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Research Article

The Design of University Coordination Utility Management and Online Repair Platform Based on Multivariate Statistical Analysis with Random Matrix

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In this paper, the random matrix of multivariate statistical analysis is used to conduct in-depth research and analysis of the university coordination utility management and online repair platform. Considering that the chunking of variables based on mechanistic knowledge is not easy to achieve, firstly, the maximum correlation and minimum redundancy algorithm is used to portray the correlation more accurately between process variables and remove the redundancy between variables to provide the optimal variable input for the base model. The multivariate mean control chart was used to calculate the offset between the data of each test group of the contact network and the overall mean and standard values of the contact network parameters under different correlations among the contact network parameters. Based on the daily work research and process document sampling of the university coordination utilities management department, the requirement analysis and design of the target system were completed, and a university coordination utility management system based on BS architecture was developed. Student information is lost, data statistics are wrong, etc., so that the business work of other departments of the school cannot be carried out smoothly. The whole platform can be divided into several submodules according to the functions: super administrator module, administrator module, staff module, and user module, and the detailed design scheme of each module is described in detail. At the same time, the logistic regression model is trained using the collected data sets, and the training scheme of the model is designed. The mathematical model of logistic regression and the related algorithm are used to decide whether to purchase maintenance equipment at this stage and the quantity of purchase. Finally, a new monitoring index is proposed to monitor the process status. MNPE-GMM not only maintains most of the local structural information of the window dataset in the feature subspace but also reduces the computational complexity of GMM in the fault detection process. The MNPE-GMM method can effectively improve the fault detection rate of multimodal intermittent processes by introducing new statistics.

1. Introduction

With the development of the times and the progress of technology, modern industries are becoming increasingly automated, integrated, and intelligent. This has also led to increasingly complex and sophisticated systems such as production and operation. However, highly integrated production systems and complex production processes also pose serious challenges to ecological protection, energy consumption, and production safety. At the same time, the more complex the production system, the higher the chance of failure in the production process. When accidents occur in some parts of the production system, if the failure cannot be detected and controlled effectively in time, it may cause equipment destruction, product defective rate increase, and production efficiency loss or cause huge safety accidents and endanger the lives of the people concerned [1]. Here, the platform is developed and designed with business functions as the unit, and these functional modules are designed as separate remote services, and the HTTP protocol is used for communication between each service. Due to the development and progress of modern science and technology, production processes and equipment have become more detailed and complex, and it has become difficult for the

traditional method of relying on manual fault analysis and early warning, which is less efficient and susceptible to subjective factors, to meet the needs of modern industrial production. Since neither a priori process knowledge nor precise mathematical models are required, the data-driven approach requires only a certain amount of V process data to achieve fault detection and diagnosis and is, therefore, more widely applicable and relatively inexpensive to implement [2]. On the other hand, with the advancement of smart sensors and mobile terminal technology, the application of data-driven methods has been facilitated, which has greatly contributed to the development of data-driven methods in the past decades.

College coordination combines several functions of service nurturing, environment nurturing, and management nurturing with one another and plays a role in promoting the stability and harmony of schools. The promotion of socialization reform of college coordination management is one of the important factors to establish a modern university system with Chinese characteristics [3]. How to continue to develop university coordination is a matter of great concern to us all. The development of the university coordination department as an indispensable part of the normal operation of universities is also essential. It can be said that the informatization of coordination management is inevitable. Nowadays, university coordination is about to enter a brand-new era. With the help of unified instructions and support, colleges and universities have combined their actual situation and constantly adjusted their ideas to give the logistic management of colleges and universities to professional units; then the logistic management of colleges and universities will not only not restrict the development of schools as in the past, but also allow schools to concentrate on education work and realize the rapid and high-quality development of the education industry of colleges and universities. After a thorough investigation and study of universities, although Southwest Jiaotong University has various campus student information management systems, such as academic affairs network, laboratory management system, and semiautomated systems such as water and electricity payment management system, and in recent years there is a small online self-service payment system, the maintenance of water and electricity in the coordination department still adopts the original telephone repair; staff use manual paper [4]. After completing the work order and other operations, the dormitory administrator has the right to enter the apartment management page and edit the student accommodation information. The way to record the statistics is not only time-consuming and labour-intensive, but also not easy to save due to the characteristics of paper products which are easy to break and occupy a lot of storage space.

The traditional paper-based management model requires precise manual records and repeated proofreading and review checks and regular redoing of data regularization to ensure the completeness and accuracy of the recorded data. A well-developed information management system can list the common options required, and staff can simply make the appropriate selections, eliminating the need for repetitive verbatim records. And people have gradually realized the strength of the database, such as proofreading, rechecking, and data statistics, can be completed by the database, and the related work becomes simple and convenient. The integrity of data is also such that there is no need to worry about disappearing over time, and as for information maintenance, it is also much easier than in the past. The review of documents at each level has also become quite fast and convenient. After the superior has conveyed the task to the subordinate, the staff can simply log in to their system to receive the corresponding task in time, and the work privileges of staff at all levels have been assigned, with dedicated accounts, and there is no need to worry about working beyond the level.

