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Virtual Exhibition Platform Display and Works Presentation Experience Based on Computer Vision

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Abstract The use of the virtual exhibition platform can effectively solve the problems of non local exhibitors being unable to participate in the exhibition on site and having high exhibition costs, and effectively expand the business of exhibition operation, exhibition decoration engineering, exhibition equipment leasing, and customer value-added services of the International Convention and Exhibition Center. This research systematically analyzes the architecture, system architecture, visual interface design components and application construction of the mainstream operating system platform of mobile terminals. This paper discusses the basic methods of application software development based on the platform, and focuses on the design of communication module and the development methods of data encapsulation and analysis, which are suitable for lightweight data interaction of the exhibition platform. The experimental results show that the virtual display platform combines the demand analysis of mobile terminal applications in the business display information system, and designs and implements mobile terminal application software. Function display schedule management information service module, display contact information service module, display commodity information service module and mailbox service module.

Index Terms computer vision, virtual reality, exhibition platform, data interaction

I. Introduction

Exhibitions refer to activities such as conferences, exhibitions and trade fairs, festivals, and incentive travel [1], [2]. The basic forms of exhibition activities are expositions, large-scale conferences, exhibitions, trade fairs, trade fairs, product, or service exhibitions, etc [3]. The 2010 Shanghai World Expo is the most representative international large-scale exhibition event. The trade fair economy is an economy of scale. For exhibitors, the larger the number of exhibitors and the larger the exhibition area [4], the higher the direct economic return, and the higher the ratio of the unit benefit of the exhibition scale to the cost of the exhibition [5], [6]. According to the history of Chinese and foreign exhibitions, the development of super-large exhibitions shows that it started from a narrow exhibition area, a small exhibition scale, and a relatively concentrated range of exhibits, and then developed into a gradually expanding exhibitor channel, increasing exhibition area, and exhibits [7], [8]. Distinctive features of range diversification. The service chain of the exhibition industry includes venues, organizers, service providers, exhibitors, buyers, general audiences, etc [9]. However, the organizers of exhibitions and exhibition industries at all levels are also faced with difficulties in information processing in the service of their customers during the exhibition, such as pre-registration of exhibitors and visitors, crowd guidance during the exhibition, and operation during the exhibition service process. There are many personnel, the level is uneven, the training time is short, the operating environment is harsh, the new requirements and updates cannot be quickly disseminated, the unexpected situation [10], the lack of customer cooperation, the synchronization of the data of the participating customers during the exhibition and after the exhibition, etc [11].

Convention and exhibition activities are essentially a kind of service.Many steps and links participate in the exhibition activities, and each link and step involve massive information exchange and management [12]. The important problem that exhibition organizations mainly focus on solving in exhibition activities is how to efficiently and orderly process and use all kinds of massive information generated by exhibition activities, to achieve the theme of exhibition and maximize benefits. The exhibition management information system is developed to adapt to the exhibition activities and according to the needs of all parties involved in the exhibition. The exhibition management information system fully uses modern scientific and technological means to collect, process, store, and process massive information in the exhibition process, import it into the management system, and enable the massive information to be standardized, normalized, and smoothly transmitted throughout the business process. Provide a solid and reliable information guarantee for the objects at all levels related to the exhibition. Objects at all levels related to the exhibition use the exhibition information management system

to effectively manage and serve the exhibition activities [13], participate in the whole process of the exhibition according to their own needs and positioning, and play their corresponding roles. [14] In general: the exhibition management information system is a support system for the exhibition-related objects at all levels to participate in the exhibition business activities, which is conducive to the management of the exhibition customer relationship, and is also an important part of the strategic system of the exhibition enterprise [15], [16]. It is not only an important standard to measure whether my country's exhibition industry is in line with international standards, but also the inevitable development of my country's exhibition industry.

