Construction of on-line video conference system based on Flex and FMS

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Abstract—The effectiveness in communication and the great economization in time and cost make the video conference system become an important application today. If the video conference system can be constructed on Internet, its practicability and application value will be improved greatly. However, with traditional web page techniques, it is difficult to construct a video conference system that has many complex functions. In this paper, we study the method of developing on-line video conference system with the RIA (Rich Internet Application) technology, and build a prototype system by using Adobe Flex and FMS (Flash Media Server) as platform, which are two important tools in RIA. In the system, multi-users can login the conference page and communicate with each other by video and voice in real-time. The system also provides text chat function and certain administrator function. Experiment results show that our system is feasible and effective. The technique provided in this paper is also a good reference to develop other on-line video communication applications and other rich Internet applications.

Keywords-RIA; Flex; FMS; Video Communication

I. INTRODUCTION

Video conference system，also known as Conference TV System, is a system that can be used to achieve real-time communication and interaction among two or more different parts of individuals or groups by transfer videos, audios, images and documents through certain transmission lines and multi-media equipments[1]. With video conference system, conference participants can not only talk to other people, but also to see their expressions and movements although these participants may be far away in space. Because of its great application value, video conference system has become a hot researh and development topic these days. At the same time, Internet has become the most popular media and tool in people's daily life and production. If we can develop the on-line video conference system, by which people can hold a video conference in Internet through web browsers, it will undoubtedly have the best facilities and application value.

However, traditional web technologies mainly support text and image display, and it is difficult to present multimedia and wide range of information on a web page. So these traditional web technologies can not meet the demands for constructing a video communication applications. In recent years, Rich Internet applications (RIA) technology emerged and became an important way for developing Internet applications. Comparing with traditional web technology, the page built with RIA technology can express richer interface features; more importantly, RIA clients can achieve better information response and update because of

the use of "asynchronous communication" [2,3]. While, a traditional HTTP protocol-based page must jump and refresh the page to complete the response and information update.

There have been many technical solutions to realize RIA applications. According to the development and application features of video communication system, we select Flex and FMS as the primary means for developing system. Flex is an application-layer solution scheme of the rich Internet application aiming to enterprises. It provides flexible and powerful development capabilities. More importantly, Flex applications are based on the most popular network animation platform - Adobe Flash, which means 98% Internet users needn't install any additional client plug-in for running the Flex application[2]. It is undoubtedly a very important advantage for the application of Internet system, and it is also an important reason for us to select Flex. The Flash Media Server (referred to as FMS) is a real-time multimedia communications platform with sufficient functions. It can integrate with Flex seamlessly, and provide audio sharing, video sharing and data flow for network clients through Flash Player [3,4].

This paper adopts Flex for constructing the front interface, adopts FMS for processing the background video stream, and uses MySQL as the back-end database, designing and implementing a web page based video conference system. By using the system, users can communicate with a number of participants online. The system also provides comprehensive text chat functions and certain administrator functions.

II. SYSTEM DESIGN AND IMPLEMENTATION

In our system, the front interface is developed in Flex Builder, and some event handling functions are added in different modules; the functions of login authentication and registration are implemented in the Web Server *Tomcat*; background viode stream is processed in FMS, and Mysql database is used to store user information.

A. System Design

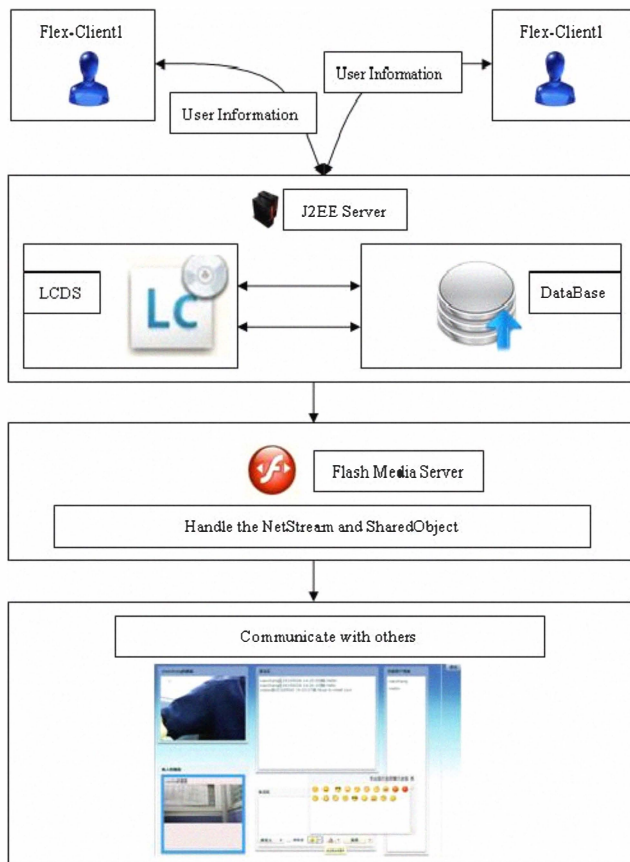The modules and functions structure of our system is show as Figure 1:

Figure 1.   Modules and Functions structure of our system

Figure 2.   Login module

The system consists of Flex front, J2EE Server and FMS backstage. Flex front receives information entered by the user, and sends the information to J2EE Server. J2EE Server receives the information and check it with the information stored in database. The backstage of FMS server broadcasts user's video streaming to all the other users, and so realizing the video communication on Internet.

System modules are introduced as follows.

B.   System Interface Design

System interface design is carried out in Flex Builder. An intact Flex program is composed of MXML code and ActionScript code MXML, which is based on XML, is used to set and design the interface and the data model of presentation layer; ActionScript, which comes from ECMAScript, can be used to design Flash animation.

Clients include three modules: user login, user registration and chat rooms. We design the view of these modules first, and then add the incident response and processing functions in these modules. Each module is composed of several components, such as Login module, as shown in Figure 2.
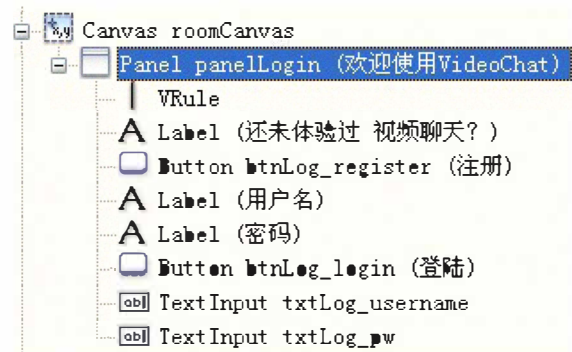
The switch function among the three modules is implemented by class *States* in Flex. Class States defines the view state, that is the components of a particular view. State properties can only be specified in the root of the application or custom controls, and can not be specified in child controls [5]. In the States view, you can see the three structures of state, as shown in Figure 3.
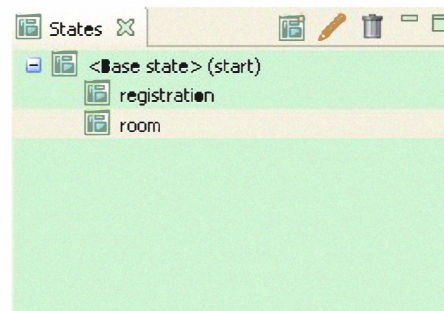

Figure 3.   the construction of States

After interface designing, we can add corresponding processing functions for each module.

1)   User login module

We use Flex's URLLoader and URLRequest to realize the processing function of this module.

Class URLRequest can capture all of the information in a single HTTP request. We add respond event in the login button as:

btnLog_login. addEventListener(MouseEvent.CLICK, checkLogin);

When a user enter user name, password, and click the login button, the function *checkLogin* will be implemented. The parameters user name and password are then passed to backstage. A JSP page can acquire the two parameters by calling *request.GetParameter ('user'),* and connect to the database for authentication. If the user exists in database, and password is correct, the page will return value *True,* and function *checkLogin* will new a instance of URLLoader, called *loader*. Several listening events are added in *loader*. The function *checkLogin* will handle the returned value from the page; if the returned value is *True,* the user will be

permitted to enter the chat room, or an error message will be prompted, and user name and password are cleared..

2) User registration module

Data validation in client-side is a humanized feature in RIA. Without data verifying in client-side, the error or promot information will not emerged until the wrong data are passed to server-side. In the process, not only the network resources, but also user's time and patience are waste. Using real-time data validation in client-side, interface will be very friendly.

In our registration module, the data validation function is implemented by several *Validator,* and these validation object, *StringValidator,* for character verification; *PhoneValidator* for the phone number verification; *DateValidator* for date verification and *EmaiValidator* for e-mail authentication.