2. Related Works

Some management systems are built and developed based on-campus network, and teachers and students can only enjoy coordination services by using the school network on campus. Some systems have poor real-time data and poor interactive experience when using new students to apply for dormitory, check the progress of repair reports, and recharge campus cards [5]. With the continuous expansion of the coordination business and the increasing demand for teachers and students, the development of coordination management systems using the traditional C/S model can no longer meet the demand [6]. The system administrator can enter the role personnel management page, and the leader can experience apartment management, repair management, warranty data statistics, role personnel management, and applet applications. To solve this problem, the person in charge of the university must introduce advanced information technology for coordination service system development, to ensure that teachers and students can access coordination services in real-time and improve the level of coordination services. Similar coordination management systems in the market include coordination management systems developed based on B/S mode, coordination security systems based on WeChat public number, coordination management systems built based on a public network, etc. However, most of these systems use languages that are not object-oriented programming, poor system expansion and maintenance, and poor user interaction experience [7]. Moreover, they basically adopt a monolithic architecture design, and the whole project is deployed on one server, and the system interface function is divided vaguely, which leads to interface data pollution and extremely low system operation efficiency in the later stage [8]. Hong et al. summarized the traditional classification methods and proposed to divide the fault detection and diagnosis techniques into two categories based on qualitative analysis and quantitative analysis, among which the latter can be subdivided into methods based on analytical models and data-driven methods [9].

The analytical model-based approach is based on the analysis of the process to establish the corresponding mathematical analytical model and then the process status monitoring through the model [10]. However, it is often

difficult for highly complex process systems to build accurate analytical models, which restricts the further development of analytical model-based fault detection methods [11]. Although it is relatively difficult to establish an accurate model for complex systems, the process data generated during system operation also contains a lot of system operation and production information [12]. Most of the logistic information construction adopts responsive design and a simple and flat interface while using high-capacity data storage and high-performance computing equipment. It also adopts distributed architecture to design unit modules and uses a centralized management mode to integrate coordination resources organically. In France and Germany, most of the universities' coordination management adopts social enterprises for centralized management, and there is no independent management organization for efficient coordination, and school affairs do not include coordination management, and coordination management is undertaken by an independent organization. Independent institutions can be fully responsible for school coordination management by themselves; meanwhile, other social enterprises can also participate in the management of coordination affairs by taking shares [13]. For example, the coordination management of French universities is managed independently by the service centres formed by university students, while the coordination of German universities is operated and managed by third-party social enterprises in cooperation with the internal coordination management institutions of universities.

The fault detection and diagnosis technology based on multivariate statistical analysis can monitor the process status in a timely and effective manner and reduce the probability of fault occurrence. The microservice instance will be released. When the access address of a microservice instance changes, it will be automatically updated to the service discovery component, and there is no need to manually modify the interface address of the service provider. And when a system failure occurs, the multivariate statistical analysis method can quickly analyse the cause of failure and help enterprises reduce losses to the greatest extent. The high level of management of coordination utilities in higher education, because its campus information technology started earlier with greater investment, has been able to provide more comprehensive coordination utility services. In addition, the supporting management, software, and hardware facilities of its services are also comprehensive. With the improvement of technology, its coordination utility management has achieved integration with other modules of campus management and is developing towards mobile, personalized customization, and using various intelligent algorithms.

3. Random Matrix Multivariate Statistical Analysis Design

In distributed modelling, the system can be partitioned using process topology or a priori knowledge. However, in the actual production process, most of the process working principles and the intrinsic structure of the equipment are more complex, and the mechanism knowledge is not easy to obtain, so it is difficult to divide the process into conceptually meaningful subblocks based entirely on the process knowledge [14]. To solve the above problems, this section uses the mRMR algorithm to automatically select the most correlated variables and divide them into the same subblock from the perspective of correlation between process variables, so that the complex dynamic correlation between variables is comprehensively portrayed and described, and the redundancy between variables is effectively eliminated. It is worth noting that the conventional PCA model assumes that the observations at a certain moment are not correlated with those at past moments, and the model can be considered a static PCA. However, in practice, it is difficult for variables to maintain temporal smoothness all the time and often show self-correlation or even intercorrelation properties. To address this issue, this section borrows findings from the literature and augments the original data matrix X in the form of the following equation:

$$X_a = \begin{bmatrix} x_{d+1}^T & x_d^T & \cdots & x_1^T \\ x_{d+2}^T & x_{d+1}^T & \cdots & x_1^T \\ \cdots & \cdots & \cdots & \cdots \\ x_m^T & x_{m-1}^T & \cdots & x_{m-d}^T \end{bmatrix}. \tag{1}$$

For a multivariate variable $X = (x_1, x_2, \ldots, x_p)$ when it satisfies the multivariate normal distribution, the probability density function of its normal distribution is expressed as if its overall mean is 0.

$$f(x) = |2\pi \sum|^{-1/2} \exp\left(-\frac{1}{2} X \sum X\right), \tag{2}$$

where $\sum$ denotes the covariance matrix of X. If we set the joint control domain of p element variables as D and take the significant level α in the control process, the relationship between the significant level and the control domain is satisfied as follows:

$$\int_1 \int_2 \cdots \int_p f(x) \mathrm{d}x_1 \mathrm{d}x_2 \cdots \mathrm{d}x_p = \alpha. \tag{3}$$

The normal distribution is symmetric, and the density of its distribution is equal everywhere on the boundary of the control domain D. It is generally believed that the state of the catenary begins to deteriorate after the reliability is less than 0.99. Therefore, when the significant level α is determined, the distribution of the covariance matrix is equal. Therefore, when the significant level α is determined, equation (3) is changed to

$$f(x) = K. \tag{4}$$

It is expressed as an ellipsoid in the p-dimensional space. The joint control domain of multivariate quality characteristics is always an ellipsoid or a hyperellipsoid, taking the binary control chart as an example, whose control domain is an ellipse, while if only the control domain of one element is used as the evaluation criterion, it will lead to an overrun; see Figure 1.

