Di   Zhang

A Photo Sharing Application for Android Mobile Device

Information   Technology

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FOREWORD

After six months' efforts, a photo sharing application for Android mobile device is completed. It has achieved basic requirements and major functions with limited time, which include the user login process design, main UI module, photo module and the server module.

Through this project, it provides a chance to understand of the Java, Android platform and MySQL database from theory to practice: combination of these technologies, and gaining further understanding the rules of application development. After learning Unified Modeling Language (UML), design of sequence diagram, component diagram, class diagram and use-case become easier; they offer an application's architectural blueprints. Certainly, QFD control and manage well the project. To enable to study other knowledge, Socket technology is applied to connect client with the database, since socket owns a great expansibility.

ACKNOWLEDGEMENTS

After six months 'efforts and hardworking, this thesis is coming to the end. Without supervisor's support and guidance, I cannot finish this task because of lacking experiences and considerations. To fulfill it alone is unthinkable.

I would like to appreciate my supervisor Ghodrat Moghadampour. He has a whole stack of work at school. However, he provides a lot of supports during my thesis period including choosing topic, deciding design draft, edition and later detailed designs. His suggestions and advices are very clearly and helpful. It is a key point to success in thesis. Of courses, my classmate's and friends' help also play an important role in this project. Their supports solve my confusions when I met difficulties.

Then, I also want to thank all my teachers teaching me a plenty of useful knowledge in information technology during these academic years, and help me to become an Engineer in future career.

I am greatly honored to graduate from VAMK.

Di Zhang

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ABSTRACT

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Nowadays, photo sharing application becomes more and more popular and own large users of different mobile device platform. It is like a bulletin board system and also Facebook. Many young people use this kind of website to communicate with others through the world.

This program is a client server application that can run on a mobile phone, and a Java Servlet is the server terminal. SQL and Java Servlet will be applied in this program. The client application was developed for Android mobile operating system. It is better to be applied on a mobile with camera, because through the client application user should be possible to take a photo. Moreover, the client side can also upload photo with comment and send it to the server. The server application can receive the data and save the data to a SQL database. And it also allows reviewing user basic information, comments, images and upload time of all users data when browse the main page of the application.

After several months 'design and development, the application achieves all the functions running on mobile phone of Android platform. Certainly, I have encountered a lot of problems during design and test procedure, but finally solve them by reading books and inquiring teachers and classmates.

ABBREVIATIONS

OS	Operating System
IM	Instant Messaging
UI	User Interface
JS	JavaScript
UGC	User-generated Content
SMS	Short Message Service
SQL	Structured Query Language
JSP	Java Server Page
QFD	Quality Function Development
JDK	Java Development Kit
SDK	Software Development Kit
AVD	Android Virtual Device
GUI	Graphical User Interface
UML	Unified Modeling Language
JDBC	Java Data Base Connectivity
HTTP	Hypertext Transfer Protocol

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1   INTRODUCTION

1.1   Backgrounds of the Topic

By making use of technical advantage of the Internet and mobile technologies, the forms of social media and communication have been developed and improved greatly nowadays (The Levin Institute, 2011). Mobile social networking service, maintenance contracts for large distributed networks, with the theme; social services can complement or replace traditional ways, facial or other form of interactive dialogue; social tools and services, such as e-mail and instant messaging (IM), and in particular social media exchange between people or groups is fully supported (Lugano, 2008), which includes a set of Web-based applications, social media Web 2.0 and mobile technology that allows creation and exchange or sharing of user-generated content (UGC) (Andreas M. & Haenlein, 2010). Merging technology of mobile social media provides technological integration supports social opportunities for shared activities without location and time limitation (Lugano, 2008).

At present, despite the proliferation of smart phones, mobile internet services just cater a little customers, because short message service (SMS) is still dominated most of mobile data traffic. Using state of the art is not only decided by the unpleasant availability of service or marketing strategy, but also need to consider that phone calls and text messages can be critical social applications of mobile technology. Massive popularity of mobile multimedia applications can explain the different way to increase income and will contribute to the revitalization of the mobile market, and provide an opportunity for social communication. It is clearly to see that the phenomenon of mobile communication enters daily life and enable

people to communicate more conveniently. However, there still exist some defects in scalability which occurs in phone calls and text messages (Lugano, 2008).

In 2011, mobile photo sharing service has become increasingly popular. Large networks and applications providing possibility to share photos through uploading photos from mobile phone to social networking such as spring up like mushrooms. Instagram is noticeable, as it serves the mobile social network with more than 15 million people. (Macgasm, 2011) Such as Path and Picplz, they also apply photo sharing service. They represent a new stage of photo sharing which means a time of taking photo immediately by mobile phone and sharing high quality of photos is coming.

Android is a mobile operating system applying in mobile device, such as cell phone or tablet computer, and it is one of most popular mobile intelligence platform. It brings Android storm in Smartphone because of application in mobile devices. Android is an open source system, so it gains support from many mobile phone manufactures, Android's interface becomes richer and has better selectivity through manufactures' development; it also regarded highly by developers. There are more than million software in Android market, many of them are free for clients; Android stems from Google, and it is obviously to see that user interface (UI) and system optimization are reputable, and it provides stable operating system because of basing on Linux and every thread runs respectively. (Source Android, w.y)

Mobile Phone Market Share
1Q 2012
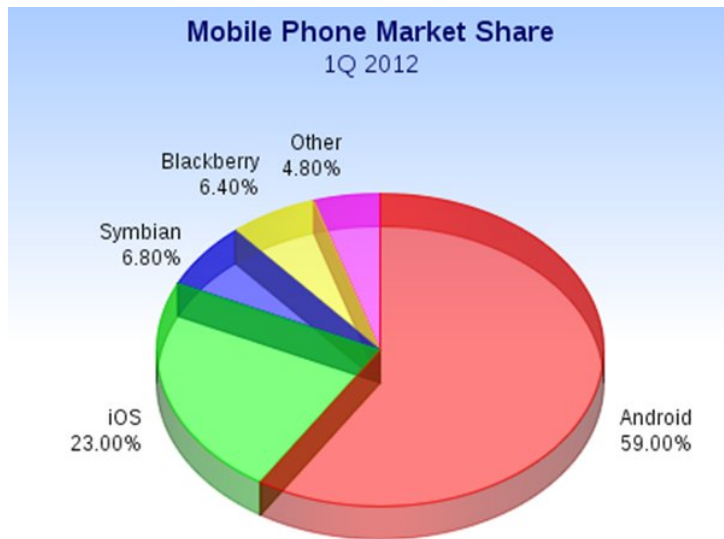
Figure 1.1 Mobile Phone Market Share (John & Mello, 2012)

In the global Smartphone market 2012, comparing to IOS, Symbian and Blackberry, Figure 1 has showed that Android has taken 59 percent of software market and it is more than a half of the global market (John & Mello, 2012). From this large portion, it is not difficult to see that Android system wins most people's high favor.

1.2 Motivations

Photo sharing is a popular mobile application, which enables users to publish or upload of a user's digital photos online by mobile devices, and the images can be displayed on the website and users can write comments and search images that they have uploaded. This service satisfies users' requirement of catching important moment in daily life and sharing private memories among friends and families. The aim of this application is to allow users taking photo through mobile phone, sharing, skimming and making comments on photos by utilizing the trend in integration of mobile phone and social networks.

Photo sharing application of Picplz, Instagram and Path bring us into a new sharing time, and they focus on how to utilize improvement of quality in mobile phone camera to meet users' demand and desire of taking and sharing photo easily. The mobile phone camera has been existed for many years; in the beginning users cannot make mobile phone as major device for photograph because of low quality of photos. However, nowadays the situation has been changed, most of smartphones enable users to take high quality of photos which have little difference comparing with digital camera, and some even have higher quality. Thus, more and more people choose to take photo, save them and share wonderful memories through mobile phone. The common faith of mobile phone users is to find a mean of taking photo and publishing it without obstacle, reducing the time and energy of transfer photo from mobile device to PC desktop finally uploading to the website. This is the necessity of designing and developing of photo sharing application.

1.3   Short Description of the Topic

This thesis is a regular supplementation to mobile services, through the many to many communication models, and it also discusses about integrate this popular social mobile service with the state-of-art Android programming technology to design and implementation of a photo sharing application, and design database of web server and web page will also be involved.

1.4   Objectives

The application should run on Android platform of a mobile phone. The user account can be registered through the registration module, and then through the account sign-in system, the client is access to the database, user can search, review

photos, modifies the operation of the personal information and upload photos which are taken by mobile phone.

