Research Article

Design and Realization of Computer Network Virtual Experiment Economic Teaching Platform Based on Mathematical Image and Signal Processing

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The emergence of computer network virtual experiment teaching provides the possibility to solve the limitations of hardware equipment and time for cultivating computer talents in colleges and universities. Although the network virtual experiment teaching platform can provide learners with an autonomous learning environment, the design of these modules still has problems such as weak integration with the teaching management system, immature functions, and high cost. In order to make the computer network virtual experiment economic teaching platform better integrate with the teaching management system, reduce the cost of investment and provide a better system environment for the development of functions; this research will design the virtual teaching platform through the method of mathematical image and signal processing. By analyzing the functional requirements of the users of the teaching platform, the overall design of the system is determined, and the designed system is specifically implemented and designed for performance testing and functional testing. The functional test results are combined with expectations. The average response time of the system in the performance test results is 0.30 s, which is in line with the expected results. The experiments show that the system designed and developed in this study works well.

1. Introduction

Today's society is already in the Internet era. Driven by the social environment, the demand for computer talents in all walks of life has surged. Coupled with the continuous maturity of Internet technology, the required computer technicians pay more attention to their professional level. This requires that computer technicians not only need to master a wealth of theoretical knowledge but also need to control the operation of the computer, including the configuration management of software and hardware and other practical content. Traditional classroom teaching methods have been difficult to meet the requirements for computer talents, so it is particularly important to design a method and platform for students to practice teaching. The computer network virtual experiment economic teaching platform is a computer teaching system that simulates real experiments and is developed to meet this training goal. This system can

realize students' practical operation learning. Students can learn independently, and teachers can design personalized teaching plans according to the results of students' independent learning. This learning method not only solves the problem of limited network hardware equipment but also provides students with a learning environment with higher knowledge mastery efficiency. At the same time, because students' learning processes and results are more transparent in this way, it will be easier for teachers to manage and provide targeted guidance to students. The design and research of the computer network virtual experiment teaching platform on one hand, increases the theoretical research on the computer network virtual experiment economic teaching platform. On the other hand, it can provide a reference for teachers' choice of practical teaching methods, which has certain theoretical significance. Meanwhile, designing different teaching methods from traditional practice teaching has certain practical

significance for optimizing the teaching process to maximize the efficiency of computer practice teaching.

The computer network virtual experiment teaching platform integrates the advantages of network teaching, which can effectively improve the problem of a lack of teaching resources, attracting many scholars to conduct related research on it. Han et al. believed that the network virtual experiment teaching has a very broad application prospect and is the key development direction of the development of computer science and other disciplines [1]. Yubao et al. analyzed some problems existing in the current experimental and practical teaching environment and studied the simulation application of network virtual experimental teaching in computer practical teaching [2]. Shimba et al. designed a controlled experiment. He also compared and analyzed the teaching effect of computer practice teaching using the hands-on laboratory method and the network virtual experiment teaching platform [3]. Tao et al. used the network virtual experiment teaching platform to conduct teaching experiments on industrial computer network and communication courses. The results showed that using this teaching method can make students understand the characteristics of the subject knowledge more intuitively and clearly [4]. Judging from the existing research results, most of the current research on the computer network virtual experiment teaching platform is based on the virtual experiment teaching platform to evaluate the teaching effect, but there is a little research on the secondary development of the computer network virtual teaching platform. However, the changes in social needs are changing with each passing day. How to improve the experimental teaching efficiency of the virtual teaching platform and how to save the economic cost and energy investment are issues that need to be considered at present.

The effective application of mathematical image and signal processing can better realize the operation of system functions, and many scholars at home and abroad have carried out related research on it. Rahami et al. constructed a seismic impact monitoring technology for building structures based on signal processing [5]. Pang et al. conducted related research on the safe operation of power grids using signal processing methods [6]. Baibai et al. performed 3D recognition of structured light projected on the surface of an object based on a signal processing method [7]. Thongkor et al. studied watermark recognition methods in digital images [8]. Xiong et al. used mathematical morphology for the study of binarization of mathematical images [9]. Das et al. have conducted research on vehicle imaging technology for assisted driving based on mathematical images [10]. It can be seen that the research scope of mathematical image and signal processing is relatively wide, which also shows the feasibility of these two methods in the research of system function.

In order to make the virtual teaching platform more economical and practical, these research designs and implementations on a computer network virtual experiment economic teaching platform by combining mathematical images and signal processing methods was done. The results show that the computer network virtual experiment economic teaching platform designed in this research has a good performance in the performance test. The image is processed and signal processing is added to provide a new teaching platform design scheme. In the design process of the platform, not only the performance of the platform is considered but also the construction cost of the platform cost is controlled. This is the innovation of this paper.

2. Mathematical Image and Signal Processing Methods

2.1. Signal Processing Method. The processing of signals refers to the process of obtaining useful information from the signals recorded in the system, including the conversion and analysis of the signal [11, 12]. Signal processing includes many theoretical and technical disciplines, which provide theoretical knowledge and technical support, respectively, as shown in Figure 1.

As shown in Figure 1, the theoretical disciplines of signal processing are mainly concentrated in the field of mathematics, including the equation theory, the function theory, and the stochastic process theory. The disciplines supporting its technological development are mainly concentrated in computer technology and circuit analysis, and there are also many related fields, such as artificial intelligence and multimedia information. It can also be seen that signal processing not only has a rich theoretical background in mathematics and science but also has broad application prospects in many practical disciplines.

The basic process of signal capture processing is shown in Figure 2.

