

**本科生毕业论文（设计）**

**开题报告**

题目： DESIGN AND IMPLEMENTATION OF MOBILE PHONE ALUM MANAGEMENT SYSTEM

**学 院： 计算机科学与技术学院**

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# **1. Background and Significance of the Topic**

## **Research Purpose and Significance**

Today, smartphones are becoming more and more widely used and their photographic capabilities are becoming more and more powerful, even surpassing those of digital and professional cameras. Image quality on smartphones has improved a lot in recent years, and the terms IOS, white balance, scene mode, aperture and other formerly professional cameras are common on mobile phones. As a result, the most popular shooting tool for many photography enthusiasts is no longer a SLR. Smart phones are light enough to fit in your pocket. It's easy to use, you don't need to adjust too many parameters, and you can get pretty good proofs at the click of the shutter. It's easy to share and easy to post-process. There are many apps that allow you to easily post-process digital photos[1].

The survey results of social network application of China Internet Network Information Center (CNNIC) show that[2], the proportion of mobile social network users who use pictures and picture uploading is 52.7%. At the same time, the number of pictures sent to social network by mobile phone is also growing, and people's demand for picture sharing has been widely recognized. At the same time, 33.4 percent of netizens have posted their GPS locations to the Internet, and more than 60 percent of respondents have used the Internet to store photos or plan to backup some photos online, according to the study. The development of a mobile photo album[3] that integrates safe storage, fast sharing and release of picture GPS information will have a great market prospect.

However, taking photos is a simple matter, but dealing with so many photos is not a simple matter. According to the data, there are more than 1000 digital photos stored in each user's smart phone on average, and with the development of The Times and the improvement of mobile phone photography function, the number continues to grow[4]. From thousands of pictures, it becomes a big problem to find those beautiful journeys, those memories. Therefore, it is of great significance to develop a photo management system for customers to intelligently and automatically manage photo information in intelligent devices[5].

The research purpose and significance of this project is to develop a smart phone album management software based on Android to improve users' experience of managing photos taken. Through the album management software, users can accurately find the photos they need, and can comment relevant contents of their photos anytime and anywhere. At the same time, users can synchronize the photos saved on their smart phones to their designated computer or other servers in real time, to ensure that the information of the photos taken is not lost at the same time, but also can classify the photos according to the time and location of the photos, so that users can better visit their favorite photos.

## **Research Background**

With the rapid development of smart phone, all kinds of applications based on it have also achieved fruitful results. Back in 2012, a software market research firm called DistimoInc reported[6] that there were more than 400,000 apps in the Android market. In China, according to the latest "2012 China Mobile App Market Quarterly Monitoring Report" released by iMedia Research, pictures and pictures occupy the first and second place in the downloaded categories of Android mobile apps in China, accounting for 12.2% of the first. At the same time, it also shows that the development of video, audio, video and other applications in the Android system is a very valuable direction[7]. In the last decade, there have been more and more pictures and pictures on the Internet. Tencent announced in 2012 that its Qzone would have 150 billion photos by August; Microsoft said in October that it had 11 billion images stored in the cloud on its SkyDrive; Facebook, meanwhile, announced this month that it has more than 220 billion images and is growing by 3 million a day[8]. The growth of Android apps and the total amount of photos on the Internet will also provide a huge market for photo software. In the first half of 2013, the main sales channel of China's mobile application market was still the mobile application market, accounting for 87.2% of the market share. At present, the most popular Android app distribution and download platforms are: Android Mall, Anzhi, Baidu, pea, app treasure, etc. Take the application of Baidu as an example. According to the statistics of its website, there are more than 350 software similar to mobile photo albums, and the number of downloads has reached 110 million[9].

Under the Android system, the development of mobile photo album application has a very good prospect. Mobile photography has only really come to the public's attention since Sharp's J-PHONE introduced its first built-in camera, the J-SH04, in late September 2000. Today, almost every Android phone has photos and photo management. People gradually take photos and view pictures as the basic functions of smart phones[10]. ZDC released a Survey report on Mobile phone Photographing Behavior of Chinese IT Netizens in 2013, showing that Android users account for more than 70% of Chinese IT netizens, and more than 90% of them use mobile phones to take photos in daily life. The biggest reasons are the convenience of taking photos, the timeliness of sharing, and the convenience of easy operation. Therefore, for Android system, how to better provide users with image management services[11] has become an urgent problem to be solved.