A web server is also developed at same time. Registering an account at MySQL-http://mysql.cc.puv.fi/ (works in intranet only) (VAMK, 2012), is used for creating a database. The web page design is also needed to be achieved.

For the learning goals, the knowledge and skills of Java client server programming, Quality Function development and software management can also be more proficient and gain a deeper understanding.

2   RELEVANT TECHNOLOGIES

2.1   The Android platform

Android is an open operating mobile phone system based on Linux platform and launched by Google in 2007. It allows any mobile terminal manufacturers to join Android alliance. Remarkable opening enables Android to get more developers, as users and applications growing, a new platform will become mature soon. (Developers Android, w.y)
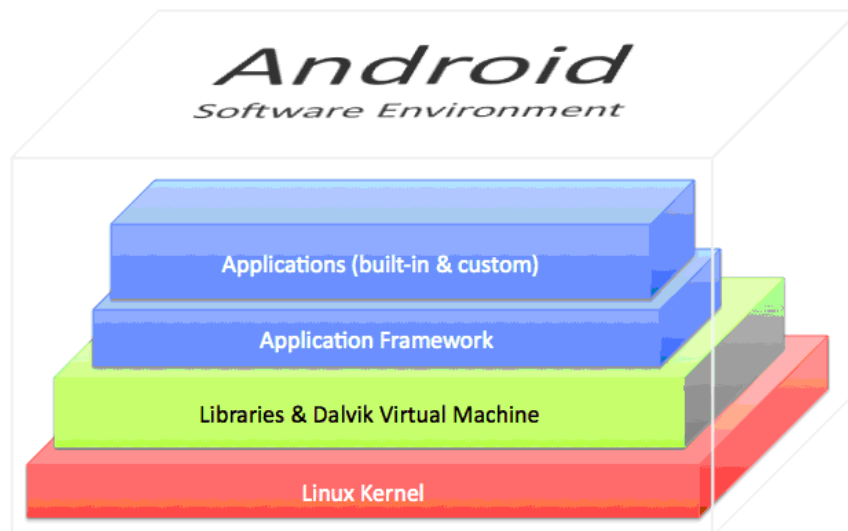
Figure 2.1 Android Software Environment (Skogberg B.,w.y)

Android platform is composed of operating system, middleware, and user interface and application software. There are four layers of Android system architecture. From Figure 2.1, they are application, application framework, libraries and Dalvik Virtual Machine and Linux Kernel from the highest to the lowest layer.

Android owns four developing components. Activity applies for expression; service is used for backgrounder and not provides interface render; broadcast receiv-

er receives broadcast; content provider supports storage and reading data in many applications, and it can be seen as database. (Developers Android, w.y)

2.2   JavaScript (JS)

JavaScript is a scripting language not a same language as Java and has different function. As an independent of programming language, the main application is creating dynamic web page and special effects. It is easy to response user's request instead of transfer data via network. JavaScript is implemented on client and it promotes greatly surfing and interactive capabilities. Meanwhile, it is a simple specialized programming language and made to measure web design. (Flanagan, 2006)

2.3   Java Server Page (JSP)

Java Server Page is a page of the server operation and is a file. It includes static HTML and dynamic Java code. The servers' container transfers JSP into Servlet, publishes and accepts request, and the file of JSP is just under application files. When a client requests a JSP page, the engine will create a Java file which is a Servlet. (Falkner & Jones, 2003)

2.4   Socket

Socket is cornerstone of communication and a basic operating unit of supporting TCP/IP protocol. It is an abstraction of endpoint in the network communication which contains connection using protocols, the local host IP, local process protocol port, remote host IP and remote process protocol port. There are three steps in connection: server monitoring, client request and connection confirmation. If both sides create Socket connection, the server transfer data to client directly; if both

sides establish HTTP connection, the server only transfer data to client after receiving client's request. (Meghanathan, w.y)

2.5 Java Database Connectivity (JDBC)

Java Database Connectivity is made of Java writing classes and ports, by means of this method, the client can connect many different data system in consistent manner instead of programming different Java code for each data system.

Java application connects database via JDBC API (java.sql)   however, actually JDBC Driver Manager connect database through JDBC drivers. In a short word JDBC is able to connect database, send operational database statement and process, improve software's life circle and reduce the costs of development and maintenances.(Patel, 1996)

3 APPLICATION DESCRIPTION

3.1 Description of Project
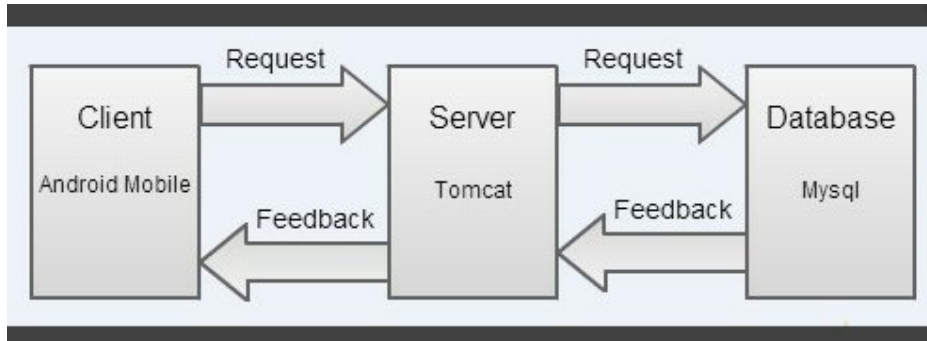
Figure 3.1 Thread of Application Design

From Figure 3.1, we can see that this application includes front-end console and back-end console. Front-end console is a client, which is based on Android platform, and back-end console contains web server which is connected with Microsoft SQL. When client sends request to the web server, the server will react to forward request to the database, then the database will response to the server, and finally the data reaches client. This is an intact circle of data transmission. This project mainly concludes back-end server, web server, internet, and Android photo application; it also applies JSP, JS, JDBC and Socket technologies.

There are some tools and design environments required:

- JDK 1.6
- Samsung i897 mobile phone with Android platform 2.1
- Eclipse development plugin ADT
- IDE Eclipse Java EE IDE for Web Developers 3.5
- Web application server Tomcat 6.0
- Database using MySQL 5.1

- Android SDK

- Client browser using IE 6.0

This application is based on C/S structure, and applies Servlet and MySQL to program to achieve data storage and operation. The mobile phone client mainly adopts Android UI technology and Activity component, and network data exchange between client and the server is implemented with Socket technology.

Android photo sharing application is web application software which is ground on Android mobile phone. It aims to provide a platform for users taking photos by mobile phone camera and sharing their daily life with their friends and family online anywhere and anytime.

3.2 Requirement Analysis

Before starting the project, some popular photo sharing applications were studied. They are references for my own design.

Today's users are eager to share life with others. Thus, uploading and taking photo are important to consider in design. Certainly, edition is also another popular function for many camera applications, it makes photo more attractive and users have more open chances to design their own images. However, edition needs more edit tools and photo frames be prepared and also it is necessary to update new materials for photo edition as a software developer, because of limited time for this project, I will improve this function in future.

This system is a photo sharing application based on Java and Android platform, and client can share photos immediately with others through web or mobile phone, and also skim over others' photos.

This application is divided into web page and Android platform. In the web server, the client can get share account via registration module, and then login to the system through the account. After sign in the application, client allows to view and search photos, and upload photos; admin account control the whole system and the main task of admin is deleting and sort of photos; normal user can visit user interface on web page after sign in, and major task include registration, sign in, search, view and uploading. In Android platform, user is possible to share photos by visiting system not only PC but also application of mobile phone; client is also allowed to register or login to the system through mobile phone, and implements searching, view, uploading photos after sign in system; while uploading, client enables to take pictures via mobile phone camera.

3.2.1 Quality Function Deployment (QFD)

Quality function deployment is a multi-level deductive analysis method which aims to transfer client's or market's demand into design requirement, components features, and technological and production requirements. It would reduce modification quantities from engineering knowledge, distinguish conflicting design requirement, put client in the key role of the whole design, and shorten product development period and lower cost of project, production and service. (Lamia, 1995)

Table 3.2.1 QFD Diagram of Requirements Analysis

Function	Importance of Photo Quality	Importance of Photo Sharing and Comment
Friendly UI	3	2
Registeration and Login	1	1
Edition of Photo	1	3
Sharing Photo and Making Comments	3	1
Photo Categorization	3	2
Search Image by Multi-keywords	3	1
Supporting Front Camera	3	1
Free of Charge	1	1
Collection of Photo	3	2
Updating User Information	3	1
Deleting Uploaded Photo	2	2
Receiving Likes and Comments	3	1
* Must Have--1, Should Have--2, Nice to Have--3.		