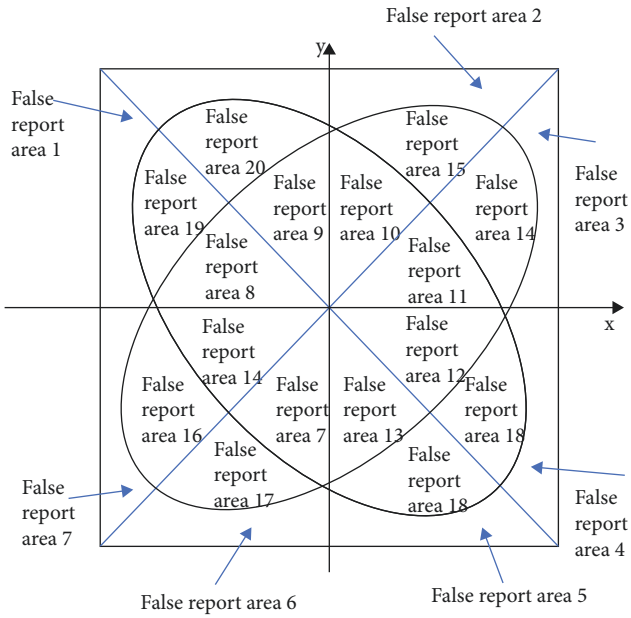


FIGURE 1: Comparison of the control domain of two one-dimensional control and binary control diagrams.

Since multivariate process control cannot be replaced by univariate control separately, the analysis process of univariate process control needs to be extended to multivariate [15]. The probability of the catenary in the excellent state is significantly lower than the probability of being in the good state and the state. In actual operation, when the reliability of the catenary reaches 0.85 or less, it is considered that there have been obvious abnormalities in the contact network. The means and variances of the one-dimensional normal distribution are independent of each other, and different control charts are used to analyse the means and covariances. When extended to multivariate, the mean vectors and covariance matrices of each multivariate variable are still independent of each other, so the mean and covariance need to be analysed and controlled accordingly in the multivariate analysis process as well. The analysis of problems that consider multiple variables of interest is collectively referred to as multivariate statistical analysis.

In the process of multivariate statistical analysis, it is necessary to determine whether the data meet the multivariate normal distribution, and the probability value pi of a parameter is obtained according to the significance test method. If the data show a nonnormal variation pattern, the data need to be normalized to transform the nonnormal data into normal data, usually using the Box-Cox transformation, whose transformation formula is expressed as

$$L^f = \begin{cases} \dfrac{L^f + 1}{f}, & f \neq 1, \\ \ln L, & f = 1, \end{cases} \tag{5}$$

where L denotes the array satisfying the nonnormal distribution, f denotes the variable parameter, and different values of f cause different transformation methods. $f = 1$ means that the inverse change is used at this time, and $f = 1$ means that the square root transformation is used. f is usually determined by the maximum likelihood estimation method. After the transformation according to equation (5), the data are then subjected to multivariate statistical analysis.

Changes in contact network detection parameters and correlations between them cause changes in the state of the contact network, while each parameter fluctuates around its standard value. Due to the unavoidable human factors in the process of contact network laying, factors such as the vibration of the contact network caused by bow network contact during the operation of the contact network can cause deviations in the standard values of the contact network, but these external factors do not affect the original change pattern of the contact network testing parameters and can be ignored and regarded as random factors [16]. During the operation of the contact network, each test parameter of the contact network changes around its corresponding standard value, so the whole should fluctuate around a certain range, and once the range value is exceeded, it means that there is abnormal data in the test parameters or the correlation between parameters has changed. The control chart approach is based on this principle. For this purpose, control charts are drawn to reflect the changes in the state of the contact network and to determine the changes in the contact network detection parameters according to the definition of the control charts.

The traditional T2 and SPE statistics are idealized statistical indicators proposed under the assumption that the variables obey Gaussian distribution. However, process data in industrial production usually have nonlinear and multimodal characteristics, so the detection methods based on T2 and SPE statistics usually have low fault detection rates for industrial data. Both labelled samples and unlabelled samples are used to train the model. The traditional T2 statistic requires the assumption that process variables are independent of each other, while there is usually a strong correlation between industrial data variables. The 2LPT statistic used in this chapter replaces the sample statistical analysis by the difference information between the sample and its predicted sample, which eliminates the influence of nonlinear and multimodal characteristics of the sample data on the calculation of the martingale distance; at the same time, the covariance matrix, which better reflects the intrinsic relationship of variables, is used instead of the diagonal matrix of eigenvalues to improve the fault detection rate; the anomalous influence of outliers is eliminated by the LP-PCA algorithm. The LP-PCA algorithm eliminates the anomalous effects of outliers, making it easier to distinguish faults from normal samples in PPCS.

Once a fault is detected, subsequent fault diagnosis and localization of the fault variable are required, which will provide an important basis and reference for determining the root cause of the fault. The main idea of the conventional contribution-based graph approach is to interrelate each variable in the original measurement space with a representation of the magnitude of that variable's contribution to the detected fault, determine the magnitude of each variable's influence on the current fault, and further infer the

major causal factors of the fault. However, due to the correlation between the diagnostic indices defined in the fault map, the implementation is prone to trailing problems and therefore can lead to incorrect diagnostic results, as shown in Figure 2.

