

## Retraction

# Retracted: Application of Intelligent Sensor Algorithm in Student Management Information Fusion

## Scientific Programming

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

- (1) Discrepancies in scope
- (2) Discrepancies in the description of the research reported
- (3) Discrepancies between the availability of data and the research described
- (4) Inappropriate citations
- (5) Incoherent, meaningless and/or irrelevant content included in the article
- (6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

## References

- [1] Y. Li, "Application of Intelligent Sensor Algorithm in Student Management Information Fusion," *Scientific Programming*, vol. 2021, Article ID 3053538, 12 pages, 2021.

## Research Article

# Application of Intelligent Sensor Algorithm in Student Management Information Fusion

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In order to improve the effectiveness of college student management and promote the integration of college student management information, this paper applies intelligent sensor algorithms to student management. Moreover, this paper combines uncertainty theory with multisensor data fusion technology to establish a complete set of multisensor data processing tools for student information and provides a complete mathematical theoretical framework for the principles of student management information fusion. In addition, in view of the problem of comparing a large number of mixed data of information sources, it is necessary to transfer the information fragments obtained by each sensor to a common set so that the information fragments expressed in different sets can be integrated. Finally, this paper constructs an intelligent student management model and conducts research in combination with simulation experiments. Through simulation research, it can be known that the method proposed in this paper can effectively improve the effect of student management.

## 1. Introduction

Higher education is the highest level of China's education system, and it directly affects the level of China's training of high-level talents. In recent years, as the pace of reform in various industries in our country has accelerated, the reform of higher education has also been accelerating year by year, the scale of enrollment has been increasing, and the number of students has also increased steadily. The level of high-level talent training should not only be expressed in quantity, but more importantly, in high standards of quality. This inevitably puts forward higher requirements on management. Many colleges and universities across the country have researched and developed their own student information management systems, but there is no very flexible and practical student information management system software on the market. Therefore, the student information management system based on intelligent sensor algorithms studied in this paper has a certain market value.

Management Information System (MIS) is a system composed of people, computers, and other peripheral equipment. It can collect, transmit, store, process, maintain,

and use information. The main task of the system is to use computer and network communication technology to maximize the information management of the enterprise. Moreover, it obtains true and accurate data through the investigation and analysis of the resource conditions of the enterprise's human, financial, material, equipment, and technology, which are processed and compiled into various information materials to provide a decision-making basis for managers [1].

The design and development of any software system must follow the general rules of software development in order to ensure better software quality and obtain higher development efficiency [2]. The general process of typical software system development can be divided into five stages: system requirements analysis, design, programming, testing, and maintenance. System requirement analysis is the first stage of software system development, and it is also a very important stage. The result of requirement analysis is the basis of the other four stages, and the analysis result directly affects software system development [3]. The main task of the requirement analysis stage is to put forward the goal that the system is going to achieve and the complete, clear, and

specific requirements of the software system that need to be constrained in terms of function, performance, and design [4]. Requirements analysis includes two aspects: functional requirements analysis and nonfunctional requirements analysis. Functional requirements refer to the functions that the software must complete and are business requirements. Through the functions provided by the software system, users can complete established tasks. Nonfunctional requirements are good expectations for system safety and operating status, including development constraints of software systems, response time, continuous working time, error recovery time, and error prompts [5].

With the gradual transformation of China's higher education from "elite education" to "mass education," higher education has developed rapidly. The number of enrolled students in colleges and universities has continued to increase, and the scale of running schools has continued to expand. The number of students in the school has grown from a few thousand at the beginning to tens of thousands of people now. The increase in the number of students has also increased the management pressure of the school on various management affairs. In addition, the expansion of the school scale has made the limited educational resources of the school even more scarce. Only by establishing an effective management mechanism, uniformly deploying existing educational resources, and increasing the utilization rate of resources can the needs of school development be met. The student integrated information management system can realize the information and scientific comprehensive management of all aspects of student management, which not only improves the efficiency of school management but also creates opportunities for the efficient scheduling of school education resources and the improvement of management quality.

Based on the abovementioned analysis, this paper combines the intelligent sensor algorithm to construct the student management information system, analyzes the information fusion process of the intelligent sensor algorithm to propose an improved algorithm, and verifies the performance of the system in this paper.

## 2. Related Work

In the era of the information society and the knowledge economy, the construction of informatization and digital campuses is a hot spot in the construction of universities at home and abroad. The concept of a digital campus was first proposed by the Massachusetts Institute of Technology in the 1970s. After years of hard work, a more mature digital campus model has been constructed. Generally, foreign universities have their own correspondingly stable technical teams for information systems. The users provide services and technical support. As a branch of the educational administration and teaching management system, the student information management system is relatively mature in terms of business and technical performance [6]. In addition, foreign universities have always paid attention to the establishment of laws and regulations in the process of building management systems. Software designers have their

own copyrights. By assigning different permissions to different software applications, users can legally share information to improve work efficiency and reduce software costs [7]. Among them, the representative research result is the SIF (schools interoperability framework) education information technology standard. It was originally initiated and formulated by some American companies and related educational organizations. The goal is to solve the current resource sharing problem in American universities. Educational information technology standard solutions enable different application programs of various university management to be operated by each other and achieve the purpose of data resource sharing through this authorized interactive operation [8].

Although the management level of student information has gradually transitioned to computer software system management and some colleges and universities have corresponding material inputs and have arranged special personnel for management, they lack supporting software development, and software management is often a mere formality. Other colleges and universities are committed to independent research and development, and actively set up special departments to be responsible for the development and promotion of the school's internal management software. Although the developed software has powerful functions and can fully meet the needs of student information management, due to the lack of communication and coordination with various functional departments in the school, the developed software cannot adapt to the specific management of each functional department requirements, resulting in software being abandoned by managers after a period of use, and formalism, which to a large extent caused a waste of resources [9]. The theory of digital campus has been deeply rooted in the hearts of the people. Colleges and universities have begun to invest in the construction of various hardware equipment and software systems according to their actual needs, including the construction of campus wired and wireless networks; various teaching, scientific research, office management, and other application system software development and introduction have formed their own informatization construction systems [10].

