



Research and Application of the 3D Virtual Community Based on WEBVR and RIA

Meng Zhang, Zhihan Lv, Xiaolei Zhang, Ge Chen & Ke Zhang

College of Information Science and Engineer

Ocean University of China

Qingdao 266100, China

E-mail: shentian1984@163.com

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Abstract

Starting from the development of VR and WEB technologies, in this article, we analyze the characters and the development foregrounds of the 3D virtual community based on the WEBVR (Web Virtual Reality) technology, and introduce the characters of the RIA (Rich Internet Application) technology system. And we put forward the technical frame of the 3D virtual community based on WEBVR and RIA, and introduce the information organization, storage, interaction and other key technologies of the 3D virtual community based on WEBVR and RIA. Finally, taking the “Real-time Interactive 3D Simulation Web Community Platform” as the example, we prove the extensive application foreground of WEBVR and RIA in future web interaction.

Keywords: WEBVR, RIA, 3D virtual community, Value of new media

Virtual Reality (VR) is a sort of computer system which can create and experience the virtual world. The virtual world is created by the computer, and it is the reappearance of the real world, and it can also be the world in the mind, and users can naturally interact with the virtual world by virtue of many sensor channels such as vision, hearing and feeling. It can create a 3D virtual world which can real-time reflect the changes of entity objects and interactions for users by the mode of simulation, and offer users a 3D interface where users can interact with the virtual world and make users directly participate in and explore in the function and changes of simulation objects in the environment and produce immersion feelings by helmet-mounted display (HMD), data gloves and other assistant sensors.

With the development of VR and relative domains, only the analog and simulation to real scenes have not completely fulfill users' high-layer demands, and real-time and dynamic scene digital information acquisition based on web and effective management, transmission and analysis computation are inspired as a sort of new demand. Under this background, the combination of WEB3D and VR is the necessary tendency for the technical development.

WEBVR is the web virtual reality technology based on Internet which is realized depending on the software technology. In 1994, Mark Pesce and Tony Parisi created the browser which was called as Labyrinth, and it was the initial shape of 3D browser on WWW. The game of Second Life developed by US Linden Lab perfectly combined VR and WEB3D, i.e. in a 3D space, establishing virtual online world can copying various scenes, details and experiences of human living to the Internet. After Google Company pushed the 3D map orientation technology based on satellite image diaphragm, Google Earth, it also pushed the online war game GEWar taking Google Earth as the platform. The new edition map service issued by US Microsoft could simulate “Virtual Earth 3D”, offer the vivid simulation of real world, establish real and sensitive construction model through pictures and make users “fly” and enjoy the diorama in the browser. The implementation of web virtual reality based on WEBVR is the result to effectively integrate “social media” and “user-generated content”.

1. Characters and development foreground of the virtual community technology based on WEBVR

In existing WEBVR virtual community, users browse through user website and log in the system user main interface through web browser, browse through the classification content according to the main control menu, interact with community activity according to system information, and produce interactions with other virtual people in the activity.

The webpage issuance mainly depends on WEB3D technology and WEBGIS technology, and the integration part adopts the system frame idea of the design mode and implements data transmission by virtue of XML document, and uses XHTML and CSS standardization representation, and uses DOM to realize dynamic display and interaction, and uses XML and XSTL to implement data exchange and data processing. The system structure of data exchange is seen in Figure 1.

With the quick change of Internet, Internet continually goes deep into human livings and WEB3.0 will largely change the Internet form of human living. As same as WEB2.0, WEB3.0 is not the technical innovation, but the idea innovation, and guides the development and application of the technology. WEB3.0 will create new virtual community which will be divided not by the terrain and border, but by the interests, language, topic, occupation and specialty. Everyone could create a new Internet kingdom and be the king, and be the president through democratic election in the Internet kingdom, and at that time, you will possess web citizens from all over the world.

