Intelligent Registration of Nucleic Acid Detection Information

Chen Wang[1], Yongbin Zhang[1], Xiuli Fu[2], Yuansheng Qi[1]
995451042@qq.com, zhangyongbin@bigc.edu.cn, *Corresponding author: fuxiuli@bipt.edu.cn, yuansheng-qi@bigc.edu.cn

[1]School of Mechatronics Engineering, Beijing Institute of Graphic Communication, Beijing Institute of Graphic Communication, BIGC Beijing, China

[2]Department of Information Engineering Beijing Institute of Petrochemical Technology Beijing, China

Abstract: With the repeated outbreak of the epidemic, nucleic acid testing has become a necessity for people's daily travel, because now nucleic acid appointments need medical staff to manually take photos and upload, nucleic acid results manual entry, brought a huge workload, time-consuming and laborious, the risk of error is also very high, in this article, we propose to create a B/S-based intelligent registration nucleic acid system, avoiding the various drawbacks brought by traditional sampling methods, improving nucleic acid detection efficiency, reducing the error rate caused by multiple factors, and reducing the work burden of medical staff. This article introduces the construction of the system, business processes and system functions, hoping to play a role in similar application scenarios.

Keywords: nucleic acid testing; Coronavirus; information system

1 INTRODUCTION

The new crown epidemic has spread widely around the world [1]. In the face of the phenomenon of the rebound peak of the new crown pneumonia epidemic, studies have shown that comprehensive testing is a critical factor in emergency prevention and control, which can enhance the speed of reflecting the disposition while further moving the epidemic gate forward [2]. Contingency plans need to be developed based on large batches of population nucleic acid testing. During the outbreak phase, screening and confirmation of suspected cases and asymptomatic infected individuals are needed first to accurately prevent and control the outbreak and reduce the risk of spreading the disease. However, with current technology, most of the information for nucleic acid testing must be recorded by hand and entered manually by medical staff, which is a hefty workload and also very prone to errors: like registering the wrong basic information, making mistakes in the entry results, missing households and missing families, etc. Therefore, the work is intensive and the risk of errors is also very high. The process of queuing and testing also adds to the negative emotions of easy medical staff and burnout. With the rapid development of Internet technology, for the emergence of new technologies we should make use of them in healthcare to make people's work and life comfortable and convenient. In turn, it is also the Internet that reduces the pressure on the health system [3] and meets the much-needed requirements of the people. In this paper, we propose to create a nucleic acid detection information system based on B/S, which can quickly

ICICA 2022, December 02-04, Chongqing, People's Republic of China

DOI 10.4108/eai.2-12-2022.2327990

carry out nucleic acid detection in large-scale populations and realize sampling appointment, specimen collection, transport, acceptance and testing, result entry, and process informatizationton improve the efficiency of nucleic acid testing, reduce the error rate of registration entry results, reduce the workload of medical personnel, and solve the current problems such as difficulty in organizing residents, avoiding aggregation, managing sample information, and delivering result information. The paper describes the process of developing and designing the system and the implementation process. The nucleic acid testing appointment system brings excellent convenience to both hospitals and residents. It is well worth promoting as it comprehensively enhances the monitoring control and emergency handling of new coronaviruses by multi-terminal users such as government, community, and the public and other multi-terminal users of the new crown virus, which is worth promoting.

2 SYSTEM ARCHITECTURE

2.1 Development environment construction

The system is based on B/S structure, MVC design mode, simple and easy to maintain, only need to change the web page, you can achieve all the users of the synchronous update, you can query, browse and other business processing at any time and anywhere. In terms of cost input, B/S mode management systems often only require more early investment, while later maintenance costs are lower and more economical in the long term [4]. In the design and development of the SSM framework technology, as well as HTML front-end page implementation and LayUI front-end framework, using the classic modular design, extremely easy to get started, ready to use, very suitable for rapid development of web interface. The use of MySQL database, combined with MyBatis data storage system to achieve persistence framework to achieve data interaction.

2.2 Feasibility analysis

2.2.1 Technical feasibility

The technologies used in this topic include Java, HTML, SSM (Spring, SpringMVC, and MyBatis), MySQL databases, and LayUI's front-end framework. Through the study of university courses and self-study and accumulation in my spare time, I will be able to master and use these technologies proficiently.