Literature [11] uses Visual Basic 6.0 as the program development language and the Access database as the realization of a relational database. It has developed a set of features for teaching and student management in colleges and universities. The functions include student employment management, grade management, course management, student status management, and a student information management system for class management. Literature [12] designed a set of postgraduate information management systems, using Microsoft's .NET technology and XML-based mature technology as the technical guarantee; SQL Server000 as the system database; different users are assigned different roles to improve management efficiency, and standardize the purpose of graduate student information management. Literature [13] adopts a multilayer application software architecture and a development route based on distributed object technology and component technology. IBM or SUN's UNIX platform-based server is the school's

central database server, and the database system adopts the ORACLE8i of the American ORACLE company and realized the teaching management information system of Shanghai Jiaotong University. At present, the key structure and some subsystems have been developed, and the inspiring new look brought by the new architecture and technology to the management information system is beginning to appear, and it also provides new ideas for the design of the information system. Literature [14] uses the MVC design pattern to design and implement a student management system on the J2EE platform and uses the popular open source framework Struts for development. Literature [15] through the research on the college student management system based on the C/S and B/S mixed modes, realized college student status management, student daily management, student-related management, counselor management, office management, student information query and statistics. It expounds the advantages of the C/S and B/S hybrid development models, and puts forward the idea of "establishing a university student management data center shared by the whole school."

The analysis of the abovementioned data found that for the university student management system, the successful experience can only be used as a reference and reference. It is not feasible to copy a certain advanced experience and management system completely. It is necessary for each university to develop a suitable one according to its actual situation. The management information system based on its own management mode is also the purpose of the development of this system.

### 3. Research on the Multisensor Data Fusion Method of Student Management Information

The essence of students' daily information management is actually the integrated navigation of multiple students. The essence of integrated navigation is multisensor data fusion, which realizes accurate positioning of the carrier position through the loose and tight coupling of MIMU/GPS, MEMS inertial sensor, magnetometer, and GPS combination ways to achieve accurate measurement of the carrier's attitude. Common sensor data fusion methods are mainly based on filtering.

For the comparison of a large number of mixed data sources, it is necessary to transfer the student management information fragments obtained by each sensor to a common set, so that the student management information fragments expressed in different sets can be integrated. Before processing student management information fragments, it is necessary to use a function to project the provided knowledge fragments into a different collection, and then it is necessary to connect these collections and express their relationships.

Combine two sets of operations through the subdivision and coarsening, adjustment, and imbalance of the recognition frame, the student management information fragment can be transferred between any two sets of credibility  $Pl(\cdot)$ . The following will focus on introducing a special extended operation based on these two types of operations. Similarly, this extension can also transfer the credibility of any recognition framework to other recognition spaces.

Specific steps are as follows:

- (1) The algorithm determines an incompletely defined likelihood function  $Pl_e(\cdot)$  within the scope of the recognition frame  $E$ .
- (2) The algorithm calculates  $Pl_s(\cdot/B \subseteq E_e)$ , that is, the incomplete likelihood function on  $c$  when subset  $B$  of  $E_e$  is truly valid.
- (3) The algorithm calculates  $E_r, E_r \subseteq E_e$ , which belongs to a set of element  $E_e$  and is associated with any given element of  $E_s$ . Elements in  $E_s$  that are incompatible with  $E_e$  are eliminated through  $Pl_s(\cdot/B \subseteq E_e) = 0$ . Conversely, elements in  $E_e$  that are incompatible with  $E_s$  are identified by  $E_e - E_r$ .
- (4) With the conclusion data of the first three steps, the algorithm begins to build an extended operation, which is divided into three steps. First, the algorithm uses the formula [16]:

$$Pl_{sr}(A \times B) = Pl_s(\cdot/B \subseteq E_e) \frac{Pl_e(B)}{Pl_e(E_r)}. \quad (1)$$

To find the value of the likelihood function  $Pl_{sr}(A \times B)$  of  $E_s \times E_r$ . Then, a specific algorithm is used to determine the mass function  $m_{sr}(\cdot)$  with the least specificity corresponding to its likelihood value. Finally, the formula is used [17]:

$$m_s(A) = \sum_{B \subseteq E_r} m_{sr}(A \times B). \quad (2)$$

To determine the mass distribution function  $m_s(\cdot)$  on the recognition frame  $E_s$ .

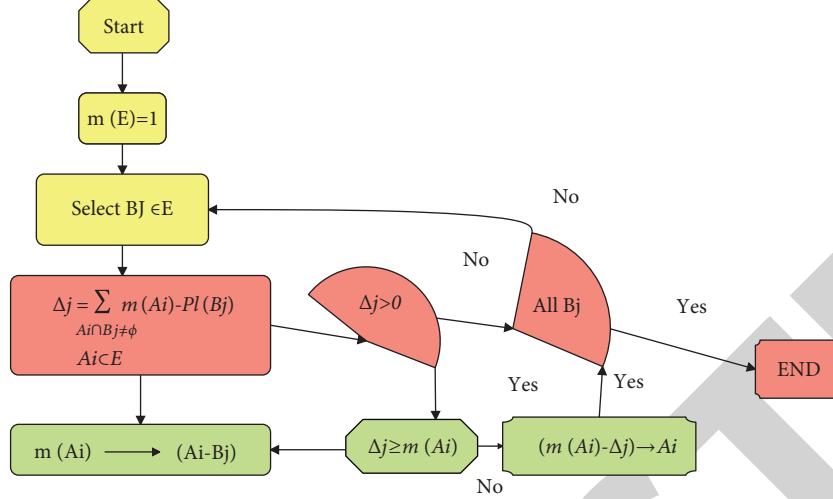
The essence of the algorithm with the smallest specific mass function is to determine the mass function  $m(\cdot)$  associated with the incompletely defined likelihood function  $Pl(\cdot)$  on the recognition space  $E$ . Because of the uncertainty of this quality function, it is necessary to find the function with the highest evidence strength. We define the specific function  $Sp(m)$  as

$$sp(m) = \sum_{B \subseteq E_r} \frac{m(A)}{|A|}. \quad (3)$$

In order to limit student management information outside the facts, it is necessary to find the smallest  $Sp(m)$ . The algorithm update flowchart is shown in Figure 1 [18].

During the update process, it should be noted that the initialization  $m(\cdot)$  process must make  $m(E) = 1$ . After processing a likelihood subset,  $m(E)$  needs to be set to an uncertain partial quality. When choosing  $B_j \subset E$ , we need to consider the order in order to reduce the cardinality. If the cardinality of the two sets is equal, it will not be considered first. When  $\Delta_j > 0$  is judged, it is necessary to examine the main element [19]  $A$  of  $m(\cdot)$ , which must satisfy formula (3).

$$\begin{cases} A_i \cap B_j \neq \emptyset, \\ A_i - B_j \neq \emptyset, \\ |A_i - B_j|^{-1} - |A_i|^{-1} = \min. \end{cases} \quad (4)$$

FIGURE 1: The smallest specific  $m(.)$  algorithm.