As shown in Figure 2, in the process of signal capture processing, the extraction of the signal first goes through the execution of the main control flow. When an instruction in the execution process of the main control fails to be interrupted as originally planned for some reason, the system will enter the kernel at this time to handle the abnormal behavior that occurs. At this time, the signals that can be transmitted in the current process are processed and enter into the user mode. After entering the user mode, operations are performed according to the signal processing function. When the execution of the signal processing function ends and returns, it enters the kernel again through the system call and continues to return to the user mode to continue the operation from the interrupted flow step. It continues with the process from the previous step and loops.

In the process of capturing the signal, the judgment of the signal needs to consider the interference factor [13]. Assuming that the signal amplitude is f_1, the signal can be expressed as formula (1):

$$A(a) = f_1 B(a) + G(a). \tag{1}$$

In formula (1), $B(a)$ represents the waveform of the signal and $G(a)$ represents white Gaussian noise with zero mean. Adding the unilateral spectral density m, the interference correlation function is obtained as in the following formula:
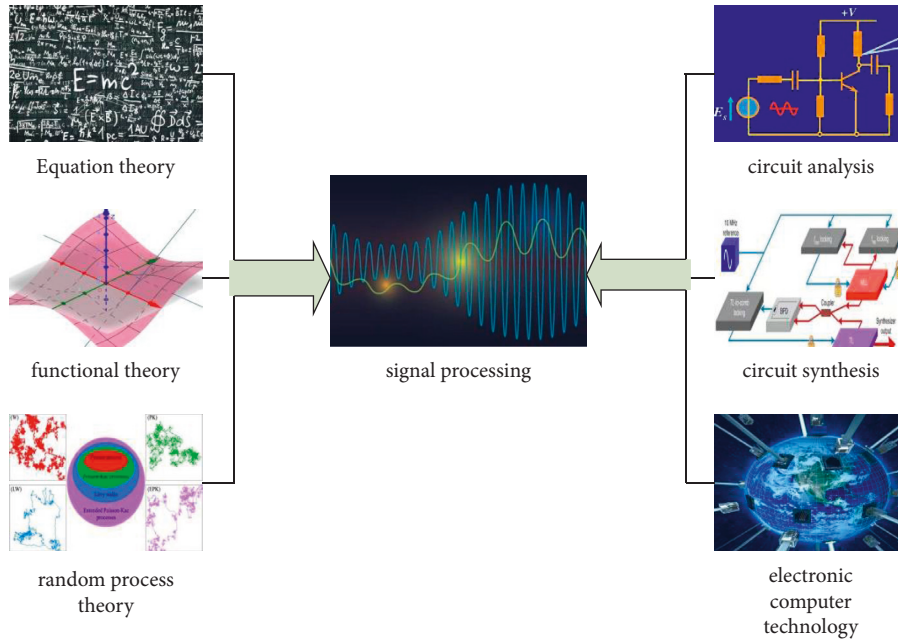
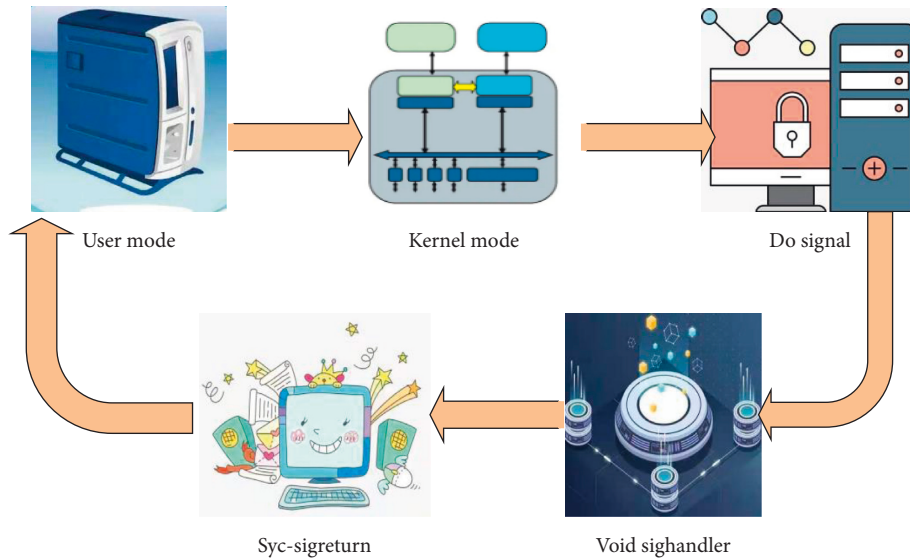Figure 1: Signal processing mathematical theory and technical pillars.

Figure 2: Signal capture process.

$$C(\varepsilon) = D[G^*(a - \varepsilon)G(a)]. \tag{2}$$

In the process of signal transmission, the signal receiver will have two outputs. One is the output of the signal, and the other is the output of the interference [14]. Assuming $e(\varepsilon)$ is the impulse response of the signal receiver, the resulting final output can be obtained according to the two output categories.

$$H(a) = f_1 \int_{-\infty}^{\infty} e(\varepsilon)B(a - \varepsilon)d\varepsilon + \int_{-\infty}^{\infty} e(\varepsilon)G(a - \varepsilon)d\varepsilon. \tag{3}$$

The front part of formula (3) represents the output of the signal, and the latter part represents the output of the interference.

Different signal receivers will have different ratios of signal and interference output. The criterion for evaluating whether a receiver is the most suitable for signal reception is the ratio of the signal output peak power to the interference output average power [15]. Assuming this ratio is Q, the mathematical expression for Q is as in the following formula:

$$Q = \frac{\left| f_1 \cdot \int_{-\infty}^{\infty} e(\varepsilon)B(a_0 - \varepsilon)d\varepsilon \right|^2}{2m \int_{-\infty}^{\infty} |e(\varepsilon)|^2 d\varepsilon}. \tag{4}$$

In formula (4), a_0 represents the real time when the signal output reaches the peak value.