## **1.3 Research History and Present Situation at Home and Abroad**

### **1.3.1 Visual Tour of Photos with Notes**

Thanks to the growing number of smart phone devices capable of shooting digital images and video clips, digital images

And video clips are becoming more and more popular. Digital images on the Internet are also growing. Digital map

The increase in images has created a need for user-friendly tools to navigate large amounts of digital material and photographs.

Krischnamachari (1999) proposed a browsing algorithm based on clustering. Hierarchical clustering algorithm was used to automatically cluster photos taken by users. Then users could browse photos taken by themselves by navigating the tree structure generated by clustering[12].

Chiao Minghui (2017) has developed a method for conveniently adding annotation information related to an object photo. The mobile terminal determines knock information based on the knock command. If the knock message meets the predetermined conditions, the mobile terminal receives the first comment message as the message edited by the user in relation to the photo of the object; The mobile terminal displays the first note information on the target photo[13].

### **1.3.2 Smart Phone Album Management Software Development**

Wang Huaxu (2014)[14] designed and implemented an Android-based smartphone photo album system based on the "cloud picture" platform on the Internet and the company's existing core technology and architecture, and adopted multiple technologies such as Android development, face recognition and image classification. On this basis, this paper also completed the design and development of an intelligent photo album system based on Android platform. The system provides Android mobile users with the services of recording baby growth, one-click arrangement of life and travel albums, network synchronization backup and sharing photos to social networks. It is a comprehensive Android mobile photo management application software integrating the functions of baby face detection, classification by geographic information, cloud storage and rapid sharing. The main research content of this paper is as follows:

1. Research on infant face detection by integrating AdaBoost[15] face detection, C1-S[16] feature extraction and support vector machine classification, so as to achieve accurate extraction of infant face in complex image sets.
2. Study the "grid" type scalable spatial segmentation method, divide the photos in life, tourism and other scenes according to a specific proportion, and put the photos in the adjacent scenes into the same photo group, so that the number of photos in the photo group is relatively the same. At present, each module of the smartphone album system has realized all the functions, and has been used in the Android store, users can use the photo management function provided by the system on the Android client. The first user survey confirmed that this is a useful Android software.

### **1.3.3 For Photo Synchronization and Backup**

Pei Lei (2019) applies for the disclosure of a data entry and photo synchronous acquisition method and system, wherein the data input end obtains the first control item of the image input end, and communicates with the photo acquisition terminal according to the second control item of the data input terminal and the first control item of the person of the picture acquisition terminal. When the data entry terminal inputs the first data, the first control sends the shooting command to the image collection terminal; The data input end uploads the input data to the server, and the server associates the first data with the first image on the image collecting end based on the unique identifier. When the data entry terminal upload the input data to the server, it only needs to send the input data and the unique identifier corresponding to the input data to the photo acquisition terminal. The photo acquisition end only needs to upload the collected photos with a unique identifier to the server, and the server automatically constructs the connection between the input data and the collected photos according to the unique identifier, thus improving the accuracy of the association between the input data and the corresponding collected photos[17].

### **1.3.4 Classify Photos According to Specific Information**

At present, due to the increasing personalized requirements of mobile photo album users, the traditional photo album software can not fully meet the personalized requirements of users. In the smartphone album, how to properly classify photos is an important job. The purpose of image classification is to make users more effective search and visual browsing, so as to provide convenience for users to add, delete and share pictures. According to the actual situation, Android phones can be divided into six types: according to the storage address of the film, shooting time, browsing times, people classification, geographical location classification.