Generally, registration, login and free of charge are most important features for all users to choose this project. However, different users have special needs. For those who are focus on photo quality which is the first group, edition of photo is another attractive point for downloading this application, friendly UI is somewhat important for accompany with edition; they do not care about sharing, comments, user info and collection.

Some users addict themselves in sharing photo, receiving and writing comments. Therefore it is easy to understand these functions are critical for them. Categorization, photo search, supporting front camera and deleting uploaded photos are also very important for them. All the functions are really useful to them for sharing photos online, thus, comparing with the first group users, they make best use of it.

3.2.2　Functional Definition

The major functions of this application are certainty taking photo though Android mobile phone and uploading photo to the web server. However, there some other important functions are also needed to be mentioned.

This is a list of functions that this application has to achieve:

- Photography: utilize mobile phone camera to take photo
- Upload: upload photos to the server from client
- Storage: save photos to SD memory card after photography
- Admin account: control web server
- Review: look up history and other users 'uploading

The application also must contain other functions:

- Registration: the new user allows to register as a customer
- Sign in: the client who has registered through the application enables to login the system
- Describe: write comments after taking photo
- Search: search photo by keywords: time or character
- Display: the latest 3 photos are showed on the front page
- Delete and sort: admin account has right to leave out photos those are already uploaded.

It would be perfect if this program include following functions:

- Expend edition right: allow clients to delete their own photos from the website
- Map management module: display uploading location of photo
- Update: modify personal information of user's account
- Write comments on others' photos

The user account can be registered through the registration module, and then through the account sign-on system. Login can search, view, modifies the operation of the personal information and upload photos. Change personal information and upload photo allows uploading personalized avatar and photos.

Users in addition to access to the system through the computer, client can also install the program to access the system by phone. At the end of the phone, the user can also be registered or login system login can perform a search, view, search, and upload operation. Upload photos at the same time, allowed to pass through the cell phone camera take pictures and upload.

3.2.3   Use Case Diagram

Use case diagram is the first step of software requirement analysis to final achievement, and it expresses how people use a system. Use case shows users, what kind of service users require and services are offered by clients to the system. It helps client to have a better understanding of functions in these elements and also benefits developers to achieve them. Use case diagram is commonly used to describe system and sub-system. (Schmuller, 2004, 114)
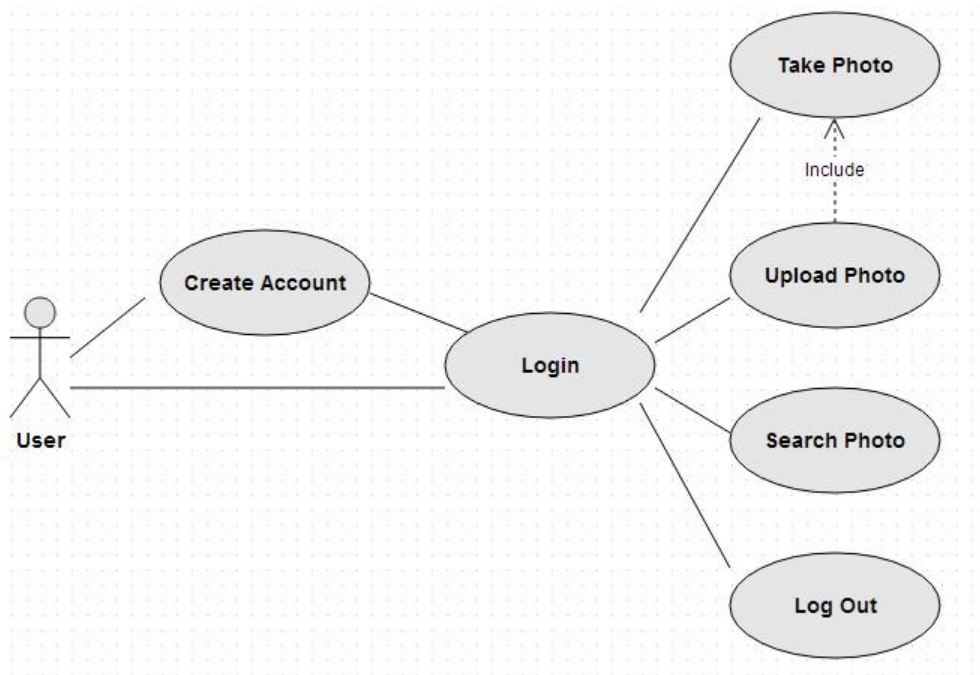
Figure 3.2.3 Application Use-case Diagram

This use-case diagram expresses how user implements this application. From Figure 3.2.3, we can see that user is allowed to have 5 actions respectively, which include create account, login, upload photo, search photo and logout. Moreover, users can take photo, and then upload it after login the system.

3.2.4 Class Diagram

Class diagram is most common UML diagram and composed of many static and descriptive model elements. It shows sort, port and their static relationships and applies to describe system structured design. Class diagram usually contains sort, port, interwork, relationships, comments and restrictions. (Schmuller, 2004, 137-141)
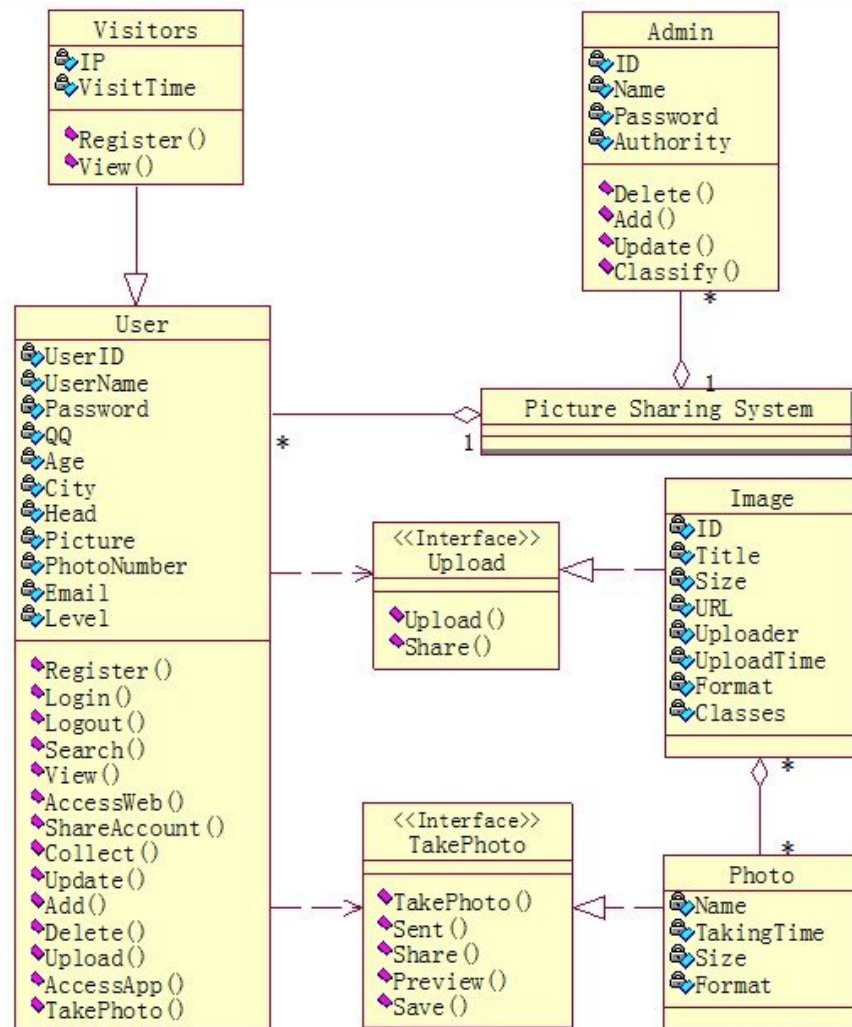
Figure 3.2.4 Project Class Diagram

The system is divided into object layer, feature layer and relationship layer to build project class diagram.

In the object layer, firstly we need to identify of active objects from consideration of problem domain and system responsibility. In the photo sharing system, initiative object is concurrent implementation, and system management and system operating are starting point for control flow which are abstracted into user class and admin class; then analyze and generalize a class of things with common characteristics, and define every object which has common property and operation as a

class; a recapitulative name will be given to a class, then visitor class, photo class and image class are abstracted. Object layer is established by these five classes generally.