As the substitute of WEB2.0, WEB3.0 is still based on WEB2.0, and is the Internet mode which realizes more intelligent communication among humans and between human and machine. Based on the grasp to WEB3.0 concept, in this article, we think that future web community should be new digital technology based on web virtual reality technology and intelligent information customization, and develop to the directions of subsection, specialty and compatibility.

- (1) The information in the website could directly interact with information in other websites, and could be integrated and used in multiple websites through the third party information platform.
- (2) Users possess their own data in the Internet and the data can not use it in other websites.
- (3) WEB3.0 is completely based on WEB, and can implement the function that complex system program can only possess by browser.

2. Structure and characters of RIA system

RIA is the next generation web application which combines interactive user experience of desk application with the deployment flexibility and cost analysis of traditional web application. The rich client technology in RIA connects with existing back-end application server through offering the running environment which can load compiled client port application (transferring by HTTP and the form of file) and using asynchronous client/server frame by client application, and it is a sort of safe and updating and service-oriented model with good adaptability, and it simplifies and improves the user interaction of WEB application, and the developed application can offer more abundant user experiences with more interaction and response. At the same time, it can realize more visible and effective application service of user experience with more responses, and it can develop the application combining the strong interaction and the abundant content of desk software with the extent of web together.

The concept of “rich” includes two aspects, i.e. the “rich” of data model and the “rich” of user interface. The “rich” in data means that the user interface could display and operate more complex data model embedding into the client port, and could operate the computation of the client port and asynchronously send and receive data. Relative to traditional HTML page, the advantage of this mode is that the program runs at the client port and the program can interact with the server few when it interacts with users more. The complex data model balancing client port and server port can give you larger space to establish more effective and interactive web application. The “rich” can also describe the completely improved user interface, and HTML only offers users very limited interface control elements, and the user interface of RIA offers flexible interface control elements which can better combine with data model. Traditional Internet model uses the linear design and offers users some choices, and then users send choice results to the server, and this single mode doesn't accord with the flexible and interactive requirement of application and users' wills. Frequent server requests and page fresh have many deficiencies such as slow page opening speed and reduced network bandwidth. If the rich client interface is adopted, the part of application only receiving the requests could make corresponding change, but the former server response would influence the whole interface. That means the interface will be decomposed into many independent models which will make responding reactions to received information, and some of them will interact with the server port, and some of them are communications among these models.

The applied character of RIA includes following aspects.

- (1) Strong interaction. RIA offers abundant UI components, strengthens localization and uses distribution to manage the components. Label guide, collapse column and tree catalog have approached to the development modes of AWT and SWING.
- (2) Direct management. Using RIA, user and interface interaction only need the part needing to be disposed. The request/return model is not necessary for all user interface actions, and the computation of the client port can directly realize the responses of users' requests.
- (3) Multiple-approach processing. RIA allows development personnel to put all contents in one interface and add

conversion and effects, and makes users more easily know the context and work flow of the application. It can mainly deal with certain approach and easily be moved among approaches in the application.

(4) Client caching. Under the environment of RIA, data can be cached in the client port, and the user interface with quick response speed and small times that data come and go the server can be realized, and the EMS memory consumption of the server can be reduced, and the resource allocation will be more reasonable.

(5) Text independence. RIA text uses a sort of opening vector graph description language based on XML, so the text can be searched by the web search engine or be inquired and compiled by the user browser.

(6) Platform independence. The language style is consistent for all client ports, so the code should not be rewrote for different applications.

3. The virtual community frame based on WEBVR and RIA

RIA offers a strong technical platform which makes the computation ability of the client port can very approach to the desk software system or the ability of the client computer in traditional C/S system, and it is fit for the traditional N-layer development process. And it can also be integrated with residual environment to develop existing application but not implement large numbers of modification. The virtual community frame based on WEBVR and RIA put forward in the article is seen in Figure 2.