In terms of classifying photo collections for user retrieval according to where and when photos were taken

Previous researchers have applied the image classification technology to mobile phone photo albums, classifying pictures according to the location and time of photo shooting, but so far, there is no similar application in Android Market mobile phone photo albums[18]. In the understanding of relevant literature, Nguyen (2008)[19] et al. proposed to classify pictures based on visual similarity, and L Cao (2009)[20] et al. also proposed to classify and calibrate mobile phone photo sets in context by combining GPS geographic information and scene classification technology. And a better classification effect was obtained. However, they also found that such methods have high requirements on smart phones, and the processing on mobile terminals consumes huge manpower and material resources, especially on large picture collections, and the time consumed is beyond the range of ordinary users. In addition, the rationality, practicability and accuracy of this classification method are also its limitations in practice.

### **1.3.5 Photo Retrieval**

With the wide use of digital cameras and the increasing number of photos, it is necessary to manage and query photos effectively. In this context, neither keyword-based search nor content-based search can fully meet the requirements of users. Therefore, semantic based search has become a research hotspot. Liang Tingting (2013) made an in-depth analysis of the ontology-based semantic search of images, studied the semantic search of images, applied it to the semantic search of images, and formed three practical and efficient image search and management tools. After testing, this system can better realize the semantic query of users[21].

In short, with the increasing demand of users for cameras and image processing, there is no dominant situation at present, and it can be done technically, and the requirements for developers are moderate. Therefore, this project is to develop a more comprehensive and more in line with users' needs of electronic photo album software by combining the actual needs of users and different development technologies.

**2. The Basic Contents and Objectives of Research and Development, the Main Problems to be Solves or the Key Technologies**

## **2.1 Research Objectives**

Based on the comparison of domestic and foreign smartphone photo album software systems, combined with the design and implementation of similar products abroad, the corresponding design and implementation. As an intelligent terminal integrating social and communication functions, mobile phone is designed to take photos. On social platforms, photos taken by mobile phone are no less good than those taken by professional digital cameras, and it is even convenient to use mobile phones for social communication[22]. However, while taking photos is easy, processing and backing up a large number of photos is not a simple task. The research objective of this topic is to use Android technology to realize the mobile phone album management system, through which users can make remarks on their photos, and at the same time can synchronize the photos on the smartphone to the computer or other servers. The computer or other servers can classify the photos according to where and when they were taken and display them to the user. The user can also retrieve the photos according to the information he or she needs.

## **2.2 Basic Research Content**

In recent years, with the popularity of smart phones, people have been accustomed to using mobile phones to take photos and record video to record and manage their study, work and life. In order to effectively manage, backup and retrieve photos and videos, a mobile album management software is planned to be developed. This software must be deployed on both mobile and computer terminals, and can achieve the following functions:

(1) Be able to make good remarks on photos and videos like wechat Moments. It's not uncommon for people to be confronted with a photo from their past and not be able to recall it, or to search for a photo and only remember certain keywords, rather than the image or video itself. Therefore, it is necessary to provide very convenient remarks, remarks editing, retrieval and other functions for photos and videos.

(2) Wireless backup of photos and videos: The existing mobile phone APP can automatically synchronize the mobile phone album to the cloud space provided by the mobile phone supplier through automatic cloud synchronization (such as Xiaomi Cloud, Huawei Cloud), however, the storage capacity of these cloud space is usually limited, and there are certain security risks, users prefer to synchronize the album to their own designated PC or server. Users can synchronize albums with the help of mobile synchronization software (such as 360 Mobile phone Assistant, QQ Sync Assistant, etc.). However, information in albums (such as shooting time and location) cannot be backed up at the same time. Therefore, it is necessary to provide a mobile album management software that can fully synchronize all the information in the album. At the same time, it is hoped that after backup, photos and videos can be classified and displayed on the computer side according to the time/place of shooting.

(3) The function of retrieving the album according to the full information of the album: in addition to retrieving the album through text information, the photo can also be retrieved according to the shooting time, shooting location and other information.

## **2.3 Key Technical Problems to be Solved**

In order to successfully complete the smart phone album management system, this topic mainly faces the following key technical problems:

(1) Use of Android development technology. Smart phone album management system is based on Android research and development, skilled use of Android development technology is a key issue in the development of the project.