Feature layer is used to define object attribute and operation through analyzing each object's static and dynamic characteristics. For the system user, his prosperity is all static information while registration which include a series of action sequences--user name, password and static data when operating system; his operation contains registration, login, view system, uploading image, updating info and image and logout. Admin account's prosperity and operation are similar with user. Image and photo own static characteristics respectively, they achieve user visiting via ports, for instance, taking photo is providing access to photo so that it forms a camera port. Uploading port is the same principle as camera port.

After analyzing inter-structure, we need also analyze relationship among these classes in order to form a holistic and organic systematic model for all objects in this system. User class and admin class are two classes related with system directly, the system can own many users and admins at same time, thus, one to much relationship exists among them. The user is a special visitor which inherits visitor's feature and develops his own features, so the relationship between them is common to special that is inheritance, and it means user class inherits visitor class. Information transmission between User to image and user to photo is achieved through their own port, however, whole and part relationship exists between image and photo; before photo is uploaded, its own servlets attribute, then it is a part of image after being uploaded, and owns picture's general property as other pictures.

Class diagram is successful created through establishing object layer, feature layer and relationship layer.

3.2.5 Sequence Diagram

Sequence diagram describes object interaction and lays emphasis on message sequence. In other words, it shows how message send and receive among the objects. There are two coordinate axes, y-axis is time and x-axis is object. (Schmuller, 2004, 165-166)
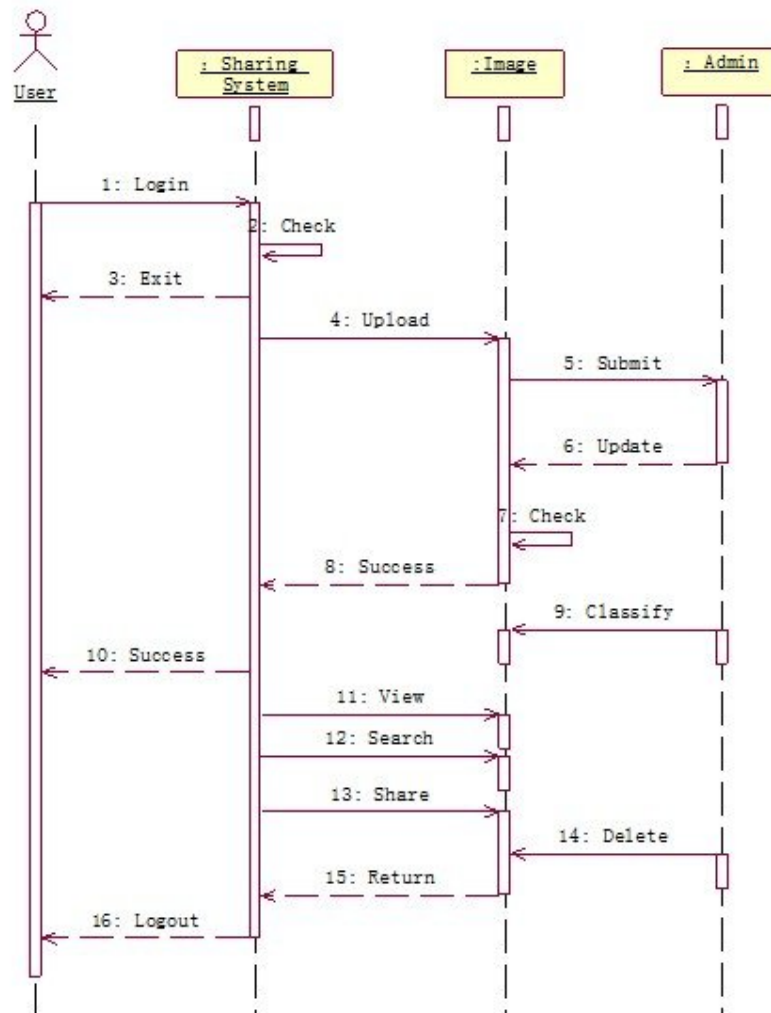
Figure 3.2.5(a) Login Sequence Diagram

User login to the system, the system will identify user name and password, user can sign in successfully if they are right, otherwise system will return to login; after sign in, user is allowed to upload photo and image, uploaded picture refers to admin for updating, then user could view picture he has uploaded, and is displayed on relevant interface in the system at same time; admin is able to sort uploaded pictures, and user is also enabled to view and search own or other's images at any time, and share their photos; admin is authorized to delete uploaded pictures which will be not displayed anymore; user can choose logout freely after finishing wanted operations.
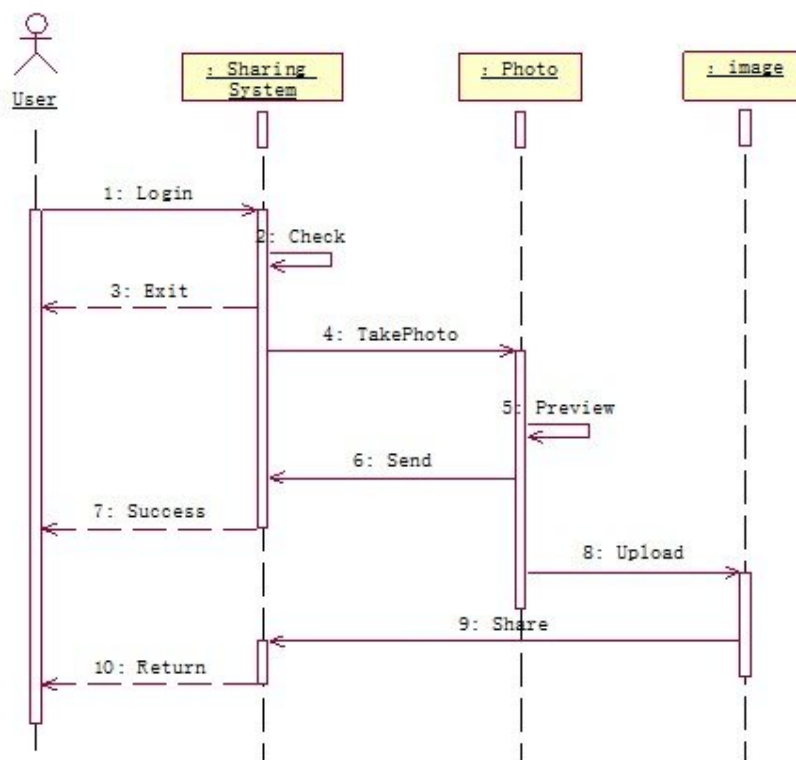
Figure 3.2.5(b) Photo-Taking Sequence Diagram

After login, user can take photo immediately, then preview the photo and share it with other users via different ways; the system will return successful message

sharing smoothly; meanwhile, user is able to upload photo to picture library, then edit information of photo or share image with other users.
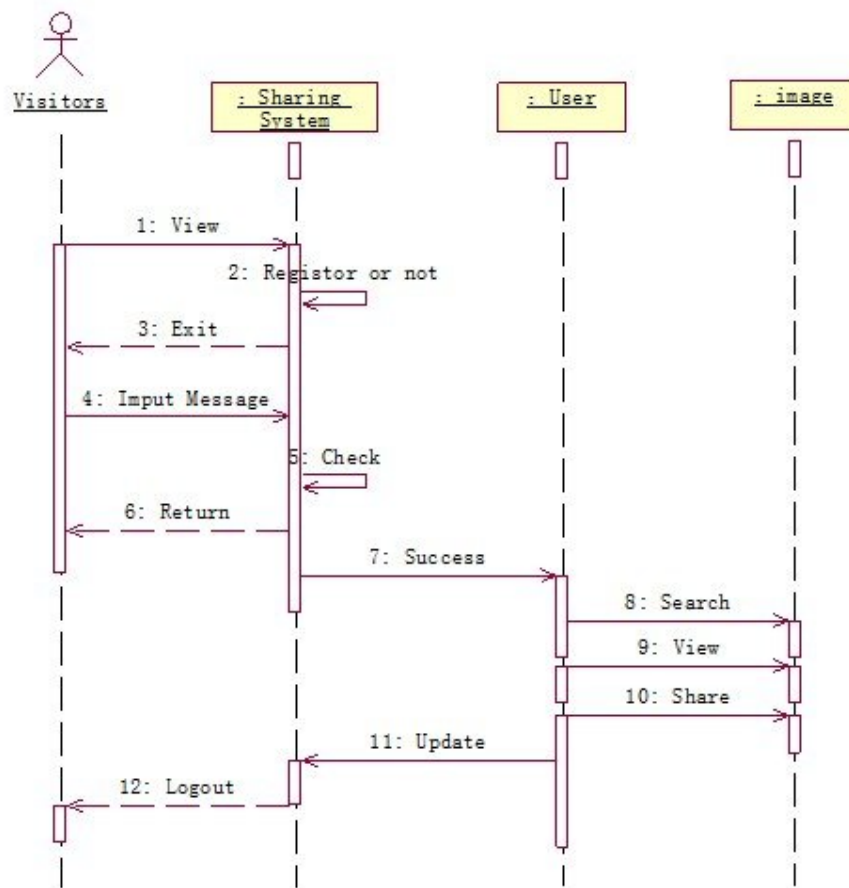
Figure 5.2.5(c) Registration Sequence Diagram

A visitor needs to register before he can do a series of operation in this sharing system. When a visitor is access to system, he will come into registration process if he chooses to register, otherwise he quits system automatically. When user try to register, he is required to input registration information and then submit, the system will evaluate information automatically, registration is successful if evaluation passes, otherwise it will return. For those who have registered, they can search image, view, and share and update personal information any time.