From the image analysis of the logistic regression function, it can be seen that the relationship between the independent variable and the predicted probability has an S-shaped curve with an overall positive correlation; that is, the probability of the dependent variable increases with the increasing value of the independent variable, but in each value interval, the trend of the dependent variable changes differently; the variable is relatively flat at the beginning, increases sharply in the middle, and tends to be flat again at the end, because it is predicting the occurrence of a certain event [17]. As the probability of an event is predicted, the value is always between [0, 1].

$$1 + P_i = 1 + \frac{e^{g(x)}}{1 - e^{g(x)}}. \tag{6}$$

If the general linear regression is used to predict the probability of an event, it is found that the prediction range of the dependent variable is the whole set of real numbers R. In real life, there are many dichotomous problems, such as determining whether an e-mail is a spam, whether a film will win an award, and whether a user will lose, which are all dichotomous prediction problems, and its output can only be some discrete specific values. If the model of linear regression is directly applied to the model of logistic regression, it will cause a mismatch between the two sides of the equation, the range of the dependent variable is [0, 1], and a probability distribution can be obtained regardless of the combination of independent variables. The model of logistic regression is nonlinear, but it is essentially a linear regression model. Leaders review the project new construction and renovation events through the project budget management and project data management provided by the hydropower project management category. If the logistic function is removed, the other steps are the same as those of linear regression, so it is said that logistic regression is supported by the theory of linear regression. In the general curve regression, the variables are often integrated and transformed to make the curve linearized and simplified, and then the linear equation is used to fit.

The essence of logistic regression is to divide the probability of an event occurring by the probability of the event not occurring and then take the logarithm. This simple variable not only expands the range of values of the independent variable but also solves the curve relationship between the independent variable and the dependent variable; to be precise, this transformation often makes the linear relationship between the independent variable and the dependent variable. In other words, the problem that the output of the dependent variable is discrete is solved in essence.

Matrix estimation also starts from a probabilistic point of view; the equations are listed by first-order moments, second-order moments, etc., to inversely solve for their parameters. The most commonly used methods are the least squares method and the maximum likelihood estimation method. Since the least squares method cannot achieve unbiased estimation of parameters, the maximum likelihood method is used in this paper.

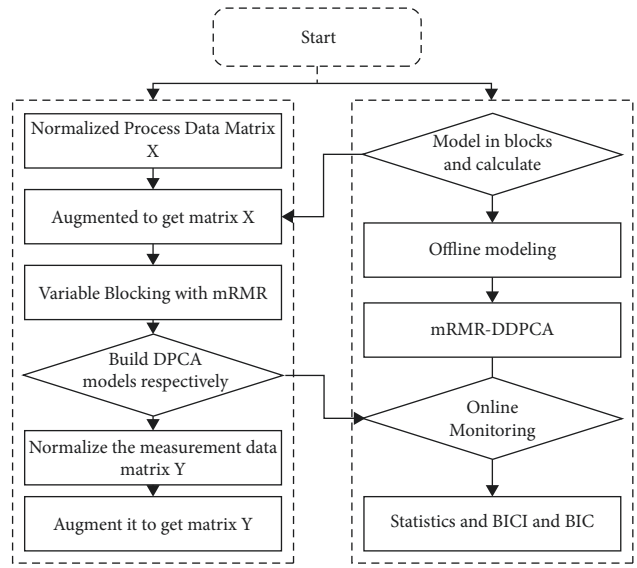


Figure 2: Flowchart of the mRMR-DDPCA algorithm.

4. Design of Coordination Utility Management and Online Repair Platform for Universities

This logistic service platform is designed to provide convenient and efficient logistic services for school staff and students. After experiencing the school coordination service system and investigating students' satisfaction, we found that students are less satisfied with dormitory applications, dormitory maintenance, and campus card payment management. The digital construction of logistic services is backward and the workflow is complicated and inefficient. Universities urgently use advanced information technology to reform and innovate to improve the efficiency of logistic service to serve the staff and students better.

The workflow of logistic service is very complicated and the business involves a wide range. Among them, daily dormitory maintenance, public maintenance, and campus payment services are far from meeting the needs of teachers and students [18]. The management work becomes extremely hectic at the two stages of new students' entrance and graduates' departure every year. In the traditional way of purely manual service, not only is the efficiency extremely low, but also it easily leads to the waste of paper, loss of student information, and errors in data statistics, which affects the smooth operation of other departments.

The business functions within the coordination area are not information, the coordination resources are not open, not shared, and not better utilized, and the coordination information forms silos. The information of teachers and students is not connected with coordination data, and it is not possible to establish a big data model, and the needs of

teachers and students cannot be more effectively explored, which eventually leads to the limitation of the scope of coordination services. Use the collected data set to train the logistic regression model, and design the training plan of the model, using the logistic regression mathematical model and related algorithms to decide whether to purchase maintenance equipment and the quantity at this stage.

To maximize the service level and efficiency of school coordination management and meet the actual needs of all teachers and students in the university, we conducted an in-depth study on the school coordination service centre. We have conducted in-depth research on the school coordination service centre and discussed it extensively with the information platform staff, maintenance workers, divisional leaders, faculty members, and students. We developed a microservice-based coordination service platform, which contains a website management system and a WeChat applet side [19]. To reduce the coupling between modules and improve the system scalability and maintainability, the platform is developed and designed in terms of business functions, these functional modules are designed as individual remote services, and each service uses HTTP protocol to communicate with each other. This design makes the coordination service platform highly cohesive and low-coupled, and it is easy to expand for new services.

This university logistic service system is designed in two parts. One part is the website and the other part is the WeChat applet side, involving many roles, and the personnel role responsible module is shown in Figure 3.