This paper takes the design of the cloud computing virtual exhibition platform uniquely launched by the Capital International Convention and Exhibition Center as the main research object, and analyzes in detail the new system architecture of the cloud computing virtual exhibition platform and the application of new technologies [17]. The presentation of the industry has been analyzed and demonstrated in detail and originality from all aspects, and combined with the unique business characteristics of the Capital International Convention and Exhibition Center and the development trend of various high-quality virtual exhibitions at home and abroad, the characteristics and technologies of various display methods and technologies are carefully analyzed [18]. Based on the advantages and disadvantages, the WEB 3D roaming combined with the background mode of large data volume is used to solve the virtual display [19]. This article will elaborate on the operation mode and business characteristics of the platform and the necessity of virtual exhibitions from all levels.These include the research significance of virtual exhibitions [20], the status quo at home and abroad, and so on. The various technologies used in cloud computing virtual exhibitions are described in detail, including virtual reality technology, VRML technology, 3D Studio Max technology, Java Script technology, augmented reality technology, and mobile Internet technology. On this basis, combined with the complete system analysis and design, its concrete and reliable feasibility is presented.Finally, combined with the realization of 3D exhibition, the application of AR technology in virtual exhibition, and the application of mobile Internet technology in virtual exhibition, the method of its system realization is described. And at the end, with the analysis of the test plan and test results, the integrity and stability of the system are completely and strictly guaranteed.

To sum up, after combining specific examples and software platforms, this study describes in detail the important roles they play in the cloud computing virtual exhibition platform.

II. Computer Vision and Virtual Exhibition Platform

The most used B/S structure (Browser/Server) in computer vision and virtual exhibition platforms is different from the C/S structure. The core of the system function and the huge database are all concentrated on the backend server, and customers use their own browsers to process data interactively with the server database through the Internet. And its operation, maintenance and upgrade and expansion are simple. There is more and more work for software system upgrade, function expansion, and bug patching, and the B/S architecture is more convenient for upgrade and maintenance. For a unit with many complex businesses, it is normal to have hundreds or even thousands of computers. If the system administrator needs to maintain each client computer, the workload and efficiency are very arduous, and if the selected application software is B/S structure, for system administrators, it is enough to manage the server effectively. Since the client is a browser, which is also highly accessible to the client, software maintenance is also unnecessary. Increasing the number of users or continuously expanding branches will not change the cost of maintaining the system, and software upgrades and maintenance are only performed on servers, as shown in Figure 1:

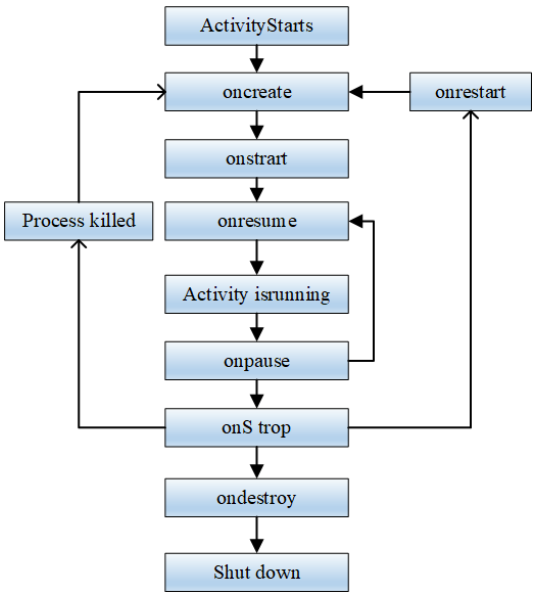

Figure 1: The infrastructure of computer vision and virtual exhibition platform

The virtual exhibition platform has many kinds of View and View Group objects, and they all inherit from the View base class. The View object is the basic object of the user interface of the virtual exhibition platform. These view classes act as parent classes for widgets that interact with the user, like text boxes and buttons. View Group acts as the parent class for layouts that provide various layout structures, such as linear, tabular, and absolute. As shown in Figure 2:

If some views are out of range, the ones drawn later will overwrite the ones drawn earlier. As shown in Figure 3:

A. Business requirements of virtual exhibition platform

Through the in-depth understanding of exhibition management and the operation process of exhibition business, it is found that some business departments have used information systems to handle related business, but the information sys-

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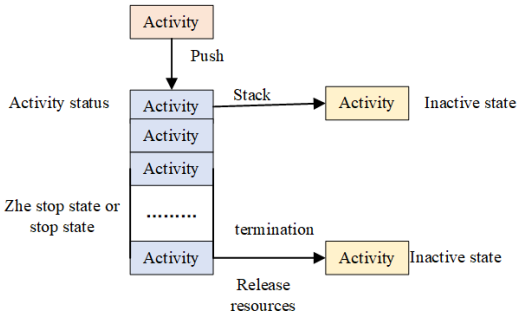

Figure 2: The active relationship of the virtual exhibition platform

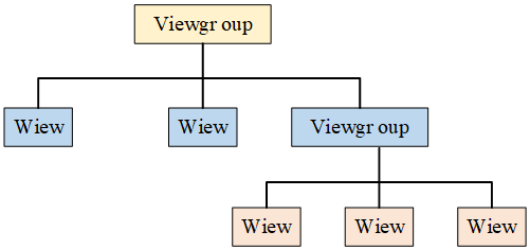

Figure 3: View architecture of the virtual exhibition platform

tems of each business department are independent and cannot be directly shared, forming information islands between them, such as exhibition recruitment The customer data of the department cannot be directly provided to the financial system of the financial department. When the financial department collects the booth fee, it needs to separately input the customer information or reprocess the customer data of the exhibition department and import it into the financial system. The data of various departments cannot be updated synchronously, resulting in inconsistencies in internal information. At the same time, the maintenance cost of information and data remains high, which affects the company's cost control and restricts. Although some convention and exhibition enterprises currently use some business software, most of them are management software commonly used by general enterprises. The overall business requirements of the comprehensive exhibition information system include.

Realize the collection, arrangement, and release of the exhibition project's own information (including the basic information of the exhibition, transaction volume and transaction volume, exhibition hall area, the number of national standard booths, the number of professional and general visitors, etc. Summarize and sort out all aspects of enterprise or personal information, collect booth information, input-output ratio information, transaction or intention information generated during the process of participating in the exhibition, track and provide technical services. Simultaneously realize the management and recording of booth reservation, sales, contract signing, and payment-related information in the process of recruiting multiple exhibition projects; realize statistical analysis of booth sales in the process of recruiting exhibitions, and conduct performance assessments for salesmen; On-site management, providing services for booth construction, exhibition equipment and flower etiquette rental, information consultation, production of exhibition certificates; value-added service items for exhibitors, such as online exhibition hall, booth promotion, SMS notification, etc. Provide supporting services for exhibitions, such as hotel reservations, air ticket reservations, and car rentals. The overall demand diagram is shown in Figure 4:

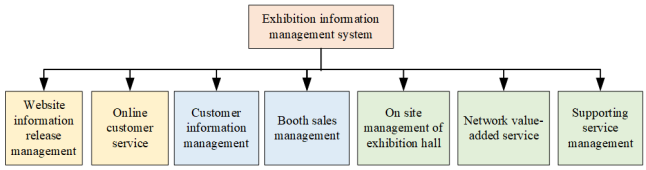

Figure 4: Overall demand diagram of virtual exhibition platform

However, if the exhibition information management system is used for exhibition recruitment and booth sales, the customer management subsystem of the computer system will automatically screen target customers, automatically send emails, and text messages to target customers for exhibition invitations and add a new graphic and intuitive display. To manage the core commodity of the booth and realize online exhibition recruitment and booth sales, the exhibition recruitment process will be more efficient and convenient, and the sales of the booth will be more efficient with less effort. The booth location, area, shape, and other attributes are displayed in the form of digital graphics. By operating these graphics, the booth is managed and interacted with other subsystems, to display all the exhibition halls of one exhibition in a visual and intuitive form. The distribution of booths reflects the sales progress of booths, booth orders, payment, and construction services in real time. With the progress of the booth sales process, after the exhibitor intends to predict the booth, the booth can be allocated to the exhibitor's name, and then the deposit will be paid until the full payment is finally paid. The booth status will be updated with the changes in the business process. In this way, through the booth status, you can clearly distinguish which booths have not been sold, which have been reserved, which booths have not paid the final payment, and which booths are selling well or unsold. The flow chart of online exhibition and booth sales is shown in Figure 5.

III. Methods

An exhibition must be represented visually. In order to enhance the external image of the virtual exhibition platform, we have done a lot of optimization in terms of vision, such as specially written dynamic lighting algorithms, glass reflection algorithms for mobile platforms, graphics and video compression algorithms based on OGG, HDR algorithms based on iris effects, making it possible to display massive graphics on the mobile platform, and with the unique compression algorithm, it ensures that users can pass the network under

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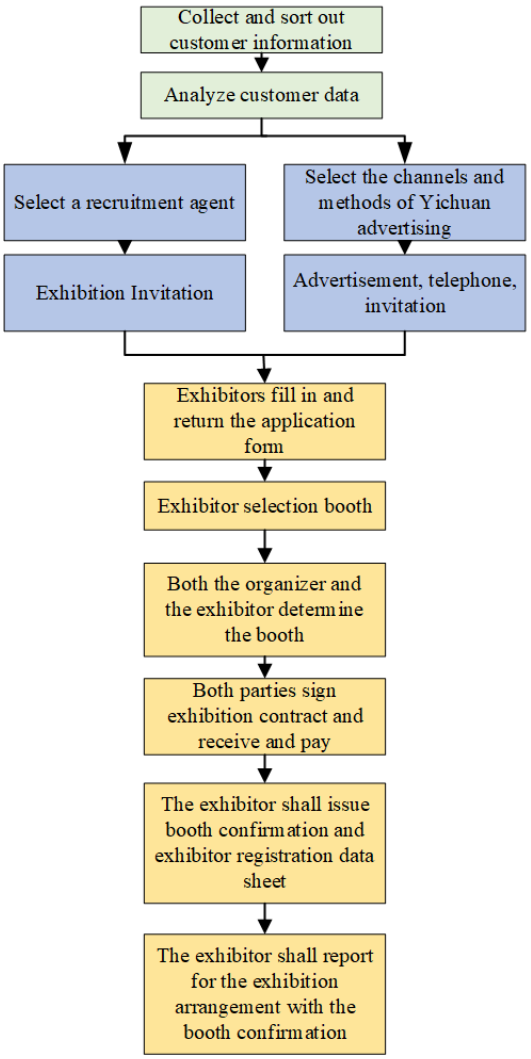

Figure 5: The process of participating in the virtual exhibition platform

low bandwidth, and can see the three-dimensional exhibition information online, which is more direct and vivid.

A. Development environment

The hardware configuration information is shown in Table 1.

The software environment used in system development is shown in Table 2.

The development environment of the system can be changed according to different business requirements, such as system server type, database type and so on.

B. System design

The layered architecture adopted by this system, on the one hand, separates the service layer without platform restrictions, and on the other hand provides an interface layer. Each platform accesses data through the interface layer, not directly. All platforms are interoperable and very free. Please refer to Figure 6 for details:

	Host configuration information (PC)
CPU	AMD Athlon(tm)IIX4640Processor3.0IGHZ
Memory	4.00GB
Hard disk	500GB
operating system	Windows 7 x 64
	Android device configuration information (galaxy nexus)
CPU	1.2 GHZ dual-core ARM Cortex-a9
Memory	1. 00GB
storage space	16GB
operating system	Android 4.1.2
	IOS device configuration information (iPhone 4)
CPU	102mhz single core Apple A4
Memory	512MB
storage space	8GB
operating system	IOS6