3.2.6 Component Diagram

Component diagram reflects physical structure of code. It helps us to understand dependency relationship between compiler and runtime in each software component. It splits system into cohesive components and displays code structure. (Schmuller, 2004, 235-236)
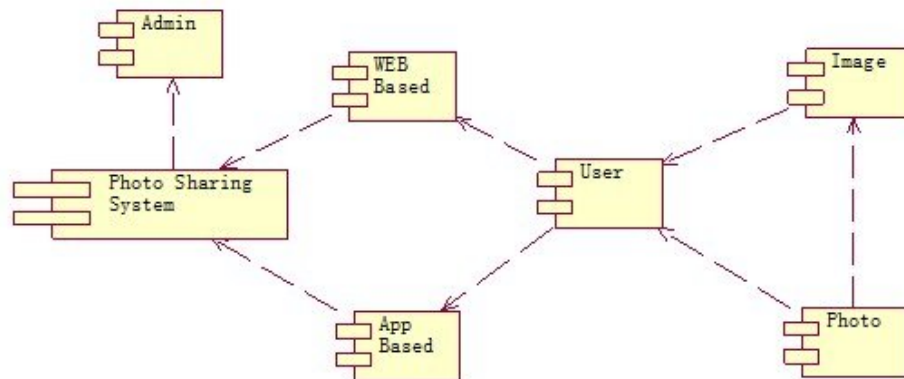
Figure 3.2.6 Component Diagram

From consideration of software structure, photo sharing system is composed of two sub-systems, one is based on web, and the other is based on application. They are asynchronous running and synchronous updating to keep consistent in back-end data of the system. Component diagram is formed by component, port and their dependent relationship; component plays a class role and is an alternative unit, and stands for a module of the system. There are seven modules isolated from the system, it means they are seven components and a series of associated operations exist among them; make a declaration for a set of actions---a port, if a component uses a port which is provided by the other component, there is a dependent relationship between them.

User can choose a sub-system to login for getting information of system, and admin just needs to control system background. Photo-taking component only di-

rects at sub-system based on application. When uploading photo, other operations are the same as sub-systematic function of web page. The final goal is to achieve sharing function in the most expeditious manner among different sub-systems.

3.2.7 Architectural Diagram

Architectural diagram shows a system relationship of hierarchical decomposition, calls between modules, transitive relationship between data and control flow among the modules. It is the main diagram tools of the physical structure of the system. (Kruchten, 1995)
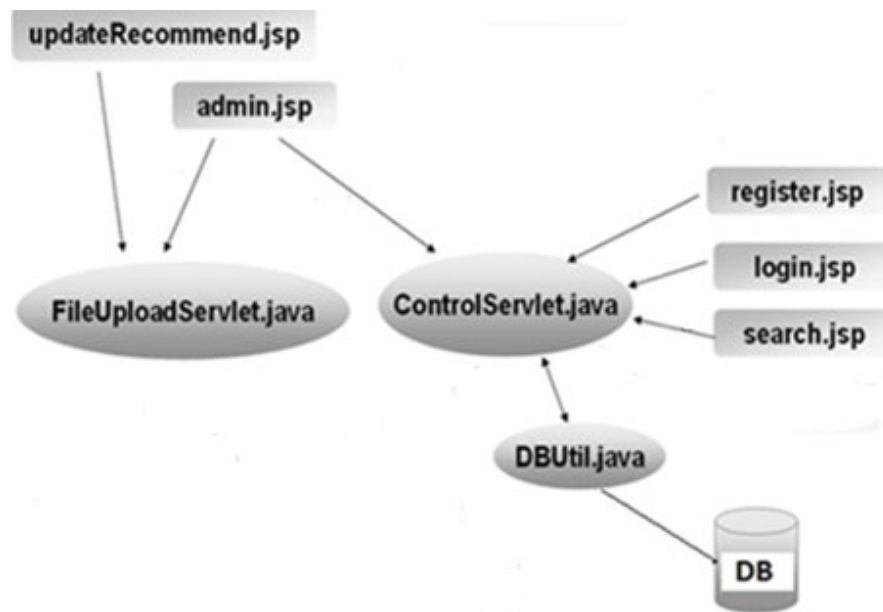
Figure 3.2.7(a) Modules in Web Server

Figure 3.2.7(a) shows that the web server is mainly composed of JSP and Servlet. The controlServlet will process the jsp requests, which contain admin, register, login and search, and select or store data to the database, and then it will create responses to the client. The FileUploadServlet will collect requests information

from jsp pages that include upload photos and admin, then forward to the control-Servlet to do the response.

The Android application architectural diagram is shown as Figure 3.2.7(b).
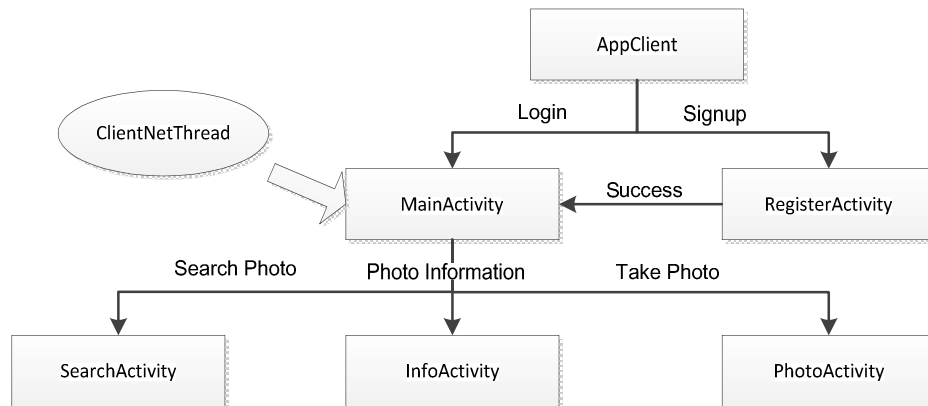
Figure 3.2.7(b) The Android Application Architectural Diagram

After user starting the program, first entered the AppClient interface, which is, when after a successful login into the MainActivity interface, and click the "register" button to enter the RegisterActivity interface. In the main, the main interface of "search" tab, click "search" button, enter the SearchActivity interface. In the search results interface when you click on food information, enter the InfoActivity interface. In the main, the main interface of "upload" tab, click "photo" button will enter the PhotoActivity interface.

