results to increase the robustness of the data.

3.3.2. Least Squares Mathematical Modeling. The derivation of the least squares algorithm is mainly based on the extreme point theorem of calculus [23]:

If the function $f(x)$ is derivable at x_0 and x_0 is an extremum of the function $f(x)$, then the first order derivative of the function $f(x)$ at x_0 is equal to zero. By taking the derivative and assigning it to zero by the method of extrema, it can be expressed as:

$$\frac{\partial e^T Q^{-1} e}{\partial x} = 2e^T Q^{-1} \frac{\partial e}{\partial x} = 2e^T Q^{-1} A = A^T Q^{-1} e = 0 \tag{6}$$

Derivative law for column vectors based on vector products:

$$\frac{\partial J^T H}{\partial \theta} = H^T \frac{\partial J}{\partial \theta} + J^T \frac{\partial H}{\partial \theta} \tag{7}$$

Substituting $e = Ax - b$ gives:

$$-2(b - Ax)^T Q^{-1} A = 0 \tag{8}$$

Both ends of the equation are transposed simultaneously:

$$A^T Q^{-1}(Ax - b) = 0 \tag{9}$$

The above equation simplifies to give:

$$A^T Q^{-1} Ax = A^T Q^{-1} b \tag{10}$$

The valuation of the unknown parameters obtained by least squares estimation has an optimal solution:

$$\hat{x} = (A^T Q^{-1} A)^{-1} A^T Q^{-1} b \tag{11}$$

Eq. (11) is the optimal solution for the unknown parameter of the least squares method, $\hat{x}$ denotes the valuation of the unknown parameter x, and the residual estimator is denoted by Eq:

$$\hat{e} = A\hat{x} - b \tag{12}$$

where $\hat{e}$ denotes the valuation of the random error e in the observation vector.

The unit-weighted medium error Eq:

$$\hat{\sigma}_0^2 = \frac{e^T Q^{-1} e}{m - n} \tag{13}$$

Where T denotes transpose, -1 denotes matrix inverse, and m and n are vector orders.

Here the data fusion utilizes the least squares principle and the forgotten information of the variance, and the weighted fusion is performed after calculating the weights of each sensor through the comparison of the mean square error. In order to ensure the quality of sensor data, with the infinite pursuit of information, people have put forward higher requirements for information accuracy. To achieve a certain measurement accuracy, the conventional method is to take the arithmetic average of the results of multiple sensors in the same environment as the final accuracy value. As the traditional method for single-sensor data accuracy has been greatly improved, but still can not meet the requirements of people for the data, to meet the requirements of high-level applications for data accuracy, so it is necessary to join the fusion process. That is, the results of multiple sensors through a number of arithmetic processes, to obtain more reliable than the traditional way of measurement results, thereby improving the accuracy of the measurement, this process is the data fusion technology.

4. Design and implementation of a decision support framework for smart campus management

4.1. IoT component

4.1.1. Effectiveness of multi-sensor data fusion:

1) Experimental environment. Experimental software environment: system Windows 10. Development environment: Matlab2020a.

Experimental hardware environment: platform: quad-core processor. Processing model: Inter(R)Core(TM)i7-4790@3.60GHz quad-core.

Memory: 8GB

Graphics: NVIDIA Quadro K2000

Graphics memory: 4GB

2) Multi-sensor data fusion preprocessing. Using 10 of the same sensors to measure the same target characteristic parameters of the object, the actual value of the indicator parameter is 1.000, and the measured raw data is shown in Table 1.

Table 1. Test data for a characteristic parameter

Sensor serial number	Observed value	Variance	Sensor serial number	Observed value	Variance
1	1.000	0.062	6	0.683	0.252
2	0.992	0.073	7	1.071	0.112
3	0.986	0.125	8	1.036	0.101
4	0.973	0.234	9	1.025	0.236
5	0.568	0.321	10	1.623	0.325

The data consistency test is performed on the sample data collected from 10 sensors at the same moment, and the raw data are first sorted from smallest to largest to obtain: 0.568, 0.683, 0.973, 0.986, 0.992, 1.000, 1.025, 1.036, 1.071, 1.623. The dispersion of median as well as quartile is obtained, and the sensor observation parameters are preprocessed. Preprocessing of the sensor observation parameters. The pre-processed parameter values for each sensor are shown in Table 2. After the pre-processing, the values of the observed parameters of the sensors are changed, and the variance of the parameter of sensor No. 1 is changed from 0.062 to 0.056, which is a decrease in the variance of the parameter.