2.2.2 Economic viability

Now the computer technology has been quite mature, relatively speaking, the technical requirements for developing this system are relatively simple, and the documentation is quite complete, it can be said that the computer that meets the configuration can be developed for this system. Later maintenance also does not need to cost much.

2.2.3 Operational feasibility

Nucleic acid detection system is based on B/S system mode, users can access and use the system through a browser, in the information age, everyone uses smart phones, for the operation of such a system does not need special training, nucleic acid testing personnel, doctors and system administrators. You can access the system through a browser, enter your account and password, and you can perform the operation you need, even if you use the system for the first time, you will not find it so difficult to operate.

2.3 Introduction of the functions of the system

The modules of the nucleic acid testing management system are divided into three main blocks: nucleic acid testing personnel, physicians and system administrators. The nucleic acid testing personnel module is further divided into three modules: nucleic acid testing appointment, personal information, and statistical analysis; the doctor includes four modules: nucleic acid testing appointment approval, nucleic acid testing result entry, new crown knowledge management, and nucleic acid result viewing. The system administrator includes three modules: nucleic acid testing personnel management, doctor management and role management. The overall functional module diagram of the system is shown in Figure 1. The overall flow of the system is shown in Figure 2.

1)Nucleic acid appointment module: Nucleic acid testers apply for an appointment for nucleic acid testing.

2)Personal information module: each user can perfect and reset their cell phone number, address, date of birth, etc.

3)Statistical analysis module: statistical analysis of the number of male and female nucleic acid testers. 4.

4)Appointment Approval Module: After the testers submit their applications, the doctor approves them in the background and chooses to pass or not.

5)Nucleic acid test entry module: After performing the nucleic acid test, the doctor is responsible for entering the test results and the testing organization into the system, and cannot be modified.

6)New crown knowledge management module: add, delete, and check the new crown knowledge.

7)Nucleic acid results viewing module: to view all nucleic acid test results.

8)Nucleic acid test personnel management module: to add, delete and check the information of nucleic acid test personnel.

9)Doctor management module: to add, delete and review the information data of doctors. 10. Acknowledgment

10)role management module: the role of the doctor and nucleic acid test personnel to assign permissions management.

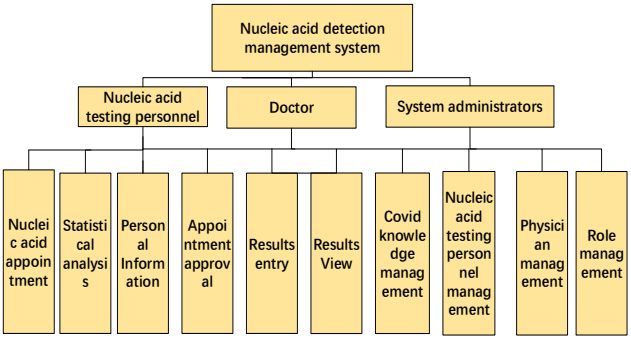

Figure 1. Overall functional module diagram

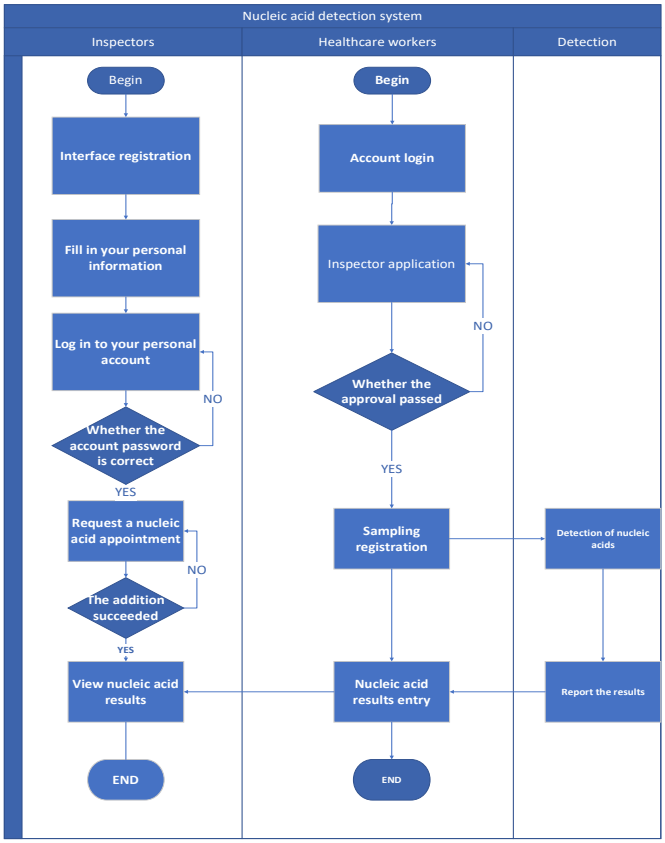

Figure 2. Overall system flowchart

2.4 Database Design

The data persistence storage of this system adopts MySQL database, according to the project needs, the data involved in this system contains administrator information, new crown information, doctor information, appointment information, nucleic acid testing personnel