Finally, it is worth noting that the solutions derived from different problem conditions are not unique. The process of student information recognition is set as the recognition frame  $E_c$  is as follows:

$$E_c = \{H_1, H_2, H_3, H_4, H_5, H_6\}. \quad (5)$$

Among them,

$$\begin{cases} H_1 = \{\text{Stationary state}\}, \\ H_2 = \{\text{Acceleration/deceleration}\}, \\ H_3 = \{\text{Slow moving state, straight walking}\}, \\ H_4 = \{\text{Slow moving state, curve walking}\}, \\ H_5 = \{\text{Fast moving state, straight line}\}, \\ H_6 = \{\text{Fast moving state, curve}\}. \end{cases} \quad (6)$$

According to the abovementioned identification framework,  $H_i$  ( $i = 1 \sim 6$ ) is the situational variable. Now, it is necessary to determine the attribute  $u_j$  corresponding to each scenario variable. The attributes are the longitude, latitude, altitude, roll angle, pitch angle, and yaw angle of the carrier, a total of six variables, which are recorded as follows [19]:

$$\mu_j = \{\lambda, \phi, h, \text{roll, pitch, yaw}\} (j = 1 \sim 6). \quad (7)$$

The collection is as follows:

$$\begin{cases} \lambda = \{\lambda_1, \lambda_2, \lambda_3, \dots, \lambda_n\}, \\ \phi = \{\phi_1, \phi_2, \phi_3, \dots, \phi_n\}, \\ h = \{h_1, h_2, h_3, \dots, h_n\}, \\ \text{roll} = \{\text{roll}_1, \text{roll}_2, \text{roll}_3, \dots, \text{roll}_n\}, \\ \text{pitch} = \{\text{pitch}_1, \text{pitch}_2, \text{pitch}_3, \dots, \text{pitch}_n\}, \\ \text{yaw} = \{\text{yaw}_1, \text{yaw}_2, \text{yaw}_3, \dots, \text{yaw}_n\}. \end{cases} \quad (8)$$

In the set,  $n$  represents the  $n$  kinds of calculation methods, which are selected according to the actual situation. Each attribute may have less than or equal to  $n$  kinds of

solution methods, and some attributes are still coupled for a certain solution method. For the convenience of building the model, the dimension is uniformly set to  $n$ . It is worth noting that taking the largest dimension does not violate the actual situation, because each attribute is directly or indirectly coupled.

In addition, we identify several important vectors [20]:

$$\begin{cases} A_c = \{C_x, C_y, C_z\}, \\ A_g = \{g_x, g_y, g_z\}, \\ A_o = \{O_x, O_y, O_z, O_B\}, \\ A_r = \{\lambda, \phi, h, v_x, v_y, v_z\}. \end{cases} \quad (9)$$

Among them,  $A_c$  is the student management information of the three-axis magnetometer;  $A_g$  is the student management information of the three-axis accelerometer;  $A_o$  is the student management information of the three-axis gyroscope; and  $A_r$  is the student management information of the GPS satellite receiver.

Start with the observation data. The vector  $A_c, A_g, A_o, A_r$  itself is not a set, so it is necessary to transform the four sets of vectors into a set. The abovementioned four sets of vectors can be transformed to the set (8), that is, each single element in the set is composed of four sets of vectors calculated by the navigation algorithm.

This section mainly analyzes the collection management. The research object is the collection (8). The application of the four sets of vectors of the collection (9) will be explained in detail in the next section. We use the attribute  $\lambda$  as an example.

*Step 1.* The algorithm calculates the likelihood function of each subset  $\lambda_i$ . The specific calculation is shown as follows [21]:

$$Pl(\lambda_i) = \frac{|\lambda_i - [\lambda]|}{\sum |\lambda_i - [\lambda]|} \quad (i = 1 \sim n). \quad (10)$$

In the formula,  $[\lambda]$  is the standard value. Because this value cannot be collected in real time, one or more sensors with the highest reliability can be determined in advance according to the way of scenario simulation, and the  $[\lambda]$  calculated by using these reliable sensors is the standard output.

The second step is as follows: according to the reliability analysis of each sensor variable, the algorithm removes the unreliable sensor attributes; the mass function  $m_{ij}(\cdot)$  of each set is calculated according to the minimum specific mass function method, and the reliability is eliminated.

The third step is as follows: the algorithm updates the student management information. When the student management information  $\lambda_k$  at the previous moment is transformed into the student management information  $\lambda_{k+1}$  at the next moment, the student management information at the two moments needs to be merged. Among them, simple weighting is one way. After that, we solve the expansion operation which is as follows:

- (1)  $E_k$  is the collection of student management information at the previous moment
- (2)  $E_{k+1}$  is the collection of student management information  $x.z$  at a later time
- (3)  $Pl_k(\cdot)$  is the Bayesian simple integration of the likelihood function distribution at the previous moment
- (4)  $Pl_{k+1}(\cdot | B \subseteq E_k)$  is the distribution of the likelihood function at a later time of Bayesian simple integration, which may have a value of 0 or 1
- (5) According to the mass distribution function of the specific set of attributes, the algorithm determines the corresponding conversion model

The reliability management of knowledge fragments is an important foundation in the process of sensor data fusion. For the problem of ensuring the stability (robustness) of the output signal in the solution process of the integrated navigation system, the reliability management of the student management information is extremely important. The combination stage usually encourages the use of a simple weighted combination of the management information of each sensor student, but the shortcomings are also obvious. It is very sensitive to the selected parameters, which often leads to low robustness of the output signal and susceptibility to external interference.

In the reliability function theory, if the source identification frame is  $E_e$ , then the mass function on  $E_e$  is  $m(A)$ , where  $\forall A \subset E_e$ . If the reliability of the source is known  $q \in [0,1]$ , the unreliable part can be eliminated to obtain

$$\begin{cases} m^q(A) = qm(A) \forall A \subset E_e \\ m^q(E_e) = 1 - q(1 - m(E_e)) \end{cases} \quad (11)$$

The function of reliability function rejection is to reduce the performance of the uncertainty part of the sensor by a factor  $(1-q)$ . That is, it reduces the mass distribution of all elements and redistributes the mass on the recognition frame. Moreover, the overall credibility is reduced by  $(1-q)$ ,

so the uncertainty of the overall  $E_e$  is increased. This elimination operation retains the original evaluation and improves the evaluation between total uncertainties. In addition, for the likelihood function, a similar method is used here, as shown in the following formula:

$$Pl^q(B) = 1 - q(1 - Pl(B)). \quad (12)$$

Here is the application process of multisensor student management information reliability management in the overall system, as shown in Figure 2.