The design of the Web service management platform mainly involves information platform personnel, maintenance personnel, dormitory administrators, leaders, and system administrators. Highly integrated production systems and complex production processes also bring serious challenges to ecological protection, energy consumption, and production safety. Among them, the information platform personnel can log into the management background to check the repair data statistics and enter the repair management to add repair orders and dispatch orders, and the maintenance workers can log into the system to enter the repair management to receive orders and complete work orders, the dormitory administrators have the authority to enter the apartment management page to edit student accommodation information and other operations, the system administrators can enter the role personnel management page, and the leaders can experience apartment management, repair management, warranty data statistics, role personnel management, and applet application.

The main purpose of the design and development of this university management system is to integrate coordination resources and informative coordination management, improve the efficiency and level of coordination work, and better serve the whole university teachers and students [20]. The scientificity, standardization, operability, and practicality of coordination management work are considered comprehensively to avoid the situation of disconnection between technical development and usage requirements.

The coordination management system of the university involves a lot of personal private information, such as staff information, student information, and so on. If personal information data is stolen, it will bring irreparable loss to staff and students, so security is the top priority during system operation. The system platform server equipment and database equipment are provided by internationally renowned companies, and the private user information is stored in the school LAN. In terms of reliability, the distributed design and distributed deployment in the cloud reduce the load rate of the server and adopt a service degradation strategy to ensure uninterrupted operation of the system, as shown in Figure 4.

When the microservice is running on the server, the access URL and other related configuration information set in the configuration file will be registered to the service discovery component, and this information will be permanently stored in the service discovery component. When a service consumer needs to invoke the relevant microservice, it needs to query the URL access interface of the relevant service provider from the service discovery component [21]. At the same time, the more complex the production system, the higher the probability of failure during the production process. The microservice instance will periodically send a heartbeat to the service discovery component to activate itself, and when the service discovery component does not receive the heartbeat within a certain period, the microservice instance will be released. When the access address of a microservice instance changes, it is automatically updated to the service discovery component, and there is no need to manually modify the service provider's interface address.

5. Results and Analysis

5.1. Random Matrix Multivariate Statistical Analysis Results. The reliability of the load-bearing cable is higher compared to the reliability of other components, the reliability of the insulator changes faster with time, and the reliability of the contact wire and load-bearing cable is closer and more stable, while the compensation device and the electric link are affected by the contact wire and load-bearing cable during the operation of the contact network, so their reliability decreases significantly faster than that of the contact wire and load-bearing cable. In summary, the operational reliability of each part is consistent with the actual operation, so the Weibull two-parameter method is used to calculate the reliability of the contact network. The scale parameters and shape parameters of each part are calculated using the above reliability functions satisfied by each part of the contact network.

Since the limits of reliability in different states are different, the time of different states is calculated by the reliability function based on the size of reliability determined by equation (5) and the actual operation law, and the state probability is defined as the ratio of the time in the state to the operation time, and the size of reliability and its corresponding time and state probability are shown in Figure 5.

The probability that the contact network is in a good state is significantly lower than the probability that it is in a good state and a medium state. The control line of the

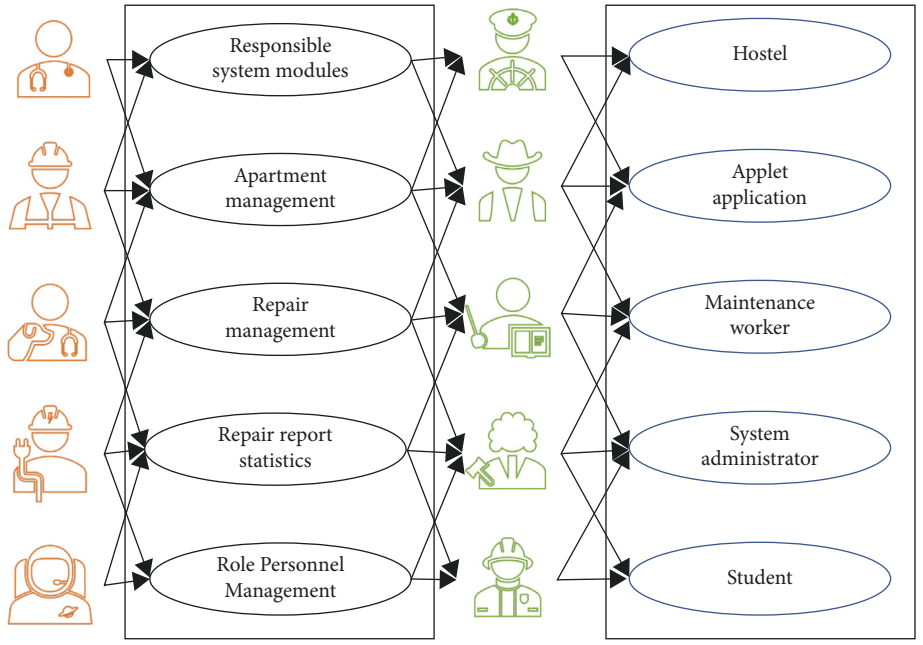


Figure 3: Personnel role responsible module diagram.