Table 2. The parameters of the sensors after pretreatment are obtained

Sensor serial number	Observed value	Variance	Sensor serial number	Observed value	Variance
1	1.000	0.056	6	1.000	0.057
2	0.992	0.072	7	1.020	0.103
3	0.986	0.103	8	1.012	0.124
4	0.973	0.224	9	1.036	0.236
5	0.895	0.057	10	1.020	0.053

3) Effectiveness of data fusion based on the least squares method. Although the signals or data collected by each sensor are not the same and there is some variability in the degree of deviation from the true value, data fusion using measurement samples with a large gap from the true value has a certain estimation effect by utilizing data redundancy. Here in this paper, the arithmetic mean method, direct variance method, BP neural network algorithm, D-S evidence theory, Kalman filter algorithm, and least squares method are selected for data fusion processing.

The comparison of the results of different algorithms is shown in Table 3. The fusion accuracy of the direct variance method, Kalman filter algorithm, and least squares method is improved in order, the error degree is reduced in order, and the robustness is enhanced in order. The experimental results show that the least squares method has the best fusion effect. It has obvious progress for targeted reduction of data fusion error in multi-sensor acquisition system.

Table 3. Comparison of different algorithms

Algorithm	Fusion result	Error value	Interference resistance
Arithmetic averaging method	0.9613	0.0527	5.40%
Direct variance method	0.9755	0.0326	3.24%
BP neural network algorithm	0.9432	0.0981	7.23%
The theory of the proof s evidence	0.9605	0.0495	5.59%
Kalman filtering algorithm	0.9869	0.0123	1.25%
Least squares method	0.9931	0.000401	0.0401%

4.1.2. Evaluation and Analysis of IoT Devices for Smart Campus. The questionnaires were distributed online and offline, with a total of 500 copies distributed to teachers and students of Y-school, and 486 copies were collected. According to the test questions set up in the questionnaire, the statistical analysis of the survey results, a total of 472 valid questionnaires. The evaluation results obtained from the questionnaire survey are shown in Table 4, from which it can be seen that "basically satisfied" and "very satisfied" account for the highest proportion in each evaluation factor. The number of "extremely dissatisfied" with the novelty of the knowledge base resources of the smart campus IoT system framework design is 16, accounting for 0.034%.

Table 4. The results of the questionnaire were evaluated

Index	The number of factors evaluated				
	Very satisfied (100)	Basic satisfaction (80)	General (60)	Unsatisfactory (40)	Deep dissatisfaction (20)
Accuracy of consultation results	178	135	112	45	2
Advisory efficiency	193	121	89	62	7
Consultation rate	175	156	74	65	2
Privacy protection and service policy	189	124	89	66	4
The new novelty of knowledge base	106	192	124	34	16
The search scope is comprehensive	156	181	105	21	9

4.2. Survey Evaluation of Educational Management Decision Making in Smart Campus

In order to objectively evaluate the performance of a school's smart campus educational management decision support system, which needs to be examined from multiple perspectives and corroborated with each other, this paper designs and develops two methods of interview questions and survey questionnaires, and uses the corresponding survey tools for different survey contents.

The establishment of the University of Y's intelligent campus education management decision support system development status questionnaire is mainly to evaluate and describe the current development status of the university's intelligent campus education management decision support system from an objective point of view.

The scoring method used in the survey is a five-point Likert scale. The scoring method consists of a set of statements, while each statement is categorized into five options A, B, C, D, and E according to the degree of assessment, which are counted as 1, 0.8, 0.6, 0.4, and the last 0.2 points, respectively. The total score of each question is the total score of the respondent's attitude towards this statement, and by taking the average it can indicate the strength of his attitude, i.e. the closer the score is to 1, the greater the degree of agreement with this statement.

A total of 500 questionnaires were distributed in this survey, and the final valid questionnaires were 472, meeting the requirements of statistical analysis.

For the content of the survey process that can obtain specific data and the content that can not be quantified this study took the interview method, mainly for the school supervisor and student management staff. The contents for which specific data can be obtained mainly include the situation of school informatization infrastructure, the situation of school-based resource base, and the contents that are not easy to quantify, such as organization and management, student management informatization, and so on.

Smart campus is a virtual educational environment based on digital information and network, established on computer and network technology for the collection, processing, integration, storage, transmission and application of campus information such as teaching, scientific research, management, technical service, life service, etc., so that digital resources can be fully and optimally utilized. Through the digital information service platform, University Y has realized various sub-platforms specialized in serving student management, including study management, merit management, internship management, employment management, life management and other aspects. The survey on the decision support system for student management is shown in Table 5.