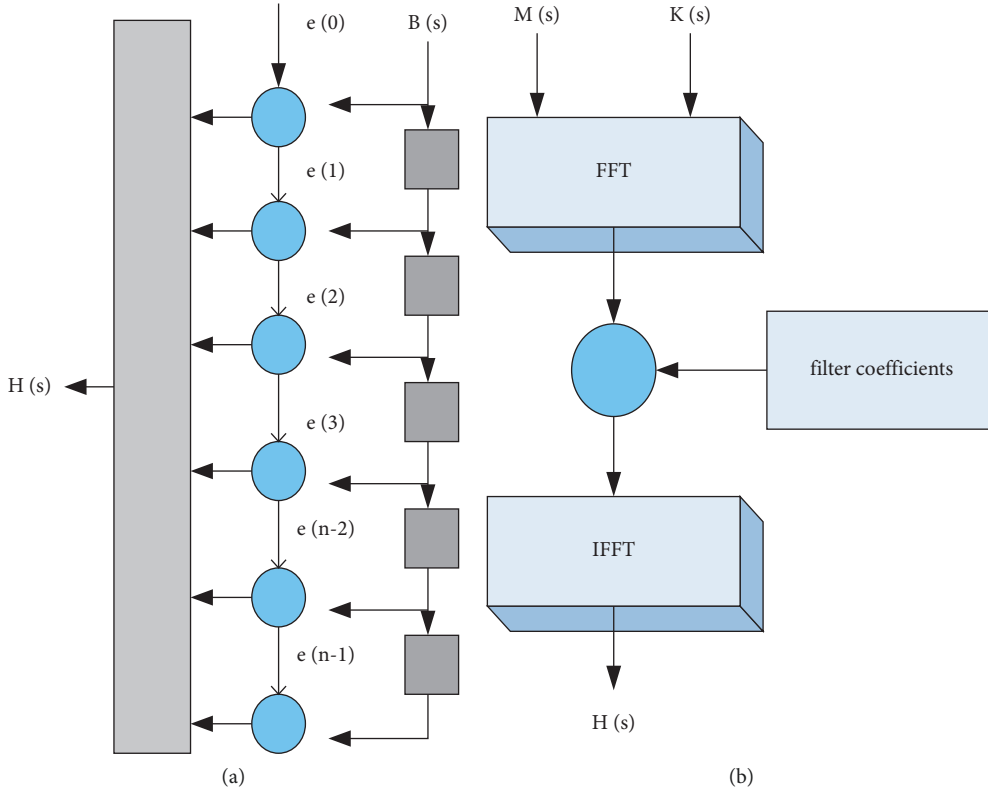When $e(\varepsilon)$ satisfies the following formula:

FIGURE 3: Schematic diagram of processing in time and frequency domains (a) Processing principle in the time domain (b) Processing principle in the frequency domain.

$$e(\varepsilon) = \delta B^*(a_0 - \varepsilon). \tag{5}$$

In formula (5), δ represents an arbitrary constant that is not zero.

then Q has a maximum value as in the following formula:

$$Q_M = \frac{f_1^2}{2m} \cdot \int_{-\infty}^{\infty} \left| B(a_0 - \varepsilon)^2 \right| d\varepsilon. \tag{6}$$

Formula (6) represents the maximum value that Q can obtain. That is to say, when $e(\varepsilon)$ in a certain signal receiver satisfies the formula (5), the receiver is the most suitable, which is called a matched filter.

In the process of signal processing, when using the filter to process the signal, there are two selection methods [16]. The principles of the two methods are shown in Figure 3.

As shown in Figure 3, the time domain is directly processed by the filter. In the frequency domain, the signal is transformed by the fast Fourier transform (FFT), combined with the frequency domain filter, and finally converted to the time domain by the IFFT [17].

The output obtained by the time domain method is as shown in the following formula:

$$H(s) = \sum_{r=0}^{n-1} B(r)B^*(r-n) + \sum_{r=0}^{n-1} G(r)B^*(r-n). \tag{7}$$

The output formula of the frequency domain method is as in the following formula:

$$H(s) = \text{IFFT}\{\text{FFT}[A(s)] \cdot \omega\}. \tag{8}$$

In formula (8), ω represents the frequency domain matched filter coefficient, and the expression is as in the following formula:

$$\omega = \text{FFT}[e(s)]. \tag{9}$$

The FFT algorithm is actually a fast and efficient calculation method for the discrete Fourier transform (DFT). Its calculation principle is to decompose the operation of the DFT and reorganize or merge the small DFT sequences that meet the conditions through the characteristics of period and symmetry to improve the operation method. The computation time can be greatly reduced [18].

Combined with the characteristics and cost considerations of the teaching platform design of this research, this research will use the frequency domain method for signal processing.

2.2. Image Processing Methods

2.2.1. Binarization of Images.
In the computer network virtual experiment economic teaching platform, the students' practical results need to be checked, and the images need to be recognized and processed. That is, the content in the image needs to be extracted and converted into

characters that can be recognized by the computer, so the binarization of the image is introduced.

In principle, the image binarization process divides the foreground and background pixels through a constant threshold, and marks the content in the image as black and white, respectively, according to the characters and background [19]. Assuming that $g(i, j)$ represents the pixel value of a pixel, the binarization process is as in the following formula:

$$g(i, j) = \begin{cases} \text{foreground}, & g(i, j) > \lambda, \\ \text{background}, & g(i, j) \leq \lambda. \end{cases} \quad (10)$$

In formula (10), λ represents the set fixed threshold.