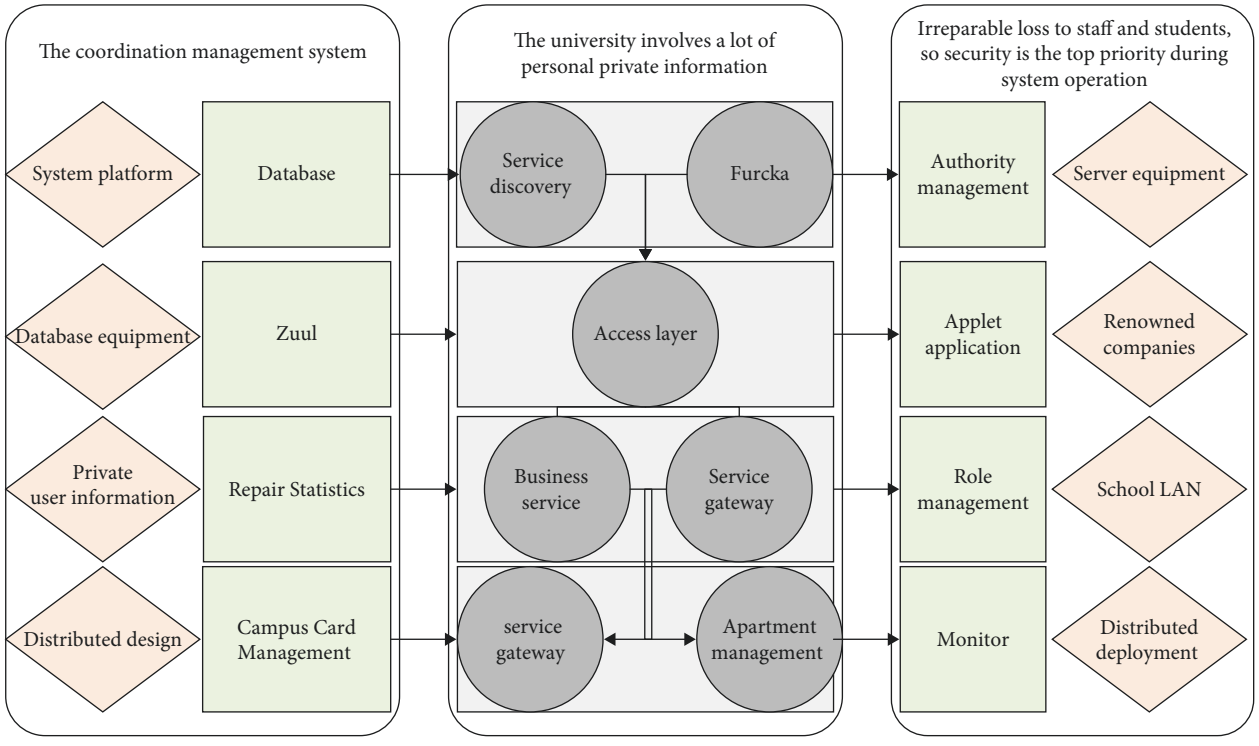


Figure 4: System application architecture.

one-dimensional control chart is mainly determined by the confidence level. The traditional method that relies on manual analysis and early warning of faults is relatively inefficient and easily affected by subjective factors, which has made it difficult to meet the needs of modern industrial production. If the control chart develops from one-dimensional to multidimensional, the control lines of different control charts are different because the data laws satisfied by each hitting value in the multidimensional control chart are different, but the calculation of these control lines cannot be separated from the calculation of the probability values, according to which the principle of statistical control of contact network state parameters can be made.

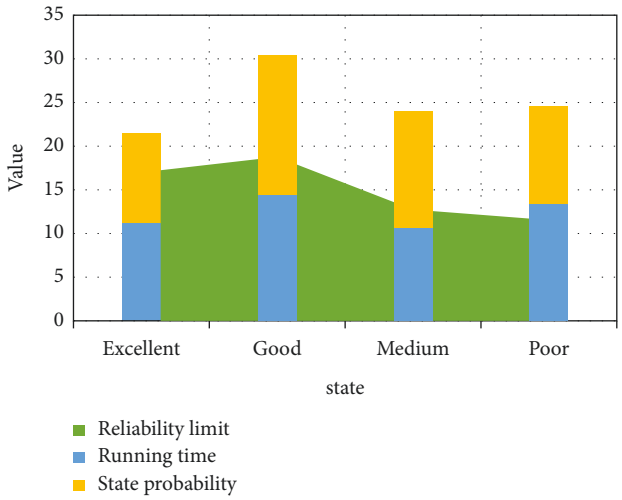


Figure 5: State distribution of contact network.

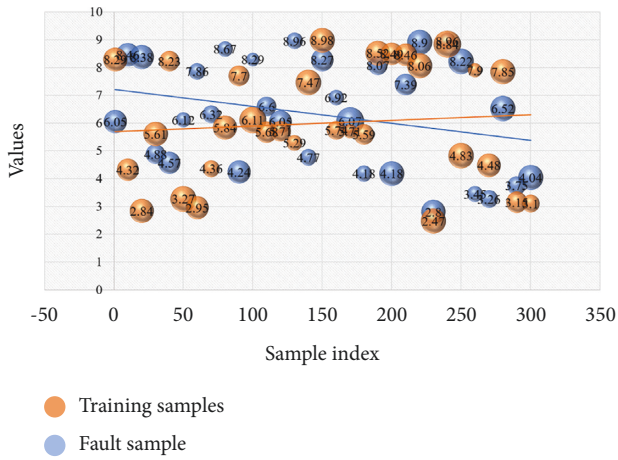


Figure 6: Statistical analysis results.