If the MTI data is  $ax$ ,  $y$ , or  $o$ , and the IMU data is  $ae$ ,  $ay$ , or  $loz$ , the reliability expression is as follows:

$$q_{ij} = \frac{|E(\tilde{\omega}_x - \omega_x)|}{E(|\tilde{\omega}_x|)} \quad (i = 1 \sim 6, j = 1 \sim 16). \quad (13)$$

Among them,  $i$  represents the student management information sequence, and  $j$  represents the sensor sequence. The essence of this kind of reliability expression is the expression of the accuracy of the sensor under the management information of different students when the sensor is not damaged. Therefore, the expression defects are also obvious:

- (1) It can only bind offline, and it is difficult to guarantee the accuracy of the binding. The first point is that when the reliability database is used for binding, the accuracy of the expression itself cannot be measured according to formula (13), that is, the reliability of the algorithm needs to be verified.
- (2) When it is applied, it must be searched by the interpolation method, and the accuracy is further degraded.
- (3) The most important point is that it is impossible to determine the true operating status of the sensor, which introduces hidden dangers to the update of student management information in a real application environment.

There is no doubt that how to optimally combine student management information from different sensors is the core content of data fusion, but this function is also the most difficult part to achieve. The influencing factors mainly include the following: the difference of sensors, the diversity of the identification framework that can express the available student management information, the rigorous mathematical modeling expression of the problem, and the handling of conflicts between signal sources. Numerous identification frameworks provide a large number of combination rules. Therefore, how to select the optimal combination has become the most difficult and most critical problem.

Here, the D-S evidence theory is used for synthesis, and this synthesis rule reflects the combined effect of evidence. We give several trust functions based on different evidence on the same identification framework. If several batches of evidence are incompletely conflicting, you can use the D-S evidence theory to calculate a new trust function.

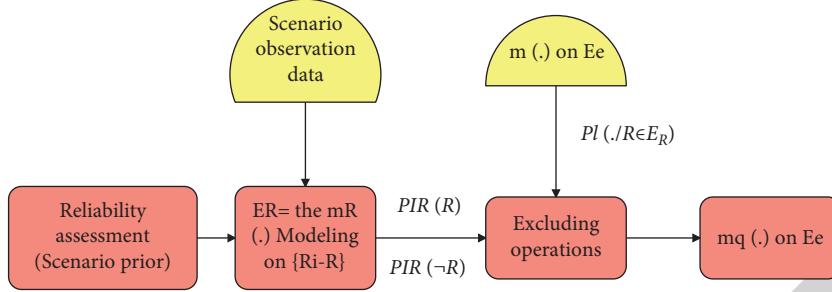


FIGURE 2: Flowchart of comprehensive management of reliability.

This trust function can be used as the trust function under the joint action of the several batches of evidence, and the trust function is called the orthogonal sum of the original trust functions.

$$m(A) = \begin{cases} \sum_{\cap A_i = A} \prod_{1 \leq j \leq n} \frac{m_i(A_j)}{(1 - K)}, & A \neq \emptyset, \\ 0, & A = \emptyset, \end{cases} \quad (14)$$

where

$$K = \sum_{\cap A_i = A} \prod_{1 \leq j \leq n} m_i(A_j). \quad (15)$$

The factor  $K$  is called the conflict coefficient, which represents the inconsistency of data fusion, that is, a measure of the degree of conflict between different quality functions.

We assume that the set  $E_k$  of student management information at the previous moment and the set  $E_{k+1}$  of student management information  $A_{k+1}$  at the next moment are two different independent signal sources and that the two sets of signal sources can determine the reliability distribution of the signal.

The identification framework is as follows:  $E_k = \{\lambda_{1k}, \lambda_{2k}, \lambda_{3k}, \dots, \lambda_{nk}\}$ ,  $E_{k+1} = \{\lambda_{1k+1}, \lambda_{2k+1}, \lambda_{3k+1}, \dots, \lambda_{nk+1}\}$ ;

The mass function assignment is  $m_k$ :  $m_k(\{\lambda_{1k}\}), m_k(\{\lambda_{2k}\}), m_k(\{\lambda_{3k}\}), \dots, m_k(\{\lambda_{nk}\}), m_k(\{\lambda_{1k}, \lambda_{2k}\}), m_k(\{\lambda_{1k}, \lambda_{3k}\}), m_k(\{\lambda_{1k}, \lambda_{4k}\}), \dots, m_k(\{\lambda_{1k}, \lambda_{4k}\}), \dots, \{1, \lambda_{2k}, \lambda_{3k}, \dots, \lambda_{nk}\} m_{k+1}$ :  $m_k(\{\lambda_{1k+1}\}), m_k(\{\lambda_{2k+1}\}), m_k(\{\lambda_{3k+1}\}), \dots, m_k(\{\lambda_{nk+1}\}), m_k(\{\lambda_{1k+1}, \lambda_{2k+1}\}), m_k(\{\lambda_{1k+1}, \lambda_{3k+1}\}), m_k(\{\lambda_{1k+1}, \lambda_{4k+1}\}), \dots, m_k(\{\lambda_{1k+1}, \lambda_{4k+1}\}), \dots, \{\lambda_{1k+1}, \lambda_{2k+1}, \lambda_{3k+1}, \dots, \lambda_{nk+1}\}$

According to Dempster combination rules (14) and (15), the probability assignment of each attribute is calculated as follows:  $m(\{\lambda_i\})$

$$K = \sum_{\cap A_i = A} \prod_{1 \leq j \leq n} m_i(A_j),$$

$$m(A) = \begin{cases} \sum_{\cap A_i = A} \prod_{1 \leq j \leq n} \frac{m_i(A_j)}{(1 - K)}, & A \neq \emptyset, \\ 0, & A = \emptyset. \end{cases} \quad (16)$$

Finally, the calculated  $m(A)$  is the basic probability assignment (BPA) of attribute 3.

The overall framework of the established model is shown in Figure 3.

The model summarizes the contents of the first three sections, and the overall framework is divided into two ways. The first path is the real-time observation value  $s_j$ , and the possibility  $C_{ij}$  under the hypothetical  $H$  condition is calculated from the real-time measurement value and expressed as the mass function  $mv(.).$   $mv(.)$  is only related to the recognition frame  $E = \{H, \neg H\}$ .