Under the system structure of WEBVR, the former so-called concept of single data center has not existed, and the model and geography information may be distributed in any nodes of the web, so it is urgent to make users find and use needed data in tremendous amount of Information Ocean. In addition, 3D web virtual community possesses large numbers of data with different formats, and it is a very important problem to effectively manage these data and realize information sharing. Facing this actuality, the space data storage, transmission and representation under the environment of RIA can obtain satisfactory results. Because RIA server text uses a sort of opening vector graph description language based on XML, so it can not only be used in the exact expression of data, but offer effective method of data communication among asynchronous information systems. And most present browsers all support FlashPlayer, so the client port needs not download any data processing components. For numerous non-professional users, they can conveniently organize and issue their own space information resource through various universal RIA visualization creation and editing tools and make WEBVR resources and other web resources can be shared conveniently by the whole society and fully exert their own values. On the other hand, WEBVR based on RIA can make the map in front of the client port possess more abundant interface expressive force and support complex image interaction, and make WEBVR become into real interactive system.

Furthermore, the technical characters of RIA also decide that it is fit for the large scale data-oriented application. WEBVR is developed in the process converting from system-orientation to data-orientation, so whether for practical meaning or for theoretical meaning, RIA has very important meaning for WEBVR.

4. The key technology of virtual community based on WEBVR and RIA

The 3D virtual community platform based on WEBVR and RIA adopts the bottom integration frame including WEBVR, RIA and WEBGIS, and integrates web foregrounding platform module, background 3D scene map module, virtual community construction module and compressive system integration module. Its total frame uses the idea of design mode for reference, harmonizes the complexity of time and space, and enhances the natures of re-plantation and extension. For the concrete implementation of the technology, the platform uses the technology of automatic modeling which can automatically identify and acquire data and enhance the production efficiency. The platform also could establish the multidimensional data pyramid model, classify and compress the multidimensional data of various kinds of scene into corresponding data layers. For the data transmission between the client port and the server data, the platform can optimize the transmission through the transfer algorithm and implement parallel transmission of multithreading. And the platform could realize seamless integration and display multidimensional data by using the 3D panorama imaging technology and the 3D model imaging engine technology through the expressive mode of 3D reality simulation.

4.1 Seamless combination and low delay load based on browser non-insert multidimensional data

For the vector data, the platform establishes a set of vector data real-time reading, converting and rendering system from the bottom layer, and it can translate the vector data into the data format supported by the browser for transmission, i.e. the server port directly reads the vector data, and plots them to supportable format and sends them to the client port. And then the platform connects the data produced from the foreground vector data resource with 3D data resource. The platform uses exact mathematical algorithm and VR theory, considers the link compactness and the strain of the effect representation, and finally achieve the effect of seamless link through multiple times operation, which can not only inosculate with the reality but represent the art property.

After opening the browser, the system adopts pre-load technology with classified batch and parallel reading to the

multidimensional data. In the 3D space data transmission process, the single task program execution efficiency is low, and if blocks happen when program receives data input, the program can keep on running after the program obtains data. In the web environment, because the system usually receives and accepts data, if the blocks happen in the process of receiving data, the program will be in the waiting state and can not implement any operation, and this web application can not let users implement normal web interaction operations. The 3D virtual community platform based on WEBVR and RIA can overcome these problems, and it can execute multiple relatively independent threads simultaneously, establish the thread which could be used in 3D space data input, the thread which could be used in data output and the thread which could be used for data processing at the background. If the input data thread is blocked when receiving data, the output data thread and the data processing thread can still run. The design of multithreading 3D space data web transmission would largely enhance the acquisition execution efficiency and the parallel processing ability of 3D space data linking multidimensional data server through the web, and it is specially fit for the web environment and multi-computer environment.

4.2 Real-time interaction between server and client 3D information

Utilize asynchronous document transmission technology to implement interaction between the operation layer and the data layer, encapsulate the 3D information and the geographical data coding and transfer to the data layer, and through the query computation of the data layer, and the final result will be feed back to the operation layer and implement reverse coding. Implement web transmission taking XML document as the carrier to response users' operations real time.