After filling out intact and correct registration information, and clicking register button, client will connect to the database, and the data will be written to the database; then, user can enter the chat room.

3) Chat room module

Chat room module includes video function, text chat function, user list display and Administrator function.

a) Video function

Video function mainly use the Flex class *NetStream* which is in the flash.net package. NetStream opens a one-way streaming connection between Flash Player or AIR and Flash Media Server application or the local file system [6].

b) Text chat function

Class *SharedObject* is used in user's computer or server to read and store a limited amount of data [7]. Using shared objects, real-time data sharing can be realized between multiple client SWF files and objects permanently stored in the local computer or remote server [8,9]. Local shared objects are similar to Browser Cookie, and remote shared objects are similar to the real-time data transmission equipment. To use remote shared objects, Adobe Flash Media Server should be used.

c) User list display

This module can list all the online users, and it is a assistance for realizing the administrator function. The component *list* is used to show the user list. In server side, an array *userList* is defined to store the information of all the connected users. When a user enters or exits, *userList* will be updated.

d) Administrator functions

In our system, the first user who enters the chat room will be defaulted as administrator. Administrator has the privileges to kick other users or upgrade other user as new administrator. After upgrading other users as administrator, the old administrator will become as ordinary user.

C. Flash Media Server Side

Macromedia Flash Media Server is a powerful server platform. It can be used to create rich media applications in Macromedia Flash, as well as import audio and video stream

into the Flash client side. Flash Media Server allows two or more people use text, audio or video to participate in a real-time conversation [10].

We create a new folder named VideoChat in the installation directory of FMS application folder. In VideoChat folder, a text file named main.asc or VideoChat.asc is created, this file is used to store server side code which is used to monitor user's state of connection and disconnect, and makes appropriate action.

When the client link to the server, the server will accept corresponding information. The code is as follows:

application.acceptConnection(currentClient);

Administrator has the ability to kick a user, the code is as follows：

```
currentClient.setOut = function(value){
    for (k = 0; k < application.clients.length; k++){
    if(application.clients[k].username==value) {
        application.onDisconnect(application.cl
    ients[k]);
        return;
    }
    }
}
```

D. Database Design

In the system, user registration information needs to be stored, and used for login validation and other administration functions, So a database is needed. We use mysql database to store the user's name, gender, email, password and other related information.

A information table is created with MySql-front, and the various fields in the table is listed in table I.:

TABLE I. USERINFO'S FIELDS

Field Name	Field Type	Field Description
id	Int	Unique identifier, since by type, primary key
username	varchar(20)	User's name, maximum length of 16
password	varchar(20）	User's password, maximum length is 16
mail	varchar(150)	The user's email address, the maximum length of 150
gender	varcha(6)	User's Gender
tel	varchar(15)	The user's telephone contact, the maximum length of 15
birth	Date	The user's birth date, format 20090608

The datebase designed in MySql-front is shows in Fig 4.

Figure 4. The view of userinfo table in Database

III. EXPERIMENTAL RESULTS

Users can access the system through a web brower. The system interface is show in Fig 5.
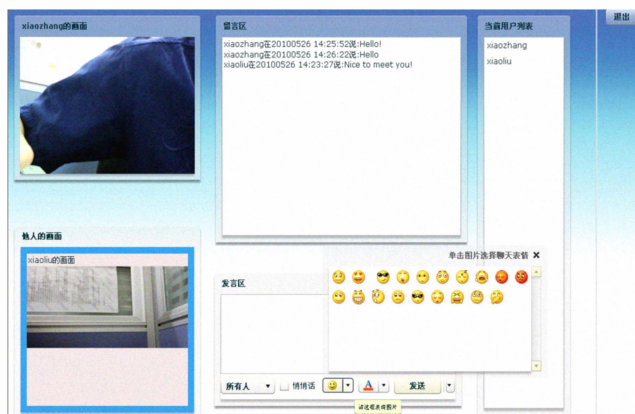

Figure 5. Video chat and text chat

In our system, users can communicate with various ways: video, audio and text. In text chat section, users can set the font color, bold and italic. The system has provided the kernel functions of video conference system, and experimental results show that users can communicate in the system very conveniently.

IV. CONCLUSION

This paper discusses the technology and method for designing and implementing on-line video conference system based on Flex and FMS. It propose an intact system development process and the design of all the basic modules. A prototype system is developed. The method presented in this paper can be used as the basis for the development of a more complete online video conference system, and it is also a good reference for developing other rich Internet applications.

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