(2) Note technology of album. In order to achieve the function of users to edit the remarks of photos and videos, the system needs to successfully realize the backup technology of albums.

(3) Use of data synchronization technology. Users can synchronize the photos and related information on the mobile phone to the computer or other servers for backup, which is inseparable from the use of data synchronization technology. Data is being synchronized at the same time, the photos in the album should be taken at the time, location and user backup information of the photos.

(4) Acquisition and retrieval of information related to photos. It is not a small problem to use GPS technology to obtain the shooting time and location of photos, which needs to be realized in this topic. GQL technology is also used to classify and retrieve information such as the location and time of shooting, so that users can smoothly find the photos they need in the mobile phone album.

# **3. Research and Development Methods, Technical Routes and Steps**

## **3.1 System Platform: Microsoft Windows**

This system is designed and developed by Windows11 bit operating system, and the advantages and characteristics of Windows11 to the research and development of this system has brought great convenience and support.

Windows is a GUI-based operating system developed by Microsoft. It is widely used in computers and smart phones. There are a total of common version, Server version (Windows Server), mobile version (Windows Phone, etc.), embedded version (Windows CE, etc.) and other sub-series, all of which are the most widely used operating systems worldwide[23]. The reason why Windows operating system can occupy the dominant position in PC is closely related to its good human-computer interaction performance. Windows operating system has a friendly user interface, beautiful window, simple operation, simple learning, a number of different times of the system has a good inheritance, effective management of computer resources, to achieve higher efficiency and better results. Windows operating system has a large number of multimedia application software, multimedia resources collection and management, users only need to use these commercial software developed based on the system, can enjoy the fun of multimedia. Windows has good hardware adaptability. The Windows operating system supports a variety of hardware platforms, which provides a broad and free development environment for hardware manufacturers, and then promotes these hardware companies to choose the operating system suitable for Windows, and also promotes the continuous perfection and improvement of Windows operating system. At the same time, the continuous development of hardware technology also provides strong support for the function expansion of the system[24].

## **3.2 System Architecture: B/S Architecture**

In this system, the use of B/S architecture for development, the user's Android phone as the client, the user's Windows11 computer as the server, using the web way to connect the client and server, to achieve the purpose of data synchronization. B/S architecture refers to browser/server architecture, also known as Web Architecture. It divides the application into two parts: client side and server side. In the B/S architecture, the client is the browser, which usually uses HTML, CSS, JavaScript and other technologies to provide interactive services to users through the web. The server side handles various business logic and data operations, usually using low-level programming languages such as Java, c++, Python, etc[25].

The advantages of the B/S architecture include: Easy maintenance: Since the business logic and data processing of the application are done on the server side, only the server-side code needs to be maintained, and data can be backed up and restored through the server side. Cross-platform: Applications developed using the B/S architecture can run on any browser-enabled computer, avoiding the problem of developing for different platforms. High security: Because the core logic of the application is on the server side, the client cannot directly access the database and application code, greatly reducing the possibility of security problems. Easy to scale: Because the business logic of the application is on the server side, the processing power of the system can be increased by increasing the number of servers or through distributed deployment. Easy upgrade: When an application needs to be upgraded, you only need to complete the corresponding upgrade on the server. No operation is required on the client. Low resource utilization: The browser displays only the page and processes user input, reducing the usage of system resources and improving the system response speed. Easy deployment: Applications developed using the B/S architecture can be easily deployed to remote servers through cloud services or virtualization technologies for easy management and maintenance.

## **3.3 Programming Language: JAVA**

The source code of this system is compiled by Java. JAVA is a new generation of object-oriented programming language released by SUN in 1995. Up to now, JAVA has become a major development language, and its application scope is constantly expanding[26]. Features:

(1) Object orientation, in the JAVA language, through the simple class library structure, and a dynamic interface model, make the design of a complex system becomes simple and clear.

(2) Cross-platform, application software written in JAVA can run on a variety of software and hardware platforms without any changes.