Commonly used image binarization methods can be divided into three types: global threshold, local threshold, and nonfixed threshold according to their processing principles [20].

The global threshold method mainly uses a uniform and fixed threshold to process all the pixels in the image. This method is convenient and fast, and its calculation is relatively simple [21, 22]. It is suitable for images with a large difference between the foreground and the background. Assuming that the original gray level of the pixel value of the image is T, that x represents the pixel value, and that N represents the total number of pixel values, the image is normalized as formulas (11) and (12):

$$\sigma_x = \frac{N}{T}, \quad (11)$$

$$\sum_{x=0} \sigma_x = 1. \quad (12)$$

After the preliminary processing, the pixels of the image are divided into two categories. The average gray values of the two categories are as follows:

$$v_1 = \frac{v(\lambda_0)}{k_1}, \quad (13)$$

$$v_2 = \frac{v_\lambda - v(\lambda_0)}{1 - k_2}, \quad (14)$$

λ_0 represents the gray value, and $v(\lambda_0)$ at this time is as given in the following formula:

$$v(\lambda_0) = \sum_{x=0} x \cdot \sigma_x. \quad (15)$$

At the same time, the calculation formulas and relationships of k_1 and k_2 are as shown in the following formulas:

$$k_1 = \sum_{x=0} \sigma_x, \quad (16)$$

$$k_1 + k_2 = 1. \quad (17)$$

Then the grayscale accumulation value in the entire original grayscale range is as given in the following formula:

$$v_\lambda = \sum_{x=0}^{T-1} x \cdot \sigma_x \quad (18)$$

$$= k_1 \cdot v_1 + k_2 \cdot v_2.$$

As can be seen from the calculation process, the method of global thresholding divides the pixel value of the image into two parts. The threshold value is determined according to the variance calculation of the gray value difference between the parts. The between-class variance is as shown in the following formula:

$$\chi^2 = k_1 \cdot k_2 \cdot (v_1 - v_2)^2. \quad (19)$$

When the traversal of λ_0 in the gray value range ends, the λ_0 that maximizes the interclass variance is taken as the fixed threshold [23, 24].

In the global threshold method, the bimodal method and the iterative method are mainly used. The flow of these two methods is shown in Figure 4.

The processing flow of the bimodal method is to first calculate the pixel values of the input pictures and sort them according to the frequency. The pixel value with the lowest frequency between the pixel values with the highest frequency and the second highest frequency is used as a fixed threshold value and then the binarization process is performed by using formula (10). The processing process of the iterative method is different from the bimodal method. The iterative method is to preset a threshold that is the average value of the maximum and minimum pixels in the image. According to the set threshold, the image is divided into two categories according to the pixel, and the average value of each of the two categories of pixels is calculated. Whether the new threshold is consistent with the preset threshold should be determined. If they are not consistent, it needs to return to the second step to continue the calculation until the threshold does not change, and then it performs binarization processing by formula (10).

The local threshold is based on the calculation of the variance and other eigenvalues in the local window to determine the threshold. This method starts from the processing of the local area, and the binarization of the image will be relatively more accurate. But it is not suitable for image processing with large pixels of background change.

The binarization process of the nonfixed threshold value is mostly carried out by the method of edge detection. Its basic principle is to identify the position of text information in the image in a certain way and then perform binarization processing according to similar rules [25, 26].

2.2.2. Image Classification and Detection of Connected Regions.
There are many common methods for image classification, such as the K-means algorithm, the decision tree, and the support vector machine. Different types of classification methods can be selected according to the attributes and characteristics of the image. This study will use the K-means algorithm.

The central idea of the means algorithm is to set the k value and cluster each center through the set k value. That is,
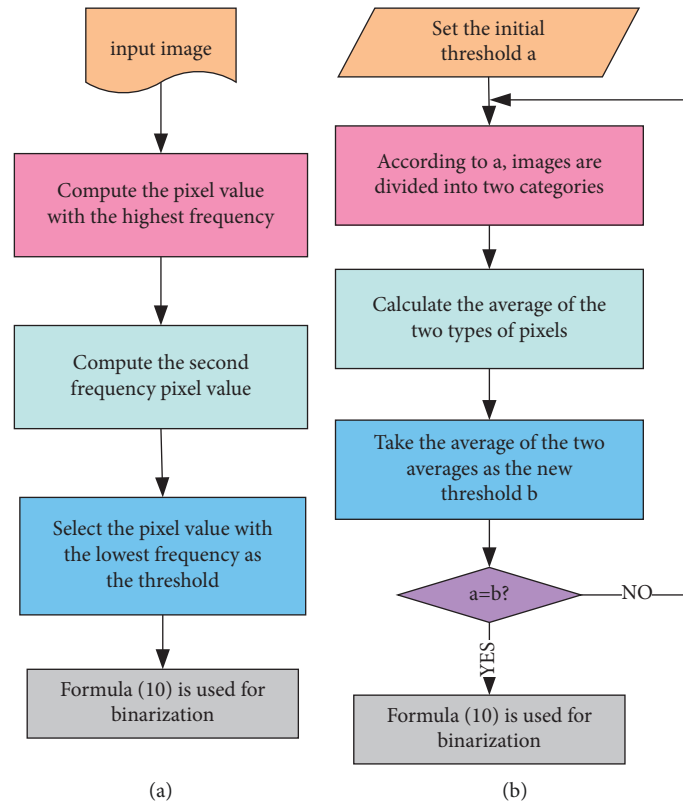
FIGURE 4: Bimodal and iterative processing flow. (a) The two-peak method processing flow. (b) The iterative method processing flow.

the points closest to the center value are regarded as a class, and the center is continuously calculated for clustering until the end. As shown in Figure 5.