4   DATABASE AND GUI DESIGN

4.1   Design of the Database

Database takes a vitally important role in information management system. The structure design of the Database determines the efficiency of the application system and the effect of the realization. This project takes MySQL database system which is free, fast, reliable and open source. Although it does lack some sophistication and facilities, but it has an active development team and, as it goes from release to release, more capabilities are added.
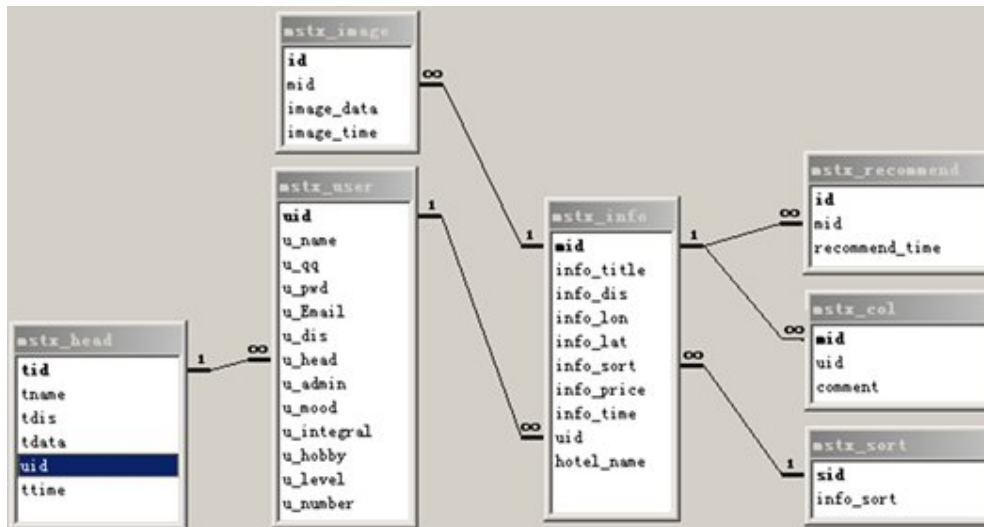
Figure 4.1. Database Entity Relationship

When creating database it should be known what should be stored and what is important and how to sort them in different tables. In this photo sharing application, the database is not complex. Figure 4.1 is the structure of what tables were created for this system, and 7 tables are created for data storage: mstx_info for photo information, mstx_recommend for recommendation information, mstx_col for comment text, mstx_sort for photo catalogs, mstx_image for photo image storage, mstx_user for app user information, and mstx_head for UI information.

In this application, user information, photo information and catalog information are described respectively in table 4.1.1, table 4.1.2 and table 4.1.3.

Table 4.1.1-User Information

User Information				
Name	Type	Length	Instruction	Description
uid	int	11	notNull/Primary Key	User ID
u_name	char	50	notNull	User Name
u_pwd	varchar	50		User password
u_Email	varchar	50		User email
u_dis	char	255		User description
u_admin	tinyint	1	notNull	User priority
u_mood	varchar	50		User mood
u_hobby	varchar	50		User hobby
u_level	int	11		User level
u_number	int	11		User number

The user information always includes name, password, email, user ID, and other details about user.

Table 4.1.2-Photo Information

Photo Information				
Name	Type	Length	Instruction	Description
mid	int	11	notNull/Primary Key	Photo ID
info_title	char	50	notNull	Photo title
info_dis	text	50		Photo description
info_sort	int	11		Photo catalog sort
info_time	timestamp	10	notNull	Photo time
uid	int	11		User ID

Photo ID, title, description, catalog, time and user ID should be contained in photo information.

Table 4.1.3-Catalog Information

Catalog Information				
Name	Type	Length	Instruction	Description
sid	int	11	Primary Key	Catalog ID
info_sort	char	50		Sort information

4.2   User Interface Design

User interface (UI) design is human-computer interaction, operating logic and interface aesthetics for software design. It enables application to become easy operation, friendly and freely. Here will discuss about UI in photo sharing application in client and the web server. There are four UI designed for client and web server respectively, which are register UI, login UI, the main UI, camera UI and search UI. They are showed in following figures.

4.2.1   Client Register UI

This is the design for new user registration and it must include some basic information of user.

Figure 4.2.1 User Register UI

In Figure 4.2.1, this is new member registration where user can type the new member account to register. After register, user jumps to another window to fill in the rest of member registration information.

When user submitted information, the system begins to determine whether the user's registration information is valid. The first is the user name it can't be empty, the user needs to enter the password twice the same, followed by subsequent users fill out to determine whether the information reach to the requirements, until all the information is correct, the system information is saved to members of the user registration form and prompts the user registered.

4.2.2 Client Login UI

A friendly login UI is an attractive point for user's view, and it is used for user login to the application.
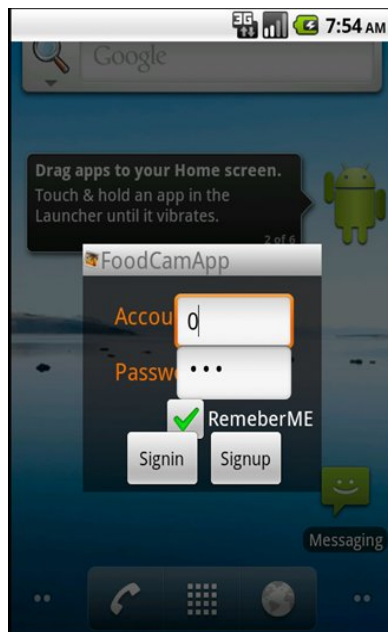
Figure 4.2.2 User Sign in UI

In Figure 4.2.2, user signing module is the first line of defense to prevent illegal user login. When the user wants to use the app, the first is to enter the authentication interface, only in the case of correct password it can continue to using; if client enters an incorrect password, it can't run and will give an error message.

4.2.3 The Main UI

The main UI of application will concentrate many important function of an application and provide ports to enter.
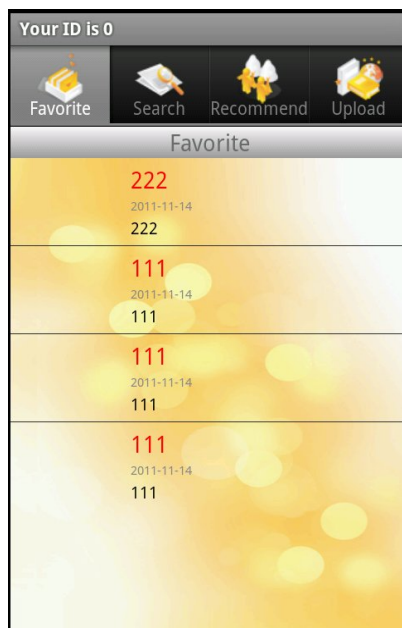
Figure 4.2.3. The Main UI

After login, client will visit the main UI showed in Figure 4.2.3. It is an interface for client to choose next action, for instance, favorite, search, recommend and upload. By clicking the button, client is allowed to jump to the UI.

4.2.4 The Camera UI

An important feature of modern cell phones is their ability to take pictures or video using a built-in camera. Some phones even support using the camera's micro-

phone to capture audio. Android supports all three features and provides a variety of ways to interact with the camera.
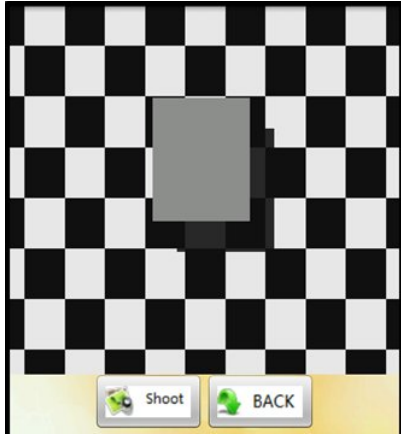
Figure 4.2.4 The Camera UI

This Figure shows the situation of taking photo. When camera is initialed, this interface will come to user, after clicking "Shoot" button, user has already taken photo, and it will come to review photo interface automatically; "Back" button is applied for returning to the main UI.

4.2.5   Server Sign in UI

Server sign in UI is the first step for user to review website and making more operations of photos and account, such as deleting uploaded photo, reviewing others images, and searching.
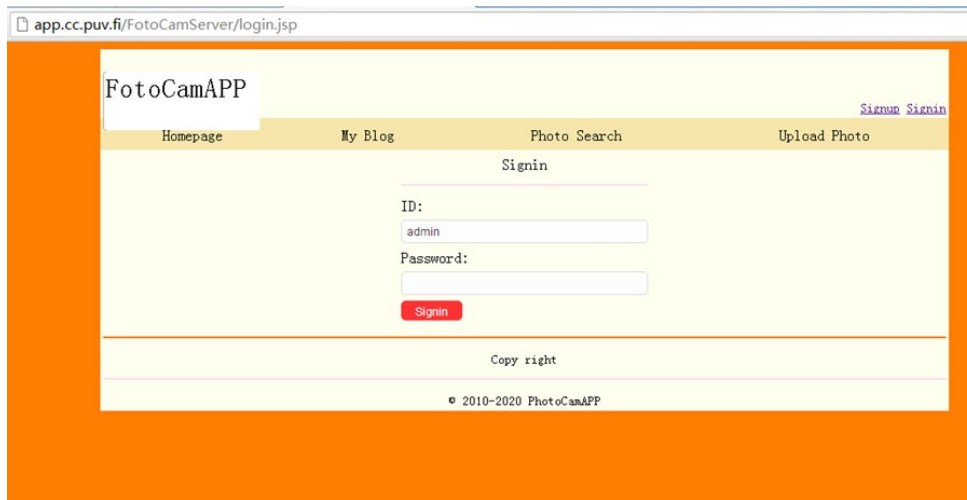
Figure 4.2.5 Server Sign in UI

This page is sign in UI for entering the system via inputting correct ID and password. However, if client has not yet registered, user is required to register firstly by clicking "signup" button in the up right corner.