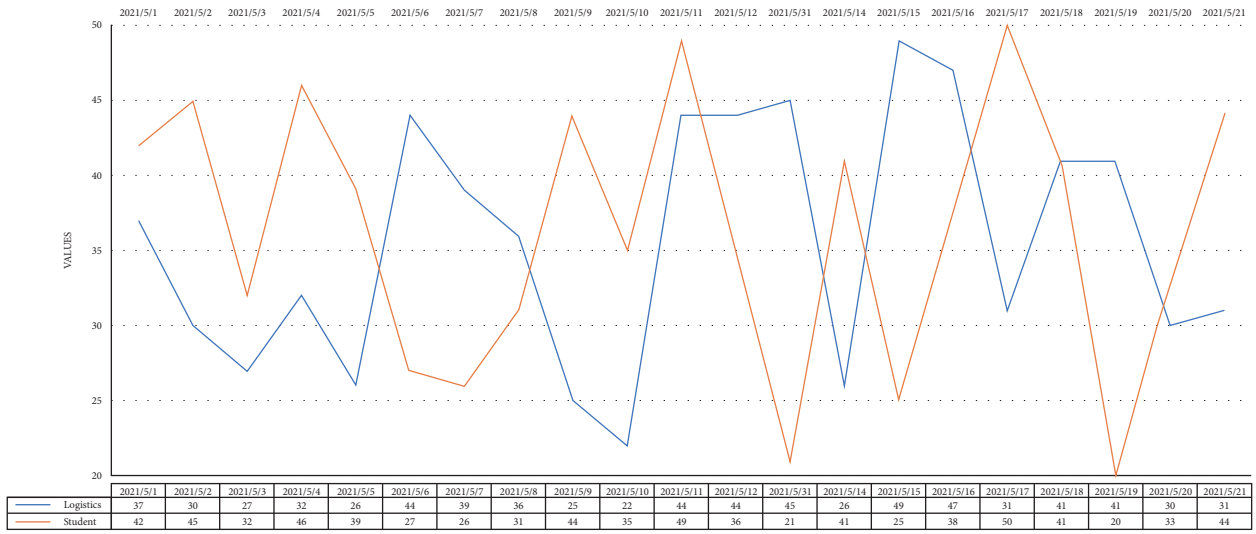
Based on the advantage that NPE dimensionality reduction can retain the data intrinsic structure information, the NPE method is successfully applied to the field of fault detection. However, the NPE method fails to detect process faults with nonlinear characteristics because the T2 statistic requires the data to obey a multivariate Gaussian distribution when detecting process data with nonlinear characteristics.

However, in the reduced dimensional data, the fault data and normal data are merged into one, which makes it impossible to distinguish the fault data effectively. At the same time, there is a large difference between the statistics in fault detection, so for the numerical example in this section, the low fault detection rate of PCA is predictable. It has played a role in promoting the stability and harmony of the school and promoted the socialization reform of coordination management in colleges and universities. Figure 6 shows the scatter plot of the NPE dimensional reduction space, which shows that the nonlinear features and local structural information of the original data are preserved after the data are dimensionally reduced, and there is a significant difference between the faulty data and the normal data. Compared with PCA, the dimensionality reduction result of the NPE method is more favourable for fault detection, but the traditional T2 statistics cannot be effectively monitored for such data.

Figure 6 is used as an example to illustrate the effect of unlabelled samples on fault classification results. As can be seen from the left part of Figure 6, when only labelled fault samples are used for modelling, it is difficult or even impossible to classify them correctly for new test samples (indicated by blue stars) because the small number of labelled samples provides very limited discriminative information, which easily leads to inaccurate classification results or overfitting problems. In contrast, on the right side of Figure 6, since both labelled and unlabelled samples are used to train the model, both the fault discriminative information from the labelled samples and the intrinsic geometric structure from the whole dataset can be retained. When a new sample is imported, the trained model can classify it into the correct category because the model incorporates the additional unlabelled sample information to avoid overfitting problems while building a more accurate and comprehensive discriminant analysis model.

The state of each testing group of the contact network in this testing section is excellent, and only the last testing group is in the state of good, which indicates that, under the condition of assuming the same degree of mutual influence among the testing parameters of the contact network, the overall changing state of the contact network is not obvious, and the state of each testing group of the contact network shows the state of excellent. On the contrary, it can allow schools to concentrate on doing a good job in education and realize the rapid and high-quality development of the education industry in colleges and universities. Compared with Figure 6, there are abnormalities in the contact network detection data, and the $\chi 2$ control chart does not accurately find the abnormal data and states, which is not consistent with the actual. This is because there must be different degrees of influence among the testing parameters of the contact network in practice. Under the assumption of the same degree of correlation among the parameters, the use of the $\chi 2$ control chart to evaluate the state will lead to the optimization of the contact network state, and the evaluation process is not strict. The interrelationships between the parameters in the actual operation are not easily measured and obtained, and the mean value of the covariance of the test data is usually used as an estimate of the covariance between the actual data.

5.2. Analysis of the Performance Results of the University Coordination Utility Management and Online Repair Reporting Platform. The statistical analysis module of repair data is to analyse the repair data in multiple dimensions, such as time dimension, repair area dimension, repair type dimension, and repair worker dimension. The whole system is divided into two parts: the first part is the WeChat applet side, which is for all students and teachers, and the second part is the backend management side, which is for



	2021/5/1	2021/5/2	2021/5/3	2021/5/4	2021/5/5	2021/5/6	2021/5/7	2021/5/8	2021/5/9	2021/5/10	2021/5/11	2021/5/12	2021/5/31	2021/5/14	2021/5/15	2021/5/16	2021/5/17	2021/5/18	2021/5/19	2021/5/20	2021/5/21
Logistics	37	30	27	32	26	44	39	36	25	22	44	44	45	26	49	47	31	41	41	30	31
Student	42	45	32	46	39	27	26	31	44	35	49	36	21	41	25	38	50	41	20	33	44

Figure 7: System platform loading performance test data.

coordination-related personnel. This chapter mainly introduces the functional testing and performance testing of the applet side, the testing of each functional module of the website, and the testing of the restful interface based on the swagger-UI interface, as shown in Figure 7.