As shown in Figure 5, the K-means algorithm first selects the value of the center point k, that is, there are k center points. The samples closest to the center point are classified into this class during the calculation process. After the preliminary clustering is completed, the center point is redetermined according to the results of the preliminary clustering, and the center point is determined by the average value of each category. These two steps need to be repeated until the calculated center point satisfies the preset conditions and ends the classification. The advantage of this classification method is that it can classify big data, and the gap between the classification categories is large. The samples in each category are highly similar, and the process of completing the classification is simple and fast [27–29].

The detection of connected regions in a binarized image is mainly to separate different members in the image by designing different labels for pixels in different regions. But the pixels in the same area are designed in the same way to get the connected area map. Generally speaking, there are two types of connectivity, four connectivity and eight connectivity, as shown in Figure 6.

As shown in Figure 6, the difference between the two connectivity types is the number of connections to intermediate values. Assuming that the pixel x has a corresponding coordinate point, the set of points corresponding to the pixel can be called the neighborhood of the pixel. If the number of connections to intermediate values is four, it is
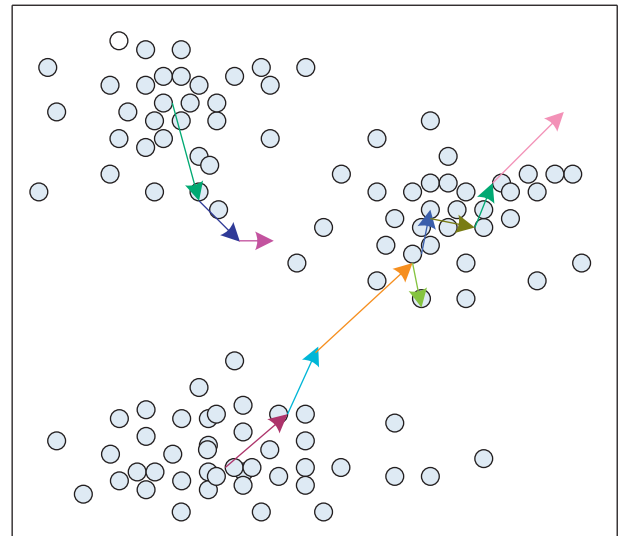

FIGURE 5: Schematic diagram of the K-means algorithm clustering process.

four connectivity. If the number of connections to intermediate values is eight, it is eight connectivity.

After all connected regions are marked, the marked region image can be obtained and the change process is shown in Figure 7.

As shown in Figure 7, the binarized image is divided into black and white according to the foreground and background. The black is the foreground pixel and the white is
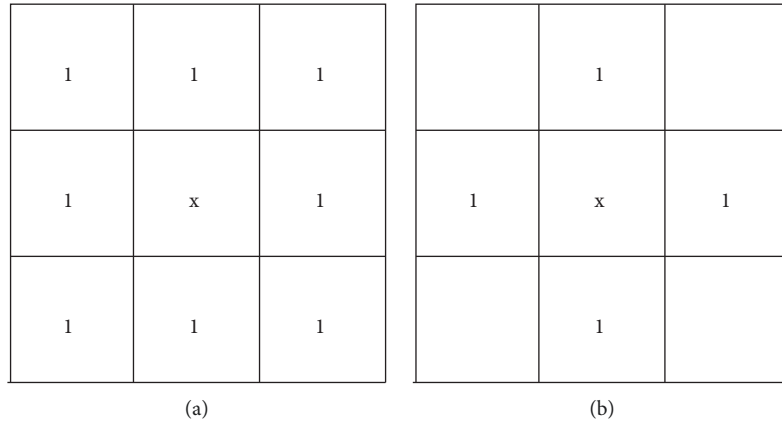
1	1	1		1	
1	x	1	1	x	1
1	1	1		1	

(a) (b)

FIGURE 6: Two types of connectivity (a) Eight connectivity (b) Four connectivity.

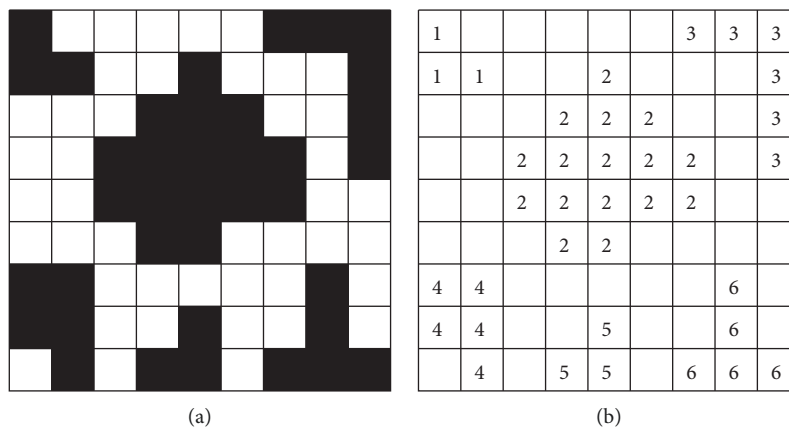| 1						3	3	3
1	1				2			3
			2	2	2			3
		2	2	2	2	2		3
		2	2	2	2	2		
			2	2				
4	4						6	
4	4			5			6	
	4		5	5		6	6	6

(a) (b)

FIGURE 7: Binarized image and connected labeled image (a) Binarized image (b) Connected labeled image.

the background pixel. The foreground part of the binarized image is marked with a digital symbol after the connected marking, and the digital symbols in the same area are the same. In different regions, different digital symbols are used for marking.