4.3 The combination of Web community and 3D VR technology

Use Web3D to realize the VR display on the web, establish a 3D scene, and users can run in the scene from the first visual angle. The interaction created between the scene and the controllers and the HD pictures will make users be personally on the scene. In the 3D web virtual community, everyone will integrate his ID and behaviors in different web activity spaces, and map a complete self in the virtual space, and everyone will have a his own multidimensional image, and users can change his dress and body at will. Based on that, for the design of the client port, adopt RIA technology, possibly offer IM, Blog, page customization, information customization and usual software interface, and make users' usage more convenient and fulfill individual demands.

4.4 The automatic 3D modeling technology through identifying and simulating acquired data

Based on the theory of pattern recognition, automatically classify the acquired data, and divide them into segment grain data and overall arrangement image data, utilize multi-angle and multi-orientation acquired overall arrangement image data to establish the outline models of various architectures in the scene and put up the position relation of the model group. Correspond the segment grain data with the architecture surface at the corresponding position, and implement pastes after optimized processing. This new technology could make the 3D model be quickly and automatically simulated and established.

5. Implementation and expectation

In this article, we select the "real-time interactive 3D simulation web community platform" as the applied case. And the platform possesses following five characters for the interactive experience.

- (1) Possessing abundant interface expressive force and quick interactive speed.
- (2) Offering multiple information representation and 3D scene visualization function.
- (3) The information loading speed is quick and users' waiting time is short.
- (4) Click the measurement point on the WEB-3D Map, the detail geographical information can be displayed. And in the information display column, HD pictures, 360° panorama graph and VR scene are especially fit for issuing to the public.
- (5) Realizing the connection with other governmental information databases, and users can directly interact with charts and acquire deeper information.

The development tendencies such as specialty, segment and compatibility of the future web virtual community decide the distributed Internet. The occurrence of RIA offers a sort of effective mechanism about information display, organization, sharing and utilization for WEBVR. As a new tool, RIA has many parts lacking in clear definitions and perfections to be developed further. We will continue to deeply study the technology of RIA. We hope the research of RIA can guide the development and practice of WEBVR community, and further enhance the computation ability of the client port, and fulfill human more and more intensive individuality demand. Otherwise, the enhancement of function also induces many hidden safe troubles which should be improved in our future researches.

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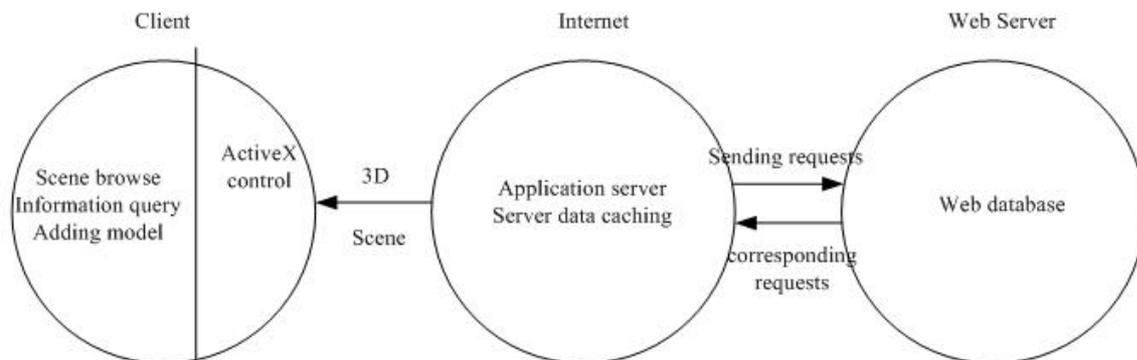