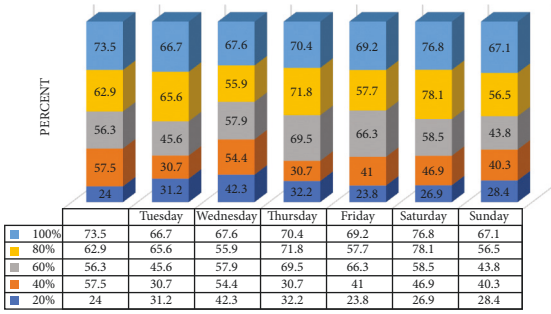
The main purpose of the basic information management package is to manage all kinds of basic information in the hydropower centre, by ordinary employees, information managers, leaders, and other roles; it mainly includes hydropower information management, departmental information management, personnel information management, and another three subpackages. Therefore, in the process of multivariate analysis, it is also necessary to analyse and control the mean and covariance accordingly. Among them, utility information management includes collecting all kinds of utility information, auditing utility information, and uploading utility information subpackage; department information management includes collecting department information, auditing department information, and uploading department information subpackage; personnel information management includes collecting external staff information files, auditing external staff information, and updating staff information subpackage.

The main purpose of the daily inspection management package is to carry out daily inspections of the school's utilities to ensure that no accidents occur and that the utilities operate normally, with the participation of ordinary employees, equipment inspectors, leaders, and other roles; it mainly includes 2 subpackages such as inspection time setting and inspection content recording. Among them, inspection time setting includes 3 subpackages of arranging staff on duty, arranging message feedback, and inspection time selection; inspection content recording includes inspection content selection, water and electricity information statistics, and equipment hygiene cleaning subpackages.

The main purpose of the repair management package is to ensure the safety of water and electricity equipment after the user raises problems about water and electricity facilities to the staff and the leader arranges the maintenance staff to carry out maintenance on-site construction, with the participation of ordinary users, equipment inspectors, leaders, maintenance staff, and other roles; it mainly includes 2 subpackages such as repair application management and maintenance record management. Among them, repair application management includes 4 subpackages of repair application, verification of equipment problems, problem classification and processing, and review of repair applications; repair record management includes 4 subpackages of assignment of repair application forms, receipt of repair materials, repair registration, and repair feedback.

The main purpose of the water and electricity project management package is to check the existing water and electricity facilities in the school coordination water list management centre after the need to renovate the old project or construct new projects, by ordinary employees, equipment inspectors, leaders, and other roles to participate; it mainly includes engineering budget management, engineering information management, and another 2 subpackages. Among them, project budget management includes finding water supply and power supply equipment, new/remodelled water, and power projects and calculating project cost subpackages; project data management includes 3 subpackages of auditing the project budget, making a renovation/new construction plan, and project plan notification, as shown in Figure 8.

Charge management in the charge clerk through the charge management control class provides the utility charge management class to carry out the collection of utilities, maintenance charge information, and other issues. Once the value exceeds the range, it means that there is abnormal data in the detection parameters or the correlation between the parameters has changed. Therefore, utility charge management relies on utility charge and bill payment information, and report query management relies on report information entity class; leaders and bill collectors can collect maintenance charges from users through maintenance charge management



		Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
100%	73.5	66.7	67.6	70.4	69.2	76.8	67.1
80%	62.9	65.6	55.9	71.8	57.7	78.1	56.5
60%	56.3	45.6	57.9	69.5	66.3	58.5	43.8
40%	57.5	30.7	54.4	30.7	41	46.9	40.3
20%	24	31.2	42.3	32.2	23.8	26.9	28.4

Figure 8: Overall analysis function page.

class, so maintenance charge management relies on maintenance charge information and bill payment information.

Ordinary users through the repair application management fill in the relevant utility equipment repair application. Equipment inspectors through the repair management class provide repair application management to check whether the utility equipment needs to be repaired. Therefore, maintenance record management relies on the maintenance record information entity class. General employees collect utility project budget information through the project budget management provided by the utility project management class. Equipment inspector through the utility project management class provide the project budget management to check whether the utility equipment is new or improve the project. Leaders review new construction and renovation events through the engineering budget management and engineering information management provided by the hydropower engineering management class. Therefore, engineering information management relies on the hydropower engineering information entity class. The method of using control chart is based on this principle.

6. Conclusion

This thesis has discussed the research background and significance of the subject in-depth and analysed the current situation of the university coordination department, through research and thinking about the problems of the existing traditional model of university coordination management system, to confirm the necessity and feasibility of the subject research, and put forward a new information management method and put it into practice. By interviewing and consulting with the relevant staff of the university's coordination utility maintenance department, we carefully created a flowchart, discussed the requirement analysis, got the approval of the coordination staff and teachers, planned the basic system structure framework, and determined the objectives of the system development and the actual contents be developed. In the coordination utility management system, the knowledge of logistic regression was used to predict the quantity and time of purchasing maintenance equipment, making the system more intelligent and efficient. The business functions of this system are studied in-depth and the problem domain of the system is clarified. Among them, the roles are divided into leaders, equipment inspectors, general employees, bill collectors, general users, maintenance personnel and system administrators, etc. The other steps are basically the same as those of linear regression, so logistic regression is theoretically supported by linear regression. In the general curve regression, the variables are often integrated and transformed to make the curve linear, simplify it easily, and then use the linear equation to fit. While the system functions are divided into modules such as daily inspection management, repair management, utility project management, and complaint management, the data requirements of this system are analysed, including thumbnail sketches for basic information management, daily inspection, entity class analysis, and data table design.

Data Availability

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

Conflicts of Interest

The author declare that there are no conflicts of interest or personal relationships that could have appeared to influence the work reported in this paper.

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