The questionnaire questions include: Q1 "Abundant learning resources and functions meet the needs of student learning management". Q2 "The evaluation criteria displayed on the school evaluation management platform fully understand, the evaluation method is reasonable and usual, and the evaluation process and evaluation results are in line with the "three public" principle. The "Q3" education management platform is updated in a timely manner, and can solve the problems fed back by students during the internship in a timely manner." Q4 "The relevant information of the management platform is updated in a timely and effective manner, which meets the actual needs of students". Q5 "The service functions of the management platform are consistent with the actual teaching". Q6 "Overall Evaluation of Student Management Decision-Making System".

The composite questionnaire scores of faculty and students of University Y for the university's student management decision support system were, in order, Q1=0.7052, Q2=0.7088, Q3=0.7208, Q4=0.7184, Q5=0.7172, and Q6=0.7440. The scores of all dimensions of the student management decision support system ranged from 0.7 to 0.8, which indicated that the student education management operated by the University Y Decision Support System is generally well received.

Table 5. A survey of student management decision support systems

Questionnaire problem	Options	Frequency	Composite score	Performance score
Q1/ Learning resources and functions meet the needs of students to learn management	A.Very fit	93	0.7052	3.526
	B. Comparison coincidence	211		
	C. General	127		
	D. Not in coincidence	32		
	E. Very inconsistent	9		
Q2/ The evaluation of the school evaluation and management platform is reasonable.	A.Very fit	102	0.7088	3.544
	B. Comparison coincidence	199		
	C. General	134		
	D. Not in coincidence	27		
	E. Very inconsistent	10		
Q3/ The education management platform information update is timely.	A.Very fit	114	0.7208	3.604
	B. Comparison coincidence	203		
	C. General	114		
	D. Not in coincidence	37		

	E. Very inconsistent	4		
Q4/ The information update of the management platform is timely and effective, which is in line with the students' actual needs.	A.Very fit	105	0.7184	3.592
	B. Comparison coincidence	208		
	C. General	125		
	D. Not in coincidence	30		
	E. Very inconsistent	4		
Q5/ The service function of the management platform is consistent with the actual teaching.	A.Very fit	122	0.7172	3.586
	B. Comparison coincidence	189		
	C. General	112		
	D. Not in coincidence	42		
	E. Very inconsistent	7		
Q6/ The overall evaluation of the student management decision system.	A.Very fit	124	0.7440	3.720
	B. Comparison coincidence	231		
	C. General	89		
	D. Not in coincidence	21		
	E. Very inconsistent	7		

The overall rating survey about the educational management decision support system of the smart campus is shown in Table 6. The overall rating of the faculty and students on the decision support system for educational management of the university's smart campus is 86.453 out of 100.Based on the results of the above analysis, it can be seen that the construction of the smart campus of the University Y has achieved a certain degree of success.

Table 6. The overall evaluation of the education management decision support system

Dimension	Fractional value	Index	Fractional value	Performance score
Infrastructure construction	22	Information management platform and system	10	9.251
		Platform system usage	12	10.662
Information technology application ability	16	Integration of the Internet of things and management	8	7.521
		Information technology knowledge and application	8	6.894
Resource building	12	Education management repository	6	4.687
		Management resources achievement	6	5.034
Organization and management	15	Organization and management	5	3.787

		Financial protection	4	3.212
		Learning management	3	2.551
		Evaluation management	3	2.263
Education management decision	35	Teaching management	15	13.204
		Life management	8	7.261
		Internship management	7	6.005
		Employment management	5	4.121
Total	100	/	100	86.453

5. Conclusion

This paper proposes a smart campus education management decision support system under the environment of Internet of Things (IoT) technology, uses the least squares method to process the multi-sensor data collected in IoT technology, optimizes the sensor data fusion accuracy, and investigates the scores of teachers and students on the smart campus education management decision support system.

The pre-processed multi-sensor observation parameters are brought into the arithmetic mean method, direct variance method and other data fusion methods, and the least squares method selected in this paper has the best fusion accuracy and the smallest error between the observation value and the parameter value, which is suitable for the construction of the smart campus system in this paper. Combining the rating dimension of 0.7~0.8 for the student management decision support system by teachers and students, and the overall rating of 86.453 for the intelligent campus education management decision support system, it can be seen that the intelligent campus education management decision support system based on IoT technology constructed in this paper has gained a certain degree of acceptance in the actual operation of the school, and it can be further upgraded and optimized for the education management on the basis of this foundation.

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