Figure 1. The System Structure of the Network VR Based on Web-3D

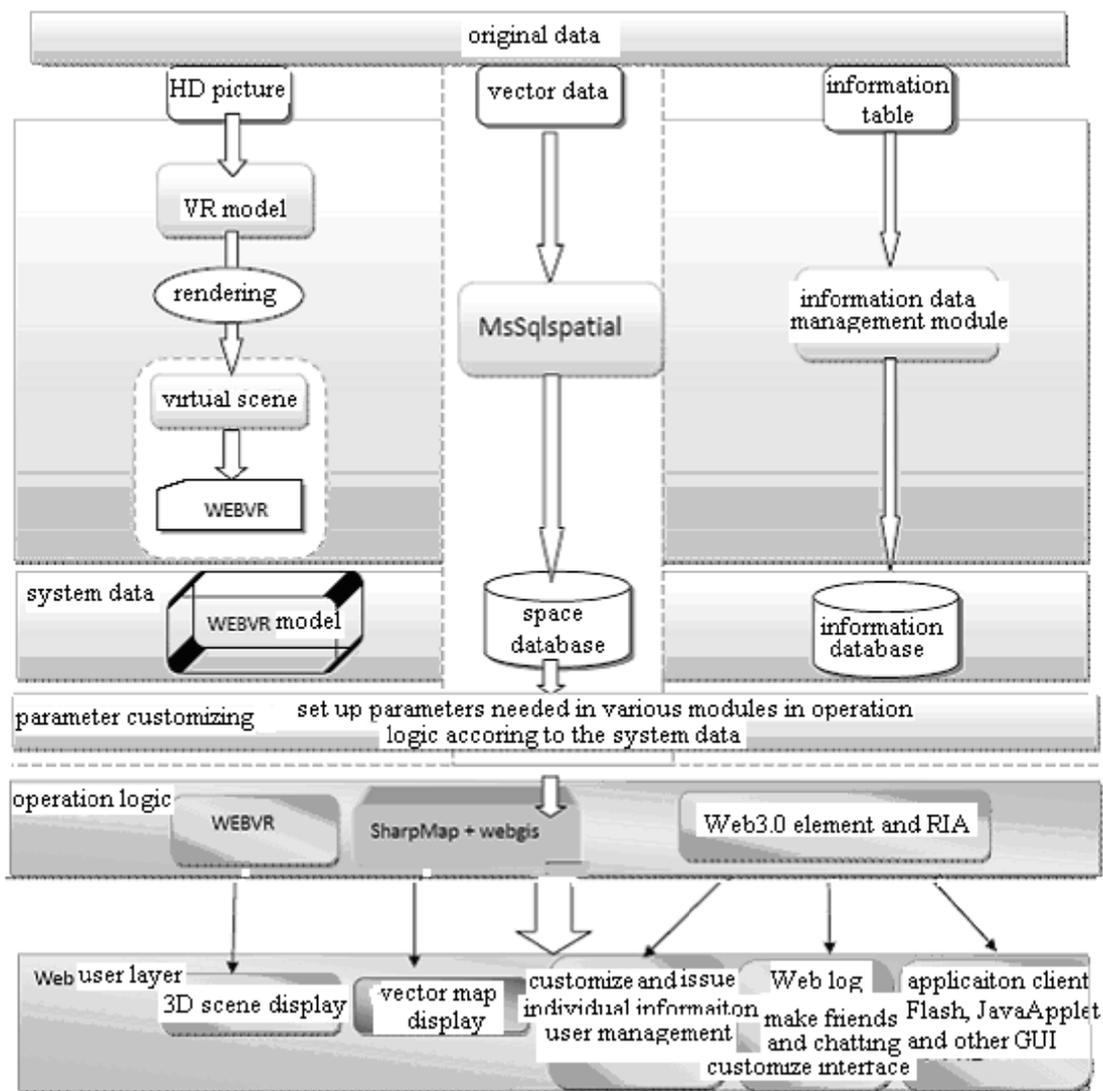


Figure 2. The Virtual Community Frame Based on WEBVR and RIA