Because  $mv_{ij}(.)$  is the quality function of  $C_{ij}$ , the general conventions are as follows:

$$Pl_{vij}(H_i) = C_{ij}. \quad (17)$$

Equation (17) accurately describes the classic problem of classification, that is, affirming that the measurement result is similar to the learning of  $H$ . However, it has uncertainty and may be similar to another hypothesis, and only considers the smallest specific mass function on  $H$ , which is called “model 1”:

$$\begin{cases} mv_{ij}(H_i) = 1 - C_{ij}, \\ mv_{ij}(E_i) = C_{ij}. \end{cases} \quad (18)$$

In particular,  $C_{ij}$  is a symbol of meaning. When the value is 0, it is believed that  $H_i$  cannot be authenticated, and when the value is 1, it is sure that  $H_i$  is authenticated. At this point, we need to add conditions:

$$Pl_{vij}(H_i) = 1 - C_{ij}. \quad (19)$$

By combining formulas (17) and (18), inferences can be made, which is called “model 2.”

$$\begin{cases} mv_{ij}(H_i)C_{ij}, \\ mv_{ij}(H_i) = 1 - C_{ij}. \end{cases} \quad (20)$$

Model 1 has the smallest specificity. Model 2 is not used under special circumstances. The data modeling in the integrated navigation system will be discussed further. Here, because of the uncertainty of sensor data, Model 1 is preferred.

In addition, when the model 2 is selected, the  $C_{ij}$  measurement method is  $s_j$ , and the learning data method is  $p(\mu_j | H_i)$ , then  $C_{ij}$  is transformed into the following:

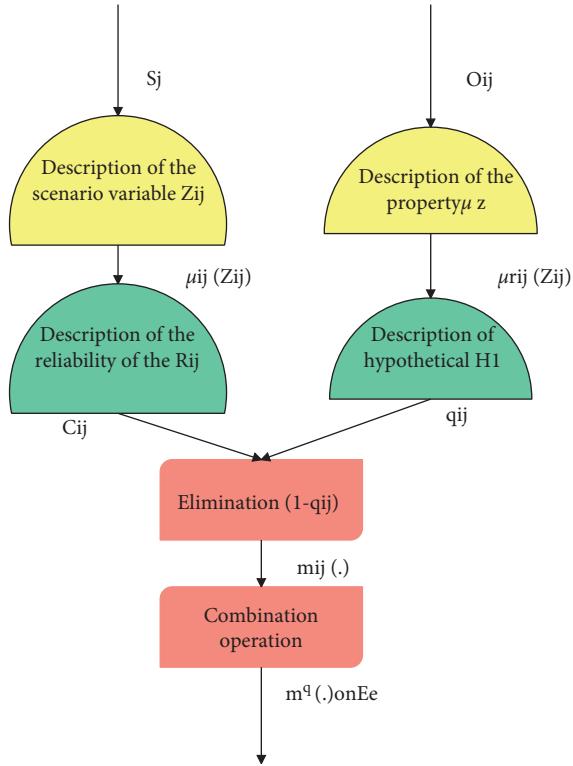


FIGURE 3: Overall framework of the model.

$$\begin{cases} C_{ij} = R_i p \frac{p(\mu_j/H_i)}{(1 + R_j p(\mu_j/H_i))}, \\ R_j \in [0, (\max(p(\mu_j/H_i)))^{-1}]. \end{cases} \quad (21)$$

#### 4. Application of an Intelligent Sensor Algorithm in Student Management Information Fusion

In the entire school, the overall plan for the daily management of all classes is as follows: student work managers (including the school's student office administrators and the student department administrators of various departments), head teachers, and teachers complete the maintenance of the basic data required by the system in the management system, including the addition, modification, and deletion of all basic data. The teacher business flowchart is shown in Figure 4.

According to the daily management of the school's head teacher's work and business processes and the requirements of all system functions, the data flow is analyzed, the specific functional modules are divided, and the relationships and connections between them are clarified. The layer 1 data flow diagram of the management information system is shown in Figure 5.

It is further refined to form the data flow diagram of the second layer, as shown in Figures 6 and 7.

Shown in Figure 8 is the basic data flow diagram of the class teacher's management of the class in the class teacher's management information system. Among them, the relevant

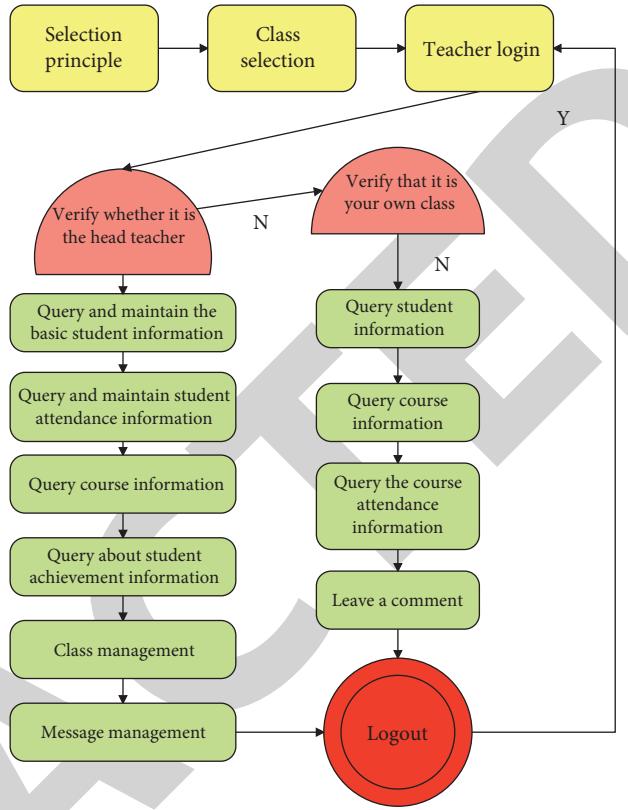


FIGURE 4: Teacher business flowchart.

regulations of the school and the department are strictly enforced to evaluate the students in the class, and the reward and punishment information is recorded and provided to all users for easy inquiries.

Users can learn more about the information of each student during their schooling through the inquiry of modules such as attendance management, teaching management, dormitory management, reward and punishment management, and student information management. Among them, attendance information, dormitory information, and performance information can more accurately and concretely show the pros and cons of each student. Moreover, it can enable the head teacher and subject teachers to discover the problems of each student in a relatively short period of time and take immediate measures to control the spread of the problems. At the same time, all queries are open to students so that all students can grasp their true situation. With the help of all teachers, they can control their words and deeds during school so as to gradually cultivate personal self-discipline and learn to abide by rules. The information in the system can also be notified to parents of students in time through the home-school communication system, so that parents can keep track of their children's performance at school. This is convenient to enhance the understanding of students and is more conducive to communication with the head teacher and the school. In addition, with the information provided by the system, teachers, students, and parents can communicate in a timely manner, thereby avoiding unnecessary disputes in the later period.