4.2.6   Server Index UI

The server index UI, it is similar to the main UI of application. All the main functions are showed here, and user enters into other UI by clicking ports' buttons.

Figure 4.2.6 Server Index UI

After sign in, user comes to Index UI. At here, there are three latest uploaded images rolling displayed, and photo search, upload new photo and my Blog can be entered through each port.

4.2.7 Server Blog UI

User can take other operations freely through server blog UI. All the uploaded photos are displayed here, as a signed user. He can view them by entering this UI.
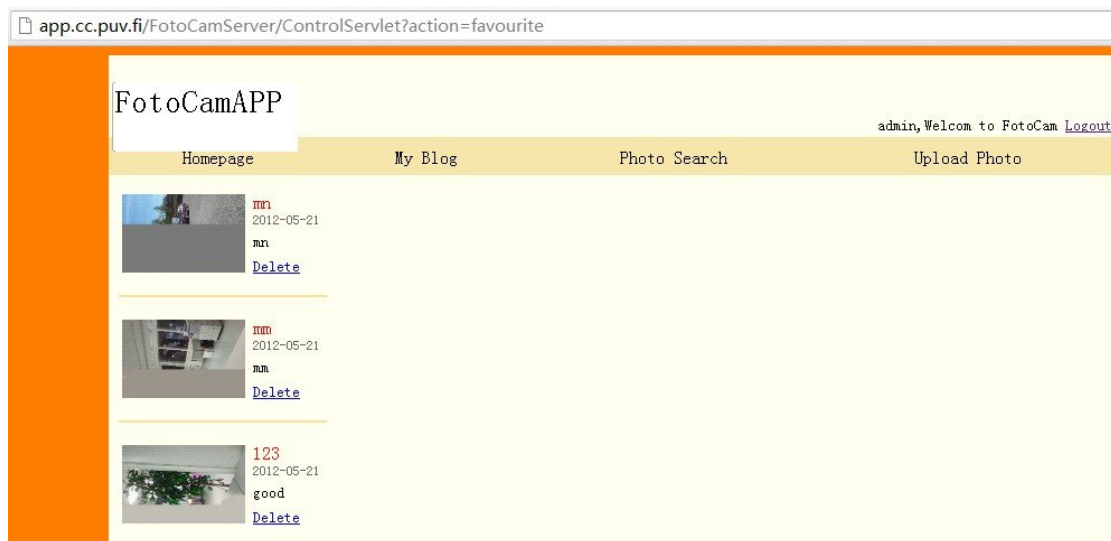
Figure 4.2.7 Server Blog UI

However, in my design, the common user has no right to delete the photos, only admin account has authority to delete, and the "delete" button shows beside photos; the photo information is attached beside each photo, which includes uploading time and image name.

4.2.8 Server Search UI

Photo search is a key function for design. Through variable keywords, user is able to search uploaded photos.

Figure 4.2.8 Server Search UI

In this UI, user enables to search images through different keywords, for example, image name or uploaded time, then all search results will showed in a new page.

5 IMPLEMENTATION

5.1 General Description of Implementation

After client input personal information through the application via web page or mobile phone application, he can login to this system as a common registered user, then initializes the built-in camera in the mobile phone, and takes a photo, the photo will be saved to SD card automatically, then user uploads image which is stored in SD card to the web page, moreover, client can also view others 'photo and search images by keywords. Admin account has right to delete uploaded photos.

5.2 Implementation of Different Parts

In this section, I will discuss some important parts of implementations in this application. They are critical functions which make this system run smoothly.

5.2.1 Registeration

Registration is the first step for applying application. Before writing code, there are some requirements needed to be considered, such as personal information details.

```
public class RegisterActivity extends Activity implements OnClickListener{
    //register Button in registration interface
    Button registerButton2 = null;
    //reset Button in registration interface
    Button resetButton = null;
    //user name in registration interface
    EditText u_nameEditText = null;
    //password1
    EditText pwdEditText1 = null;
    //password2
    EditText pwdEditText2 = null;
```

```
//email
EditText emailEditText = null;
//description
EditText u_disEditText = null;
//declare reference of Socket
Socket s = null;
//Output Stream
DataOutputStream dout = null;
//Input Stream
DataInputStream din = null;
//Progress Dialog
ProgressDialog myDialog = null;
//create Handler used for updating UI
Handler myHandler = new Handler(){
        public void handleMessage(Message msg) {
                super.handleMessage(msg);
                //get message "Registration is successful"
                if(msg.what == 1){
                        //get data
                        Bundle data = msg.getData();
                        //get user name
                        String u_name = data.getString("u_name");
                        Intent intent = new Intent();
                        intent.setClass(RegisterActivity.this, MainActivity.class);
                        Bundle bundle = new Bundle();
                        //add user name to bundle
                        bundle.putString("u_name", u_name);
                        //put bundlet into Intent
                        intent.putExtras(bundle);
                        //start MainActivity
                        startActivity(intent);
                        //release Activity
                        RegisterActivity.this.finish();
                }
        }
};
```

Figure 5.2.1 User Registration

This code is designed for user registration. It defines registerButton and resetButton, and requires user to input user name, password and password conformation. After registration, "registration is successful" will be displayed.

5.2.2   Connection

Connections are composed of database connection and network connection. In following Figures, I will explain more details.

```
//get connection to database
public static Connection getConnection(){
    Connection conn = null;
            try{
                    Class.forName("com.mysql.jdbc.Driver").newInstance();
    conn=DriverManager.getConnection("jdbc:mysql://mysql.cc.puv.fi/e0600173_...mstx","e
0600173","RSgBtV2TM2Zt");
            }
            catch(Exception e){
                    e.printStackTrace();
            }
            return conn;
    }
```

Figure 5.2.2(a) Connection to Database

I insert mysql.cc.puv.fi/e0600173_...mstx, my user account and password into function of connection which enable the server to have connection with database. A connection to the database is set up under user's permission. The database will check the username and password through the JDBC.

```
public void run(){
            //connect to the network and open flow
            try{
        //192.168.135.254, app.cc.puv.fi
        s = new Socket("app.cc.puv.fi", 9999);
        dout = new DataOutputStream(s.getOutputStream());
        din = new DataInputStream(s.getInputStream());
```

```
        }
        //catch the exception
        catch(Exception e){
                //print the exception
                e.printStackTrace();
        }
```

Figure 5.2.2(b) Connection to Network

This code is connecting to VAMK's web server which is "app.cc.puv.fi" via port 9999, and opening stream.

5.2.3 Camera Initialization

This application is to use built-in camera in the mobile phone to taking photo. If camera can be initialized successfully, taking photo function would be achieved then.

```
//Initialize the camera
public void initCamera(){
            //whether displayed
            if(!isView){
            myCamera = Camera.open();
    }
            if(myCamera != null && !isView){
        try {
            Camera.Parameters myParameters = myCamera.getParameters();
            myParameters.setPictureFormat(PixelFormat.JPEG);
            myParameters.setPictureSize(1024, 768);
            myParameters.setJpegQuality(90);
            myCamera.setParameters(myParameters);
                    myCamera.setPreviewDisplay(mySurfaceHolder);
                    //start Preview
                    myCamera.startPreview();
            }
         //catch exception
        catch (IOException e) {
                    //print exception
                    e.printStackTrace();
```

```
                    }
        //set the whether display flag as true
       isView = true;
                }
        }
```

Figure 5.2.3 Camera Initialization

The code in Figure 5.2.3 works for initializing camera in mobile phone and setting

picture's parameters including picture format, size and quality.