3. System Design and Implementation

3.1. System Design. The design of the teaching platform system needs to be combined with the needs of users, and different functions need to be designed in consideration of the needs of different types of users. The most appropriate system design is chosen from a practical point of view. The design and implementation of the virtual experimental economic teaching platform in this study is mainly based on the secondary development of the commonly used computer network simulation software.

3.1.1. Teaching Platform Requirements. The users of the teaching platform mainly have three identities, namely, the administrator with the highest system authority, teachers, and students as common users. These three identities have different requirements. The requirements of administrators are as follows:

The first is user management requirements. Users can query, add or delete users, maintain user information, change passwords, and set user permissions.

Then there is performance management. It includes grade maintenance, grade entry and correction, and grade inquiry.

Then there is course management. Curriculum management includes curriculum formulation and arrangement, curriculum requirements, experimental curriculum arrangement of teachers and students, and experimental arrangement of students.

Next comes experiment management. It includes job management and result file analysis, job file modification and deletion, and job file download and upload.

Finally, there comes message management mainly including the review and deletion of messages and information query.

The specific requirements of ordinary users for teachers and students are as follows:

The first is the teacher. The functional requirements of teachers include personal information query, password modification, experimental results query, course query, knowledge weight setting, experimental homework upload, results file download, message query, and message reply.
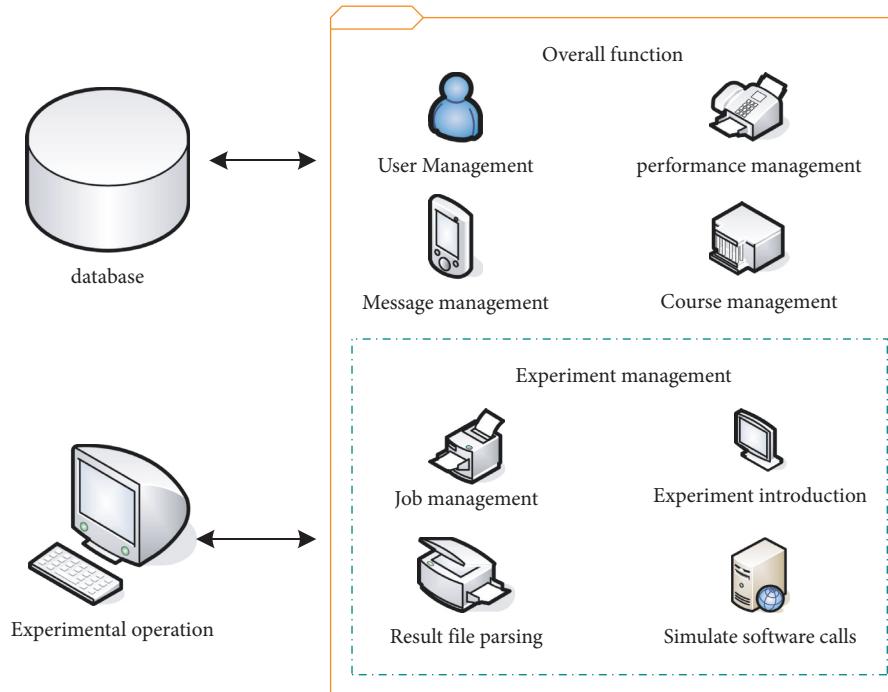
FIGURE 8: Overall system design.

Then there are the functional requirements of students, including student information query and modification, password modification, results query, client call and download, homework download and upload, experimental operation, set reply to the teacher, message information filling, and reply query.

Teachers are responsible for modifying and checking the weights of assignments, while students are responsible for experimental operations and uploading and downloading assignments. On the message board, students can fill in messages and assign teachers to answer them, and teachers need to query messages and answer them.

3.1.2. The Design of the Teaching Platform. The design of the teaching platform is related to the needs of users. According to the user identities sorted out above, the user roles and basic functional sections of the platform are determined. The user roles are manager, teacher, and student, respectively. The functional sections are user management, performance management, course management, experiment management, and message management. The specific design is shown in Figure 8.

From Figure 8, the overall design of the system is mainly the selection and determination of functional blocks. Different functional blocks design specific functional items according to the specific contents. The design of the database includes the information content of teachers and students, the information content of courses, the information content of messages and homework, the test content, and the character library after image binarization. By analyzing the applicable objects, functions, and costs of the currently more popular centralized mainstream databases, this study finally chooses the MySQL database.

3.2. Design of the Teaching Platform Based on Mathematical Image and Signal Processing. Since this research is based on the secondary development of the simulation software, the user needs to install the simulation software on the client to perform the experimental operation, and the results of the experimental operation need to be obtained from the simulation software. This step requires parsing the result file. The parsing of the student result file will use the image processing technology mentioned above, using signal processing in image recognition and binarizing the image. Its processing process is shown in Figure 9.

As shown in Figure 9, after opening the file, it is necessary to obtain the windows window, identify the image, and perform binarization processing. The character content of the image is obtained. In this step, since the background of the student's result file information is white, the letters are mainly digitally processed and the steps of noise reduction and normalization can be removed. After the image processing is completed, it is compared with the image template in the database to obtain the final character, and the knowledge points in the image are classified and extracted by the classification method.