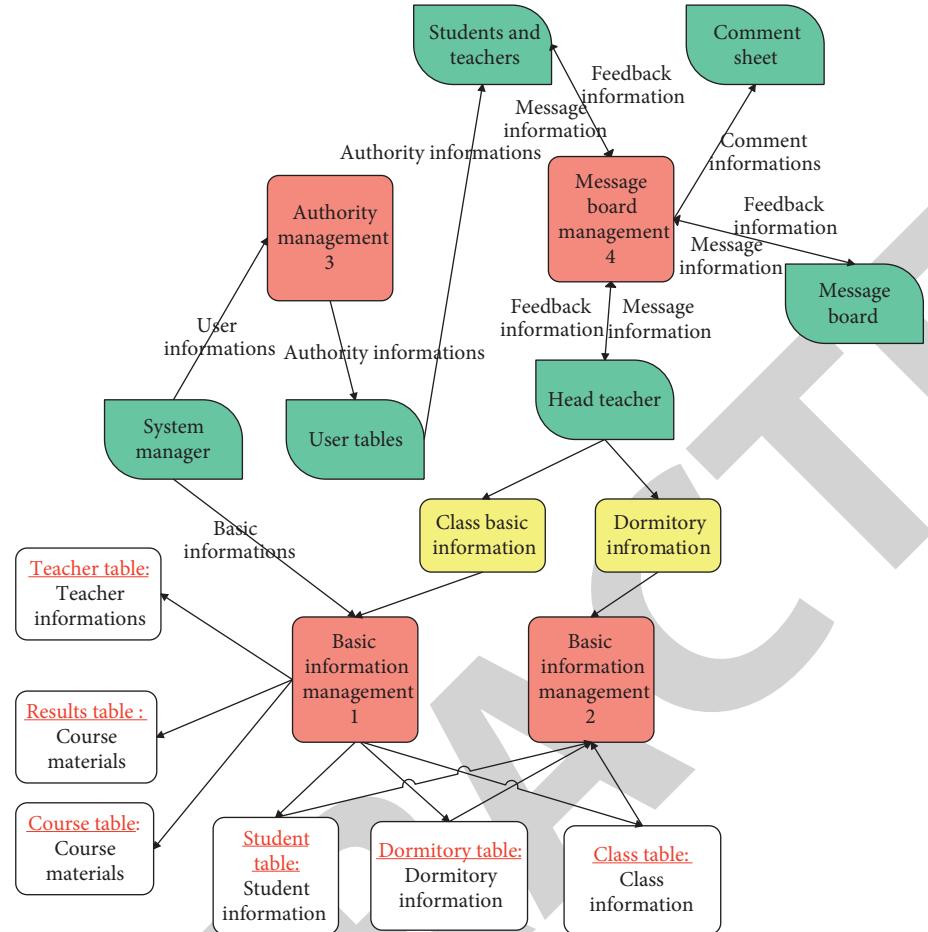


FIGURE 5: Data flow diagram of the management information system.

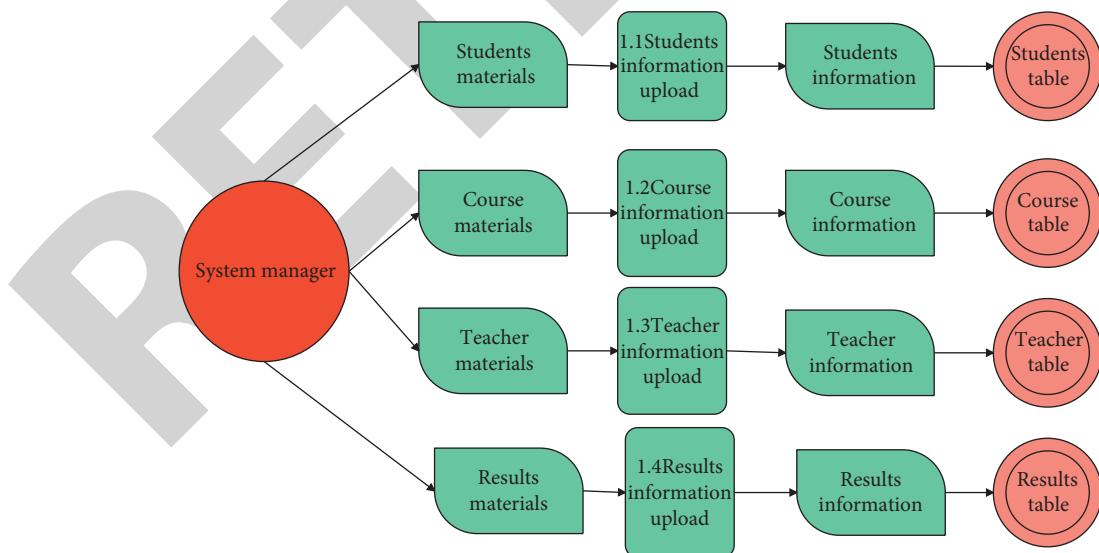


FIGURE 6: Data flow diagram of basic information management.

The user table is used to store basic user information, including user ID, user name, student ID or teacher ID, student card number, teacher user password, and user type, as shown in Table 1.

The student basic information table is used to store the basic personal information of students, mainly including student name, student number, card number, gender, political outlook, telephone number, class, dormitory number,

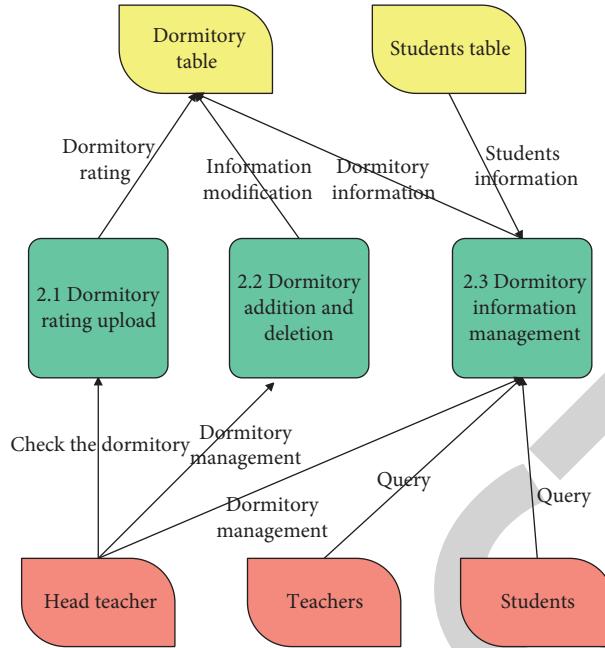


FIGURE 7: Data flow diagram of dormitory management.