(3) Reliability and security. Because java is a kind of software based on Web, it has a high demand for security. Without any security guarantee, the programs that users download from the Internet will be very dangerous. JAVA, with its own security, can effectively prevent the generation of viruses, also can effectively prevent the downloaded software to the computer system. When the JAVA bytecode enters the interpreter, it needs to be checked by the bytecode validator, after which the JAVA interpreter will determine the memory layout of the classes in the program, and then, The classloader is responsible for loading classes from the network into a separate memory region to prevent applications from interfering with each other. Eventually, client users can also limit the categories loaded from the network to access only specific file systems. Together, these mechanisms make up JAVA security.

(4) JAVA has distributed, multi-threaded, efficient, dynamic and other advantages.

## **3.4 System Development Tool: Android Studio**

The smartphone album management system is developed with Android Studio as the development tool, and the smartphone software based on Android is developed and produced.

Android Studio is an Android integrated development tool launched by Google, based on IntelliJ IDEA[27]. Like Eclipse ADT, Android Studio provides integrated Android development tools for development and debugging. Based on the JetBrains Intellij IDEA, Android Studio provides graphics-based generation support for Android reconfiguration and quick fixes only, some tools to catch performance, availability and version compatibility issues, As well as powerful features such as support for program guidelines and application features, and a powerful layout editor that allows you to control and preview effects by dragging the interface[28].

## **3.5 Database Software: MySQL**

The server side of the system uses MySQL to the client side, which is the photo album on the user's smart phone

All information, including the data of the photo, the user's remarks on the photo and the location and time when the photo was taken are stored. MySQL is a relational database management system developed by MySQLAB, Sweden. MySQL is currently the most popular relational database management system. It is one of the best applications on the WEB. MySQL is a relational database that stores data in different tables for faster processing and greater flexibility. The SQL language used by MySQL is the most commonly standardized language for accessing databases[29]. MySQL applies dual authorization strategy, can be divided into community and commercial two, because of its small size, fast speed, low overall cost of ownership, especially open source characteristics, so most small, medium and large websites will MySQL as their website database.

## **3.6 Search Tool: GQL**

After the photo information is stored on the server, GQL statements can be used to retrieve and query the data. GQL is a relational database similar to SQL used to get data from the extensible database of Google App Engine[30]. The syntax of GQL is similar to SQL in that it starts with "select" and can use the "where" statement to add adjustment filtering, but only in a field such as "greater than", "less than", "equal to" and other conditions. You can also categorize photo data by when and where it was taken using the "Order by" statement. As with SQL statements, ASC represents increasing order and DESC represents decreasing order. Keywords in GQL are also case insensitive, but class names in GQL are case sensitive. Because the Google Application Engine has an upper limit for each database request, GQL queries return zero or more data, but no more than 1,000 rows.

# **4. Overall Arrangement and Schedule of Research Work**

Table 4-1 Scheduling tasks

|  |  |  |
| --- | --- | --- |
| Task number | Start-stop time | Phase task Task points |
| 1 | 2022.11.30 - 2023.1.20 | Determine the name of the project, understand the relevant content of the project, and find English materials |
| 2 | 2023.1.21 - 2023.2.25 | Review literature, complete literature review, proposal report and foreign translation |
| 3 | 2023.2.26 - 2023.3.10 | Learn the relevant techniques of development |
| 4 | 2023.3.11 - 2023.3.15 | Analyze requirements and identify development tools |
| 5 | 2023.3.16 - 2023.3.20 | Carry on the system outline design, detailed design, system framework several development environment constructions |
| 6 | 2023.3.21 - 2023.4.8 | Complete basic coding work |
| 7 | 2023.4.9 - 2023.5.21 | Complete project development |
| 8 | 2023.5.22 - 2023.5.25 | Complete system test |
| 9 | 2023.5.26 - 2023.6.4 | Sort out the materials and finish the graduation thesis |
| 10 | 2023.6.5 - 2023.6.10 | Hand in the graduation thesis for graduation defense |