After analyzing the results of a single experiment of the students, it is necessary to analyze all the individual results of the students to obtain the students' mastery of the knowledge points and experimental operations. Since the mastery of students in different knowledge point modules is different and the level of students is different, in the design of the analysis of students' mastery of knowledge points, it is necessary to consider these aspects as a whole. Combining these situations, this research will deal with the way of document marking. The job files in the database are numerically tagged based on attributes. Teacher uploads and student uploads are marked with two different numbers.

open a file   get handle   Enter the inspection result interface   get window

Classification of knowledge points   Model comparison   image binarization   draw window
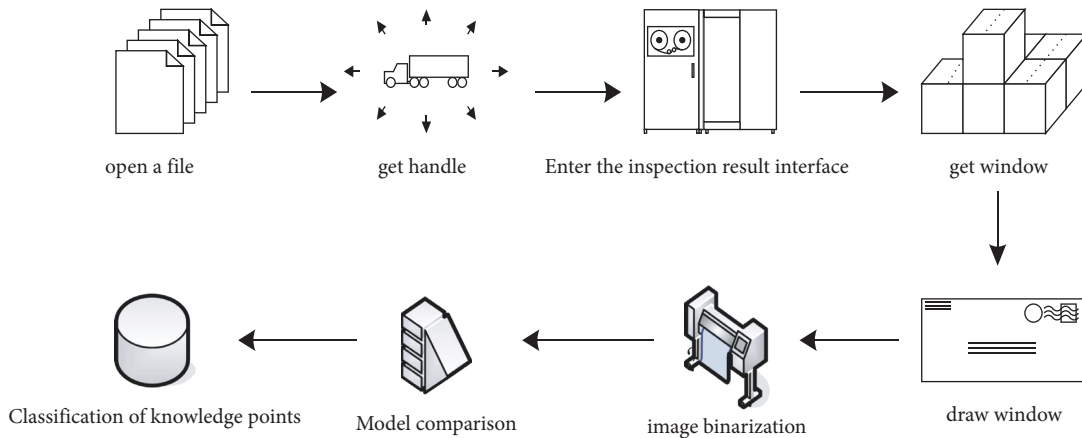
FIGURE 9: File parsing process.

When there is a duplicate file the next time, the numerical label of the previous identical file is changed, and only the file data of the initial numerical label will be counted.

The analysis of a student's mastery of a certain knowledge point not only needs to be judged from a certain score but also needs to be comprehensively analyzed for all the students' completion of the knowledge point homework. First, the total number of homework completed by the student is counted; then the number of correct completion results is counted. Finally, the ratio of the two can be calculated.

3.3. Realization and System Testing of the Teaching Platform

3.3.1. Realization of the Teaching Platform. According to the design of the teaching platform above, the functional modules of the system are implemented, and the modules are introduced according to the different user identities. The first is from the perspective of the administrator. The authority of the administrator mainly includes the management and maintenance of the data information used, which is the background management section of the system. From the administrator's perspective, operations include basic information management and maintenance for users, arrangement of teacher and student experimental courses, and message management. In the part of experiment management, the introduction of the experiment will be more comprehensive in the operation interface of the administrator, including all the experimental information of all teachers and students at different stages.

Ordinary users are teachers and students. This part is the operating system of the front desk. According to the functional requirements mentioned above, the user interface function panels of these two types of users are divided into five sectors, including user management, course management, grade management, experiment management, and message management. In the experiment management section, teachers can upload assignment files, and students need to download plugins to download assignments uploaded by teachers. The background of the system parses the homework files uploaded by the students through the process described above. The teacher can query the students' test scores and can summarize and analyze the students' scores to grasp the students' understanding of the knowledge points.

3.3.2. System Test Results and Analysis. The test of the function is to log in and use the function blocks of different user identities. Members with three identities of administrator, teacher, and student log in to the system, perform functional operations on the system, and observe the implementation of the system. At the same time, the test software will be run to test the performance of the system.

The test of the system functions mainly includes the login test, administrator maintenance, and class scheduling, as well as the upload and analysis of assignments. The results of the login test are shown in Table 1.

Table 1 shows the results of the login test. Three different ways are chosen to perform the login operation and observe the system prompt results. When the entered user name corresponds to the role but the password is incorrect, the system prompts that the password is incorrect, which is consistent with the expected result. When the entered user name does not correspond to the role but the password is correct, it prompts that the role is wrong, which is consistent with expectations. When choosing to enter the information corresponding to the user name and role but the password is randomly obtained, the system prompts that the password is incorrect, which is consistent with expectations. The login test results show that the system performs well.

The test results of administrator information maintenance are shown in Table 2.

As shown in Table 2, when choosing to create and modify personal information on the operation interface, the information prompted by the system is consistent with the expected prompt information. The administrator information maintenance test shows that the system operates without errors.

The test results for class scheduling and homework management are shown in Table 3.

As shown in Table 3, the test results of class scheduling and homework management show no abnormalities, indicating that the functions of the system can operate normally.

The conventional method of performance testing is to test the load, concurrency, and stress of the system. The

TABLE 1: Results of the login test.

Step	Data	Expected outcome	Actual results
The username corresponds to the role, but the wrong password was entered	Administrator role	Incorrect password prompt	Incorrect password prompt
The username does not correspond to the role but the password is correct	Username is student but login role is admin	Prompt role error	Prompt role error
The username corresponds to the role but the password is fetched from the database	Administrator role	Incorrect password prompt	Incorrect password prompt

TABLE 2: Administrator information maintenance test results.