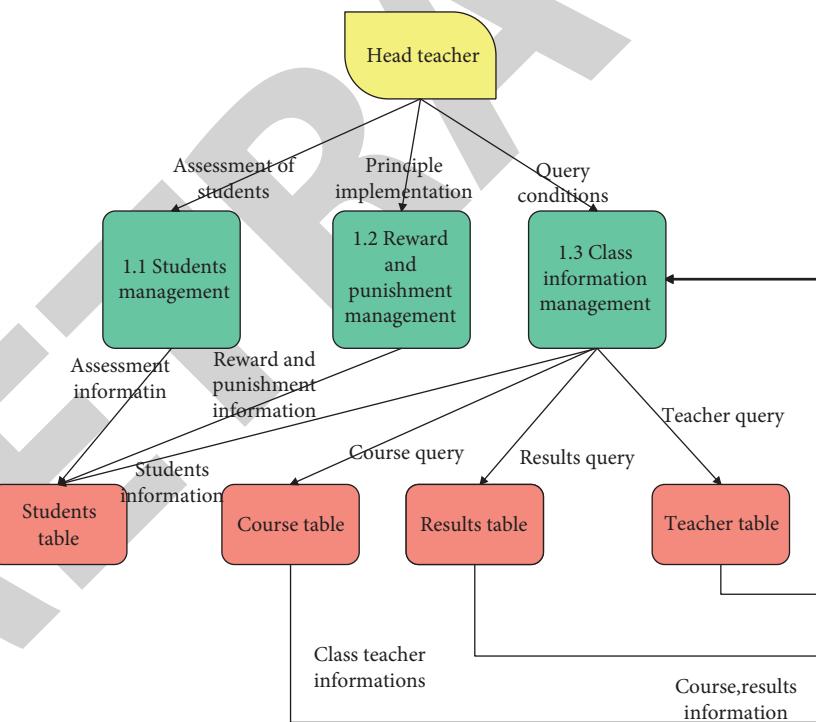


FIGURE 8: Data flow diagram of class management.

bed number, reward and punishment information, ID number, home address, and parent contact number, as shown in Table 2.

On the basis of the above-built system, through multiple sets of data, this paper uses the system proposed in this paper to fusion processing student information and performs data processing with the support of intelligent sensing algorithms. The results are shown in Figure 9.

As can be seen from the above figure, the smart sensor algorithm proposed in this paper can effectively promote the integration of student management information and has an important supporting role in the processing of college student management information. On this basis, the effect of the student assistance management of this system is evaluated, and the results are shown in Figure 10.

TABLE 1: User table.

| Field name | Type of data | Annotation                                |
|------------|--------------|-------------------------------------------|
| User_ID    | Int          | User ID                                   |
| User_Num   | Varchar      | Teacher employee number or student number |
| Card_num   | Varchar      | Student card number                       |
| User_Name  | Varchar      | Username                                  |
| User_Pwd   | Varchar      | User password                             |
| User_Acc   | Int          | User rights                               |

TABLE 2: Student basic information table.

| Field name | Type of data | Annotation                                                 |
|------------|--------------|------------------------------------------------------------|
| Stu_ID     | Int          | Student ID                                                 |
| Stu_Num    | Varchar      | Student ID                                                 |
| Card_Num   | Varchar      | Student card number                                        |
| Class_ID   | Int          | Class number                                               |
| Stu_Name   | Varchar      | Student name                                               |
| Stu_Sex    | Varchar      | Student gender                                             |
| Stu_Rem    | Varchar      | Student rewards and punishments information                |
| Stu_Adr    | Varchar      | Student's home address                                     |
| Stu_HKLX   | Varchar      | Student account type                                       |
| Stu_XSGZ   | Logic        | Whether the student enjoys the national bursary            |
| Stu_XSDB   | Logic        | Whether the student enjoys the urban subsistence allowance |
| Stu_Zzmm   | Varchar      | Student political outlook                                  |
| Stu_Sfc    | Varchar      | Student ID number                                          |
| Stu_Csny   | Date         | Student's date of birth                                    |
| Stu_Tel    | Varchar      | Student phone                                              |
| Stu_Fqtel  | Varchar      | Student father phone                                       |
| Stu_Mqtel  | Varchar      | Student mother phone                                       |
| SS_ID      | Int          | Dormitory number                                           |

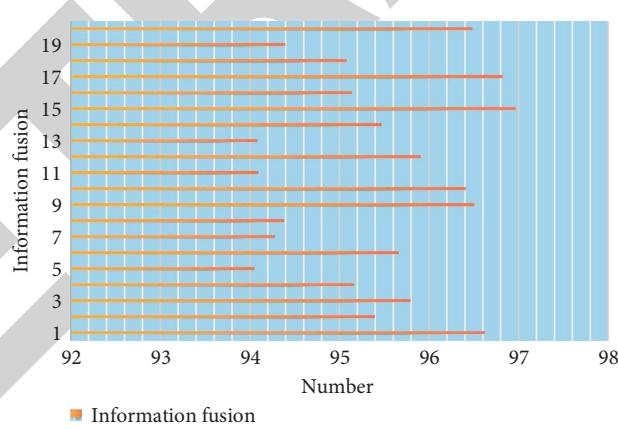


FIGURE 9: Information fusion processing results.

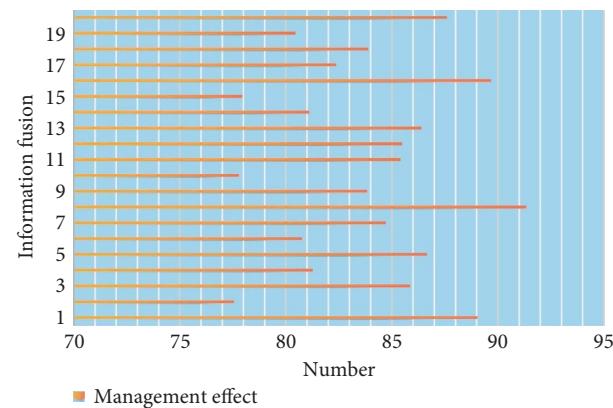


FIGURE 10: Student management effect.