information department information, role information, nucleic acid result information, etc. The perfect database can be designed to make the business logic of the system clearer and more quickly and ready to obtain data, to ensure the consistency and accuracy of data information. In the nucleic acid detection management system, the connection between each entity is different, and the E-R diagram of the nucleic acid detection management system is shown in Figure 3.

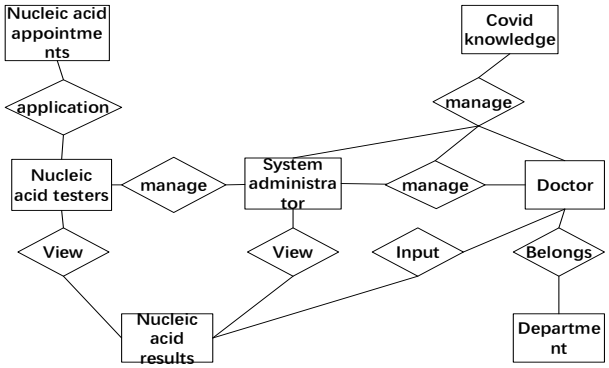

Figure 3. Nucleic acid detection management system E-R diagram

2.5 Database table design

The table design in the database is mainly based on the logical structure between each model, as well as the data items of each instance to design a practical field storage information, the following select several main information tables for listing.

2.5.1 Admin

The system administrator table is used to store basic administrator information, and there are four fields in the table, namely account ID (id), administrator name (a name), administrator password (a password), and administrator mobile phone number (a phone).

Table 1 System Administrator Table

Field name	Data type	length	Whether it is a primary key	Exegesis
id	int	11	yes	Account ID
aname	varchar	255		User name
apassword	varchar	255		Administrator password
aphone	varchar	11		Administrator phone number

2.5.2 Result

The nucleic acid result table is used to store the appointment result information table of nucleic acid testing personnel, which has a total of 6 fields, namely number (ID), name of nucleic acid testing personnel (uname), gender of nucleic acid testing personnel (sex), nucleic acid test results (final result), entry result institution (doctor), and reporting time (updatetime) as shown in Table.

Table 2 Nucleic acid results table

Field name	Data type	length	Whether it is a primary key	Exegesis
id	int	11	yes	id
uname	int	11		User id
sex	int	11		Detect human gender
Final result	int	11		Nucleic acid test results
doctor	varchar	255		Enter the results body
updatetime	date			Date of report

2.6 Class diagram design

The role of class diagram is to describe the types in the system and the relationships between classes, class diagram can help people simplify the understanding of the system, it is an essential product of system analysis and design, but also an important basis for coding and testing. The analogy diagram of the nucleic acid appointment system is shown in Figure 4.

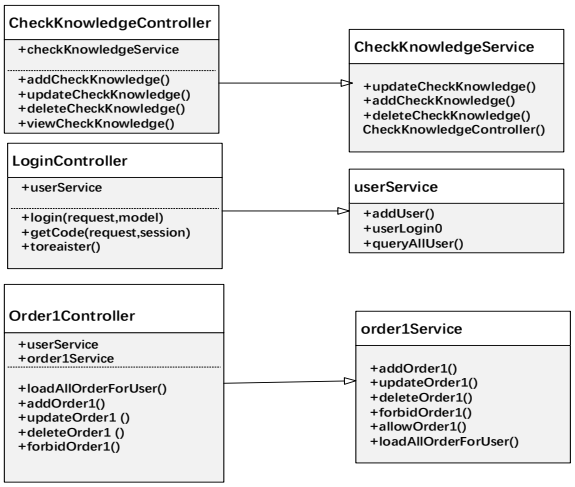

Figure 4. Nucleic acid detection system class diagram

3 KEY MODULE FUNCTION DESIGN

Through the nucleic acid testing information management system, doctors can reduce a lot of excessive labor, you can see the information of nucleic acid testing personnel at a glance, residents also realize the freedom of identity authentication, also unnecessary every time to carry out nucleic acid testing need to bring the relevant documents, the flow of personnel is also under the control of the administrator. The efficiency of testing has been dramatically improved and the speed at the time of testing has been increased. Potential conflicts are avoided, and the main functional modules are as follows.