Step	Data	Expected outcome	Actual results
Click on create user and fill in the information but enter the wrong mobile number	Student role	Incorrect phone number	Incorrect phone number
All information entered correctly	Student role	Prompt that the creation is successful, the list displays information, and you can log in	Prompt that the creation is successful, the list displays information, and you can log in
Modify role	Change student role to teacher, and other information unchanged	The list shows that the role has changed, and log in again as the teacher role	The list shows that the role has changed, and log in again as the teacher role

TABLE 3: Class scheduling and assignment management test results.

| Step	Expected outcome	Actual results
Click the schedule option and select the teacher, course, time, and location	Incorrect phone number	Incorrect phone number
Click experiment	If the control is not installed, the file cannot be opened, and the installed control file is opened.	If the control is not installed, the file cannot be opened, and the installed control file is opened.
Click score analysis	Displays student's most recent test results	Displays student's most recent test results
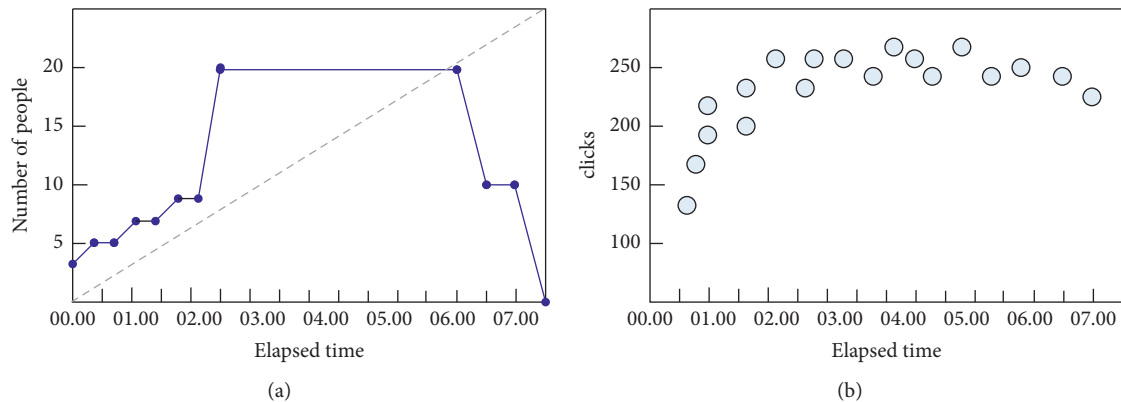
FIGURE 10: Test results of the number of affordable users and the number of clicks (a) Number of affordable users (b) Number of clicks.

performance test indicators selected in this study are the system response time, the number of users that can be tolerated, and the number of clicks. Figure 10 shows the results of the number of affordable users and clicks tested using the test tool.

As shown in Figure 10, the number of users that can be tolerated by the system is 20, and the number of users that can be tolerated is not large, which is related to the simulation software selected and the program design during the operation. The click frequency is normal.

The response time results of the system are shown in Figure 11.

As shown in Figure 11, the response time result of the system is smooth over a time period. According to the experimental results, the average response time of the system is 0.30 s, and the response time gradually increases with the change in the number of users. This is related to the load capacity of the system, which is in line with the actual situation.
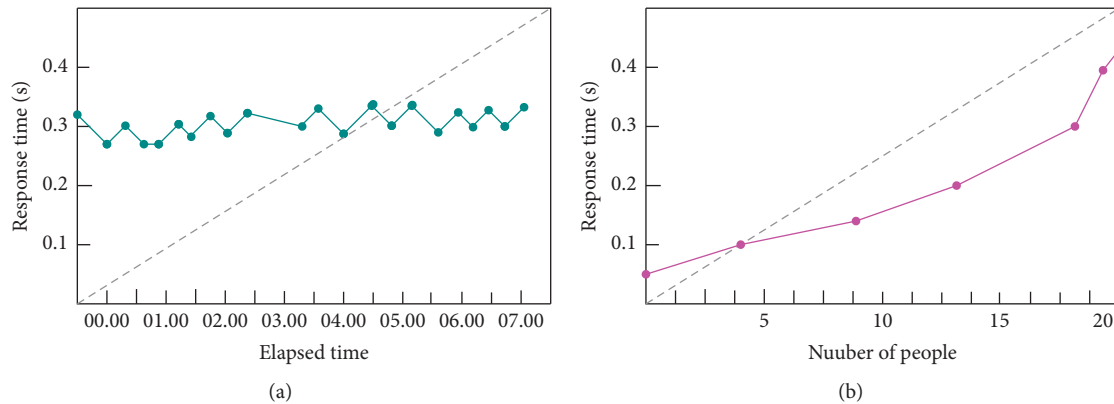
FIGURE 11: Response time results of the system. (a) Response time as a function of time period. (b) Response time as a function of the number of users.

4. Conclusion

The economy of the virtual experiment teaching platform, based on computer network, to do a background introduction, illustrates the current social environment of computer network virtual experiment teaching platform of economic importance and proposes the use of mathematical methods of image and signal processing for the computer network virtual experiment teaching platform economy to carry on the design and implementation, according to the features of system platform. The application of mathematical image and signal processing systems is analyzed. Through the analysis of the functional requirements of the users of the system; from the perspective of managers, teachers and students plate design; and the function of the system and the design of system function and performance test experiment, the experimental results show that the system login, administrator information management, course arrangement, and job management function is normal. The performance test of the experimental results show that the system can withstand users upto 20. The change of click-through rate is normal, and the change of response time of the system is in line with expectations. Therefore, the teaching platform design of this study has achieved good results. Due to the limitations of technical conditions, the system platform design developed in this paper, such as the carrying capacity of the system, cannot meet the actual application requirements, so there needs to be continued research to improve the design in the future.

Data Availability

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

Conflicts of Interest

The authors declare that there are no conflicts of interest.

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