It can be seen from the above figure that the method proposed in this paper can effectively improve the effect of student management and has an important role in promoting student information management in colleges and universities.

## 5. Conclusion

When colleges and universities conduct student management under the traditional management mode and the stand-alone mode of computer information systems, most of the time of each stage of the work of the management personnel is used to manually search for data and statistical information from various tables. Even if a computer information system is used in management work, it is limited to simple data processing, and there is no connection between different management tasks on the computer. Moreover, the role of the computer only improves the efficiency of management staff in handling daily business. The data of management work is communicated in a static way, and the data is completely relied on manual mutual verification and collaborative work, which causes the school's management links to be disconnected from each other and affects the overall management order of the school. This paper combines the intelligent sensor algorithm to construct the student management information system, analyzes the information fusion process of the intelligent sensor algorithm, proposes an improved algorithm, and verifies the performance of the system in this paper. Through simulation research, we can see that the method proposed in this paper can effectively improve the management effect of students.

## Data Availability

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

## Conflicts of Interest

The author declares no conflicts of interest.

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## References

- [1] V. Rodriguez-Galiano, M. Sanchez-Castillo, M. Chica-Olmo, and M. Chica-Rivas, "Machine learning predictive models for mineral prospectivity: an evaluation of neural networks, random forest, regression trees and support vector machines," *Ore Geology Reviews*, vol. 71, no. 3, pp. 804–818, 2015.
- [2] C. W. Coley, R. Barzilay, T. S. Jaakkola, W. H. Green, and K. F. Jensen, "Prediction of organic reaction outcomes using machine learning," *ACS Central Science*, vol. 3, no. 5, pp. 434–443, 2017.
- [3] A. Chowdhury, E. Kautz, B. Yener, and D. Lewis, "Image driven machine learning methods for microstructure recognition," *Computational Materials Science*, vol. 123, no. 8, pp. 176–187, 2016.
- [4] S. Basith, B. Manavalan, T. H. Shin, and G. Lee, "SDM6A: a web-based integrative machine-learning framework for predicting 6mA sites in the rice genome," *Molecular Therapy - Nucleic Acids*, vol. 18, no. 6, pp. 131–141, 2019.
- [5] C. Voyant, G. Notton, S. Kalogirou et al., "Machine learning methods for solar radiation forecasting: a review," *Renewable Energy*, vol. 105, no. 2, pp. 569–582, 2017.
- [6] H. Li, O. L. Kafka, J. Gao et al., "Clustering discretization methods for generation of material performance databases in machine learning and design optimization," *Computational Mechanics*, vol. 64, no. 2, pp. 281–305, 2019.
- [7] L. Cheng, N. B. Kovachki, M. Welborn, and T. F. Miller, "Regression clustering for improved accuracy and training costs with molecular-orbital-based machine learning," *Journal of Chemical Theory and Computation*, vol. 15, no. 12, pp. 6668–6677, 2019.
- [8] S. K. Mydhili, S. Periyayagi, S. Baskar, P. M. Shakeel, and P. R. Hariharan, "Machine learning based multi scale parallel K-means++ clustering for cloud assisted internet of things," *Peer-to-Peer Networking and Applications*, vol. 13, no. 6, pp. 2023–2035, 2020.
- [9] M. Mirmozaffari, A. Boskabadi, G. Azeem et al., "Machine learning clustering algorithms based on the DEA optimization approach for banking system in developing countries," *European Journal of Engineering Research and Science*, vol. 5, no. 6, pp. 651–658, 2020.
- [10] M. Chegini, J. Bernard, P. Berger, A. Sourin, K. Andrews, and T. Schreck, "Interactive labelling of a multivariate dataset for supervised machine learning using linked visualisations, clustering, and active learning," *Visual Informatics*, vol. 3, no. 1, pp. 9–17, 2019.
- [11] A. Nandi, J. M. Bowman, and P. Houston, "A machine learning approach for rate constants. II. Clustering, training, and predictions for the O(3P) + HCl → OH + Cl reaction," *The Journal of Physical Chemistry A*, vol. 124, no. 28, pp. 5746–5755, 2020.
- [12] S. Dotsenko, O. Illiashenko, S. Kamenskyi, and V. Kharchenko, "Integrated security management system for enterprises in industry 4.0," *Information and security: an international journal*, vol. 43, no. 3, pp. 294–304, 2019.
- [13] N. Y. Kim, S. Rathore, and J. H. Ryu, "A survey on cyber physical system security for IoT: issues, challenges, threats, solutions," *Journal of Information Processing Systems*, vol. 14, no. 6, pp. 1361–1384, 2018.
- [14] S. U. Hani and A. T. Alam, "Software development for information system - achieving optimum quality with security," *International Journal of Information System Modeling and Design*, vol. 8, no. 4, pp. 1–20, 2017.
- [15] M. Sun, I. Konstantelos, and G. Strbac, "A deep learning-based feature extraction framework for system security assessment," *IEEE Transactions on Smart Grid*, vol. 10, no. 5, pp. 5007–5020, 2018.
- [16] K.-K. R. Choo, M. M. Kermani, R. Azarderakhsh, and M. Govindarasu, "Emerging embedded and cyber physical system security challenges and innovations," *IEEE Transactions on Dependable and Secure Computing*, vol. 14, no. 3, pp. 235–236, 2017.
- [17] D. Li, Z. Cai, L. Deng, Y. Xiang, and H. W. Harry, "Information security model of block chain based on intrusion sensing in the IoT environment," *Cluster Computing*, vol. 22, no. 1, pp. 451–468, 2019.
- [18] A. Safi, "Improving the security of internet of things using encryption algorithms," *International Journal of Computer and Information Engineering*, vol. 11, no. 5, pp. 558–561, 2017.

- [19] W. A. Cram, J. D'arcy, J. D'Arcy, and J. G. Proudfoot, "Seeing the forest and the trees: a meta-analysis of the antecedents to information security policy compliance," *MIS Quarterly*, vol. 43, no. 2, pp. 525–554, 2019.
- [20] V. H. Le, V. O. Phung, and N. H. Nguyen, "Information security risk management by a holistic approach: a case study for Vietnamese e-government," *IJCSNS International Journal of Computer Science and Network Security*, vol. 20, no. 6, pp. 72–82, 2020.
- [21] A. B. Lopez, K. Vatanparvar, A. P. Deb Nath, S. Yang, S. Bhunia, and M. A. Al Faruque, "A security perspective on battery systems of the internet of things," *Journal of Hardware and Systems Security*, vol. 1, no. 2, pp. 188–199, 2017.

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