3.1 Appointment module

Residents can first register their information, and after successfully logging into their account, they can click on the Nucleic Acid Test Appointment button to apply for an appointment for a nucleic acid test online, filling in their name, phone number, gender, date of birth, nucleic acid test method, and nucleic acid test date. Check your appointment status and nucleic acid test results. After confirming that the information is correct; you can submit it and the doctor's side will process it according to your situation for the following follow-up process. The process is visualized so that residents can know that their application has been going through the process line and is predictable.

3.2 Result entry module

After the nucleic acid test is completed, the doctor logs in through the system and clicks the nucleic acid result entry button, which will display all the information of the person who has performed the nucleic acid test, including the date of birth and contact information. Nucleic acid testers can the view their nucleic acid test results through the system. Only after the nucleic acid tester has performed the nucleic acid test can the results be classified as positive or negative. After logging in through the back-end system, the physician enters the test results for the nucleic acid testers into the system, including the test structure and test information. The test result entry prompts for confirmation of submission and indicates that the submitted result cannot be modified. After submission, nucleic acid testers can view their nucleic acid test records and results by logging in through their account.

3.3 New crown knowledge increase function module

After the testers log in their accounts, they can see the interface with warm tips about the new crown prevention knowledge. This interface allows doctors and system administrators to manage the new crown knowledge after logging in. Still, nucleic acid testers do not have the authority to address the new crown knowledge. Doctors and nucleic acid testers can update, delete, query and publish new understanding of unique crowns, including the title and content of the new crown knowledge, to strengthen the residents' awareness of epidemic prevention.

3.4 Role management module

The role management module test is mainly to test the function of system administrator to manage the authority of doctors and nucleic acid testing personnel. It includes granting module functions such as appointment approval, nucleic acid result entry, new crown knowledge management, and personal information to doctors, and giving module functions such as nucleic

acid appointment application, personal information management, and statistical analysis to nucleic acid testing personnel. For modifying passwords, doctors and nucleic acid testers can change their account passwords, and system administrators can modify the passwords of doctors and nucleic acid testers in emergencies.

4 CONCLUSION

Since the new crown epidemic in December 2019, has become a public health emergency around the world [5], the paper takes the specific needs of the users of the nucleic acid testing system as the route of system creation, in the context of the current trends in the medical market and the changes that hospitals need to make to develop, the design of the nucleic acid testing system, the essential functions of this system is complete, superior performance, but also has a high degree of stability and security The advantages of the system are that it facilitates the tasks and work of the hospital. The functional performance of the system has been tested and the test results are satisfactory. The safety and stability of the system have been tested, using the testing capacity of the nucleic acid testing organization, undertaking the task volume, testing quality, scientific distribution and dispatching of medical resources, centralizing the overall coordination of the nucleic acid testing work, and arranging fixed guides to guide the users. To a certain extent, the time cost is saved and the whole testing process is well organized, enhancing testing efficiency and enterprise competitiveness.

Acknowledgement. this research is supported by the national key research project (2019YFB1707202).

REFERENCES

[1]. Jianan Xu, Ning Wang, Qing Chang, Huanxi Shen, Dandan Yang. Prevention and control of novel coronavirus pneumonia in Medical Waste Disposal Institutions in Jiangsu [J]. Journal of Public Health and Emergency,2021,5(March).

[2]. WOLICKISB, NUZZOJB, BLZASSDL, etal. Public health surveillance: At the core of the global health security agenda [J]. Health Security,2016,14(3):185-188.

[3]. Abdelsamad, Y., Rushdi, M., & Tawfik, B. . (2019). Corrigendum to "functional and spatial design of emergency departments using quality function deployment." Journal of healthcare engineering. (Pt.2), 2019.

[4]. Liu Xize.(2021) Development and Implementation of Enterprise SIMS
Based on B/S Mode. Journal of Physics: Conference Series,2037(1)

[5]. LI Q, GUAN X, WU P, etal. Early transmission dynamics in Wuhan, China of novel coronavirus infected pneumonia [J]. NEnglJMed.2020(382)13:1199-1207.