Table 1: Hardware configuration table

Type	Software name	Edition
Program development tools	My Eclipse	10.0
Art development tools	3DMAX	2012
Virtual exhibition development tool	Unit	4.1.5
Android development environment	ADT	21.1.0

Table 2: Software configuration table

The virtual exhibition platform fully supports PC and Android, iPhone platform customer access. And taking advantage of the characteristics of the mobile platform, the city navigation system and the AR electronic product description system were customized. Its subsystem support table is shown in Table 3:

System	PC	Android	IP
Cloud exhibition online browsing system	O	O	O
Cloud exhibition booth management system	O	X	X
Cloud exhibition merchant self-service booth placement system (3D)	O	X	X
Cloud exhibition 3D booth roaming system (3D)	O	X	X
Cloud exhibition mobile exhibition hall system	X	O	O
Cloud exhibition digital instruction system	O	O	O

Table 3: Subsystem overview

In the IOS client, the view is the part that is closest to the user and interacts with it. It is the part of the client that displays the processed data and allows the user to operate. The model is the part of the IOS client used to process the data logic of the program. The model handles the most tasks and mainly stores the data in the memory. Usually, the object of the model is responsible for data access through the database.

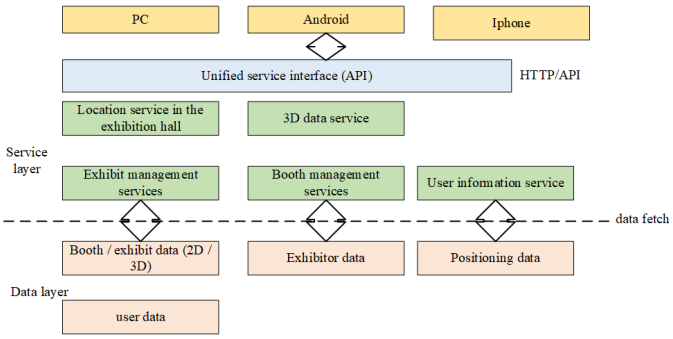

Figure 6: Customer access architecture diagram of the virtual exhibition platform

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It does not do any output and processing itself. It is the part of the IOS client that deals with user interaction. The controller generally reads data through the view. Send data to the model. The processing flow of the IOS client is that the model calls the database server data interface, reads data, or sends data to the server, and then returns the model or operates the status to update the display. As shown in Figure 7:

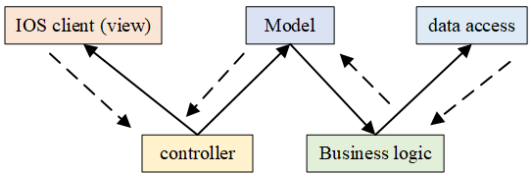

Figure 7: Client MVC framework

To facilitate the management of information in the virtual exhibition center, the background management system can be operated on any PC. Based on the requirements of a convention and exhibition center, the background management system will use a B/S structure, and the system architecture will be built using a classic three-tier architecture. At the same time, due to the use of SQL Server2008 database, combined with ADO.NET technology, WEB applications based on the classic three-tier architecture can be quickly developed. In the background management system, the user interface layer is the part closest to the user, providing an interactive operation interface for the user, which is represented by the web. The business logic layer is mainly aimed at various problems, to perform corresponding operations on the data layer and process according to the data logic. As shown in Figure 8 and Figure 9:

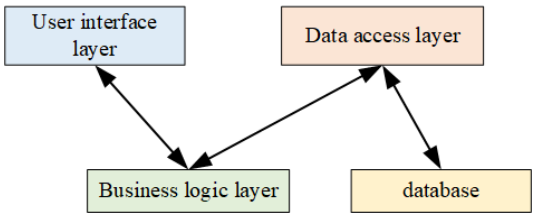

Figure 8: Background management system architecture of the virtual exhibition platform