5.2.4   Reading Data from SD Card

Usually, there are two ways to save photo after taking it, which are SD card and

mobile phone's ram. In this application, the photo would be saved into SD card.

```
//get data
Bundle bundle = data.getExtras();
picPath = bundle.getString("picPath");
picPath = "sdcard/foodUpload/Thumbnail_food/" + picPath;
FileInputStream file;
    //file = new FileInputStream
    try {
//(picPath);
("sdcard/foodUpload/Thumbnail_food/201201.jpg");
                    file = new FileInputStream(picPath);
                    BufferedInputStream in = new BufferedInputStream(file);
                    ByteArrayOutputStream out = new ByteArrayOutputStream();
                    byte[] temp = new byte[1024];
                    int len;
                    while ((len = in.read(temp)) > 0) {
                    out.write(temp, 0, len);
                    }
                    byte[] imgData = out.toByteArray();
                    in.close();
                    out.close();
                    image = imgData;
                            // TODO Auto-generated catch block
                        } catch (FileNotFoundException e) {
                                e.printStackTrace();
```

```
                              }
                               // TODO Auto-generated catch block
                              catch (IOException e) {
                                      e.printStackTrace();
                              }
```

Figure 5.2.4 Reading Data from SD Card

Taken photo is saved in path "sdcard/foodUpload/Thumbnail_food/". The photo first is put into buffer memory, and is stored in ByteArray. Photo's output is defined by Bitmap.

5.2.5   Photo Search

Searching is often achieved through inputting keywords. There needs some consideration for keywords, such as character type and length.

```
//send message to server
public void sendToServerMsg(){
    new Thread(){
            public void run(){
            try{
     // send message to server for searching
    dout.writeUTF("<#SEARCH#>"+infoValues+"|"+searchSort+"|"+startPrice+"|"+endPrice+
"|"+span+"|"+currentPageNo);
            //get the message from server
             String msg=din.readUTF();
            //search results
            if(msg.startsWith("<#SEARCHINFO#>")){
                    //Intercept substring
                    msg=msg.substring(14);
                    //Split  string
                    String[] number = msg.split("\\|");
                    //get total number of search results
                    totleNumber = Integer.parseInt(number[1]);
                    String[][] strs = new String[Integer.parseInt(number[0])][8];
                            ArrayList mstxInfos = new ArrayList();
                            for(int i=0; i<strs.length; i++){
                                    String temp = din.readUTF();
```

```
System.out.println(temp);
//Split  string
String[] str = temp.split("\\|");
mstxInfos.add(str);
            }
```

Figure 5.2.5 Search Image

This code serves for photo search by keywords. User inputs keyword including picture title and upload time, and then the keyword will be sent to the server. A number of search reslut.

5.2.6   Delete Image

Deleting image is just carried out by admin account not common user.

```
String uid = (String)session.getAttribute("uid");
    //if user is admin
    if(uid.equals("admin")){
```

Figure 5.2.6(a) Check User

Read current sign-in user's session (uid) if it is admin account.

```
ArrayList<MstxInfo> info = DBUtil.getFavourite(uid);
                if(info.size() != 0){
                        for(MstxInfo mi : info){
                                String mid = mi.getMid();
                }
```

Figure 5.2.6(b) Find Target Photo

Find a photo that is needed to be deleted and its mid.

```
<a href="ControlServlet?action=delteImage&mid=<%=mid%>">Delete</a>
```

Figure 5.2.6(c) Create Link

Create a link for deleting photo.

```
public static void deleteMstxCol(String mid, String uid){
```

```
Connection con = getConnection();
PreparedStatement pstmt = null;
try {
        pstmt = con.prepareStatement("delete from mstx_col where mid=?
and uid=?");
        pstmt.setString(1, mid);
        pstmt.setString(2, uid);
        pstmt.execute();
}
```

Figure 5.2.6(d) Delete Photo

This is the main part of deleting photo. Admin account has permission to do it. DeleteMstxCol is applied for deleting images and implementation statement is "delete from mstx_col where mid=? and uid=?".

6   TESTING

In this section, we will make test of each function in this application and find so-lutions, and any part of the test is failed.

6.1   Test Cases

Test case is designed for testing function of an application. It is important for re-cording test procedure, since it will be helpful for further modifications in future if some functions are failed.

There are four important tests of this project which are taking photo, uploading, searching and delete. Each test case is showed below:

	Test Case		
Test Case Name:	Taking photo		
Test ID:	1		
Test Date:	02.02.2012		
Prerequisites:	WLAN available		
Hardware Required:	Android mobile phone		
Software Required:	Photo sharing application		
Duration:	10 mins		
Effort:	5 mins		
Step	**Action**		**Result**
1	Login to the photo sharing application		Pass
2	Go to the photo taking UI		Pass
3	Taking a photo		Fail

Figure 6.1.1 Taking Photo Test Case

Test Case		
Test Case Name:	Uploading photo	
Test ID:	3	
Test Date:	06.02.2012	
Prerequisites:	WLAN available	
Hardware Required:	Android mobile phone	
Software Required:	Photo sharing application	
Duration:	15 mins	
Effort:	30 mins	
Step	**Action**	**Result**
1	Login to the photo sharing application	Pass
2	Go to the upload UI	Pass
3	Taking a photo	Pass
4	Uploading a photo	Fail

Figure 6.1.2 Uploading Test Case

Test Case		
Test Case Name:	Delete Image from Website	
Test ID:	15	
Test Date:	05.03.2012	
Prerequisites:	WLAN available	
Hardware Required:	Android mobile phone	
Software Required:	Photo sharing application	
Duration:	5 mins	
Effort:	15 mins	
Step	**Action**	**Result**
1	Login to the website as Admin account	Pass
2	Go to the myblog UI	Pass
3	Delet a photo	Pass

Figure 6.1.3 Delete Image Test Case

Test Case		
Test Case Name:	Search image on website	
Test ID:	10	
Test Date:	01.06.2012	
Prerequisites:	WLAN available	
Hardware Required:	Android mobile phone	
Software Required:	Photo sharing application	
Duration:	25 mins	
Effort:	15 mins	
Step	**Action**	**Result**
1	Login to the website	Pass
2	Go to the search photo UI	Pass
3	Search photo with keyword: image name	Pass
4	Search photo with keyword: uploading time	Fail

Figure 6.1.4 Search Photo by Keyword Test Case

6.2   Description of Test Result

In the taking photo test case, login and going to photo taking UI were implemented successfully. However, there were two problems raised. While initializing camera, the frame that was showed in surface view was rotated 90 degrees to the horizontal; after taking a colorful photo, the UI could not jump to next interface which was used for uploading; I put the mobile phone on the table, camera was covered by the table, then I took a photo unawares, fortunately, the application was able to jump to next automatically.

In the uploading image test case, uploading was failed. The application shut itself by clicking "upload" button after taking a photo.

In the delete image from website test case, all steps were passing. Admin account login was no problem, then chose myblog UI, admin account deleted uploaded photo smoothly.

In the photo search on website test case, search photo with keyword could pass partly. This search should be implemented by multi keywords, time or picture's title. After login the website with ID and password, and then went to the search photo UI, photo could be searched by inputting image's title, but when inputting keyword was time, photo could not be found.

6.3   Possible Improvement

To make surface view parallel with the horizontal, we can change the camera setting into content always landscape during taking picture, and in this way surface view will never be rotated 90 degree or 180 degree with horizontal.

All the pictures taken by camera are saved in the mobile phone memory by applying bundle, however, Samsung I897 mobile phone owns a higher camera resolution, and thus a color picture would have a large size. In this case, large size picture would be overflow. If we just use bundle to save picture's address which is in flash memory, and actual photo is stored in mobile phone's flash memory, and read it while upload photo. This solution can solve problem that UI is failed to jump to upload interface after taking a color picture.

Search photo by keyword is an important function of this project. GetMstxlnfo-ForPhone is a mean for achieving this function. Input is time or image's title, and output is search result and returns a List structure. During searching procedure, keyword is checked. If keyword is not null, relevant search statement is required to be modified. This enables both time and image's title as keyword to search uploaded photo.

7 CONCLUSION

This photo sharing application's implementation is successful after several times' debugging, and most of basic and necessary functions are achieved, which include uploading pictures, admin account, taking photos, registration and so on. Requirement analysis guides a whole sight for this project and provides a lot of considerations before starting to design this application.

It was a big challenge to draw UML diagram and make requirement analysis of the project. This was the first time to apply them in application; it requires reading a lot of books and models, and also inquiring teachers and other classmates when confusion appears.

Moreover, a lot of problems occur during the project, sometimes a small error will make me spend a lot of time and concentrate efforts on finding and fix. The problems are overcome, finally though repeating checking code, many times test and modifies. Since then, it would redouble more efforts to research, acquire more skilled on the basis of new technology to improve level of development. On the other hand, it proved knowledge and ability.

 However, this application has many deficiencies because of limited time. In the future, it is possible to have a better art design for client and web pages, and this would provide users more fresh experience; map management module can also be added, since nowadays this function become more common in this kind of application; personal information management interface will be achieved too.

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