References

1. 孙家贺. 面向 Android 平台的智慧相册的设计与实现 [D].[S.l.]: 北京交通大学, 2017:8.
2. 张紫. 第 33 次中国互联网络发展状况统计报告 [J]. 计算机与网络, 2014,000(002):5–5.
3. 李征航. GPS 测量与数据处理 [M].[S.l.]: GPS 测量与数据处理, 2013:12.
4. 杜万平. 机关数码照片归档现状与对策 [J]. 山西档案, 2011(01):31–32.
5. 程涛, 陈慧琴, 孙萍. 基于 Android 的手机相册分享软件的设计与实现 [J]. 微型机与应用, 2014, 33(13):2.
6. Rodden K, Wood K R. How Do People Manage Their Digital Photographs?[C].CHI 2003: New Horizons Vol.No.5 Issue No.1, 2003:34.
7. 郭靖, 郭晨峰. 中国移动互联网应用市场分析 [J]. 通讯世界, 2010:2.
8. Shi Z, Sun X, Wu F. Photo Album Compression for Cloud Storage Using Local Features[J]. IEEE Journal on Emerging and Selected Topics in Circuits and Systems, 2014, 4(1):17–28.
9. 靳岩. eoeMarket 本土化的第三方 Android 应用软件发布平台 [J]. 程序员,2009(9):2.
10. 张姗. 智能手机拍照功能对于社会的影响研究 [J]. 旅游与摄影, 2021(006):000.
11. 吴志强. 图片管理探索 [J]. 图书馆建设, 2003:38.
12. Krishnamachari S, Abdelmottaleb M. Image browsing using hierarchical clustering[C]. , 1999:23.
13. 焦明慧. 一种照片备注的方法以及移动终端 [EB/OL]:12.
14. 王华旭. 基于 Android 平台的智能手机相册的设计与实现 [D].[S.l.]: 中山大学:13.
15. Viola P A, Jones M J. Rapid Object Detection using a Boosted Cascade of Simple Features[C]. Computer Vision and Pattern Recognition, 2001. CVPR 2001. Proceedings of the 2001 IEEE Computer Society Conference on, 2001:52.
16. Serre T, Wolf L, Poggio T. Object Recognition with Features Inspired by Visual Cortex[C]. Computer Vision and Pattern Recognition, 2005. CVPR 2005. IEEE Computer Society Conference on, 2005:43.
17. 裴磊, 高文荣. 一种数据录入与照片同步采集方法及系统 [EB/OL]:7.
18. 刘铁锋. 深入探析 Android Market 大势 [J]. 程序员, 2011(3):3.
19. Nguyen G P, Worring M. Interactive access to large image collections using similarity-based visualization[J]. Journal of Visual Languages & Computing, 2008,19(2):203–224.
20. Cao L, Luo J, Kautz H, et al. Image Annotation Within the Context of Personal Photo Collections Using Hierarchical Event and Scene Models[J]. IEEE Transactions on Multimedia, 2009, 11(2):208–219.
21. 梁婷婷. 基于语义的相片检索研究与系统实现 [J]. 信息技术与信息化, 2013,000(006):95–100.
22. 万利成. 手机相册系统的设计与实现 [D].[S.l.]: 吉林大学, 2016:9.
23. 张丽, 李晓明. 计算机系统平台 [M].[S.l.]: 计算机系统平台, 200912.
24. 李海坤 . 浅谈 Windows 操作系统 [J]. 数码世界, 2017(66-67):52.
25. 蔡长安, 王盈瑛, CAIChang-an,等. C/S和B/S的模式的比较和选择[J]. 渭南师范学院学报, 2006, 21(2):47-50.
26. 杨兰. 计算机软件开发的 JAVA 编程语言及其实际应用 [J]. 电子设计工程,2017(21):5.
27. 陈甫. Android Studio 应用 [J]. 电脑知识与技术：学术版, 2014(8X):4.
28. 李新辉, 邹绍芳. Android 移动应用开发项目教程 [M].[S.l.]: Android 移动应用开发项目教程, 2014:49.
29. 兰旭辉, 熊家军, 邓刚. 基于 MySQL 的应用程序设计 [J]. 计算机工程与设计,2004, 25(3):3.
30. 刘昶. Android 操作系统的存储技术研究 [D].[S.l.]: 北京理工大学, 2011:22.