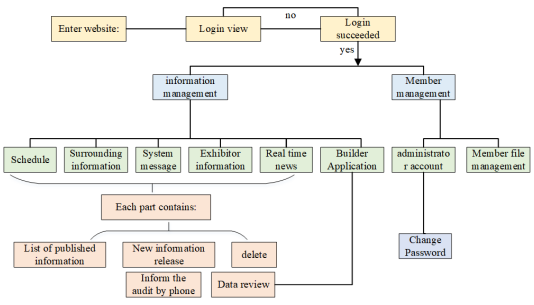

Figure 9: Flow chart of the background management system of the virtual exhibition platform

The background member management part can manage the user account in a unified way and provide corresponding services such as canceling the user and changing the password after the user applies; at the same time, it can also perform operations such as administrator login and password modification. With the establishment of the member management part in the background, the exhibition center can realize the unified management of member information and files, and at the same time, it can also classify users, integrate member resources, and improve the efficiency of member management.

IV. Case study

API is also known as application programming interface. According to the demand analysis, we divide the API of the virtual exhibition client system into the following parts, namely user, initialization data, exhibitor, nearby, meeting/schedule, service guide, parameter, and exhibition. Each part contains several parameters, the interface address and interface mode of the virtual exhibition client system are summarized, as shown in Table 4.

The function test of the virtual exhibition management information system mainly adopts the black box test method, mainly through testing and comparing the realization of various functions of the system, whether there is a gap with the requirements of the requirements specification, whether it meets the requirements of the requirements specification; whether the system can effectively input data and respond to the input data, output correct information and prompts. The function test in this chapter ignores the internal logical structure of the implementation program and focuses on the function of each system module and only tests whether the software interface and software functions are correctly implemented. The specific test results are shown in Table 5 and Table 6.

V. Conclusion

This paper makes a detailed design and research on the development of the virtual exhibition platform system under computer vision and the application technology of each functional module. The characteristics of the exhibition system in the exhibition industry are fully analyzed, and the characteristics and advantages of each functional module technology are demonstrated in many aspects. According to the specific business needs of the Capital International Convention and Exhibition Center, combined, the WEB 3D roaming form is finally used to interpret the virtual exhibition industry, which highly enhances the informatization level of the exhibition industry. The experimental results show that the mobile terminal is different from the PC-side style display, so that mobile phone users can also experience the technological exhibition. The management background part of the virtual exhibition platform adopts the MVC design mode, and a complete set of virtual exhibition management system has been developed to ensure the stable operation of the above-mentioned front-end manifestations, and at the same time provide the development of multiple virtual exhibitions.

User	Interface address	Interface mode
User	registration /main/register	all
Save / update the builder's data	/contractor /save Contractor	all
Sign in	/main/login	all
Get membership center data	/user/get User info/token	all
Modify user information	/user/updates name/token	post
Modify Avatar	/user/update User head/ token	post
Change Password	/user/update Password/ token	post
Staff details	/Search /loosestrife/	all
Retrieve password	/ main / reset password	all

Table 4: The interface address and interface method of the client system of the virtual exhibition platform

Enter the equivalent of the user's account and password	Effective equivalence class	Invalid equivalence class
Letters and numbers are the main components of string types	1. Character combination including only letters2. Character combinations containing only numbers3. Character combination containing letters and numbers	4. Character combinations containing special symbols 5. Character combination including punctuation 6. Character combinations containing spaces
String length > 0, no more than 16	7. Length of string: 1-16	8. Length of string = 0 9. String length > 16
The password is the same as the confirmation password	10. The password is the same as the confirmation password	11. The password and confirmation password are inconsistent
The username is not the same	12. The username has not been used	13. Existing username

Table 5: Equivalence class division of user registration function test

Test data	Expected results	Valid equivalence classes covered
Username: admin Password:admin Confirm password: admin	Correctly register users	1,2,3,7,10,12

Table 6: Valid equivalence classes of virtual exhibition platforms

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