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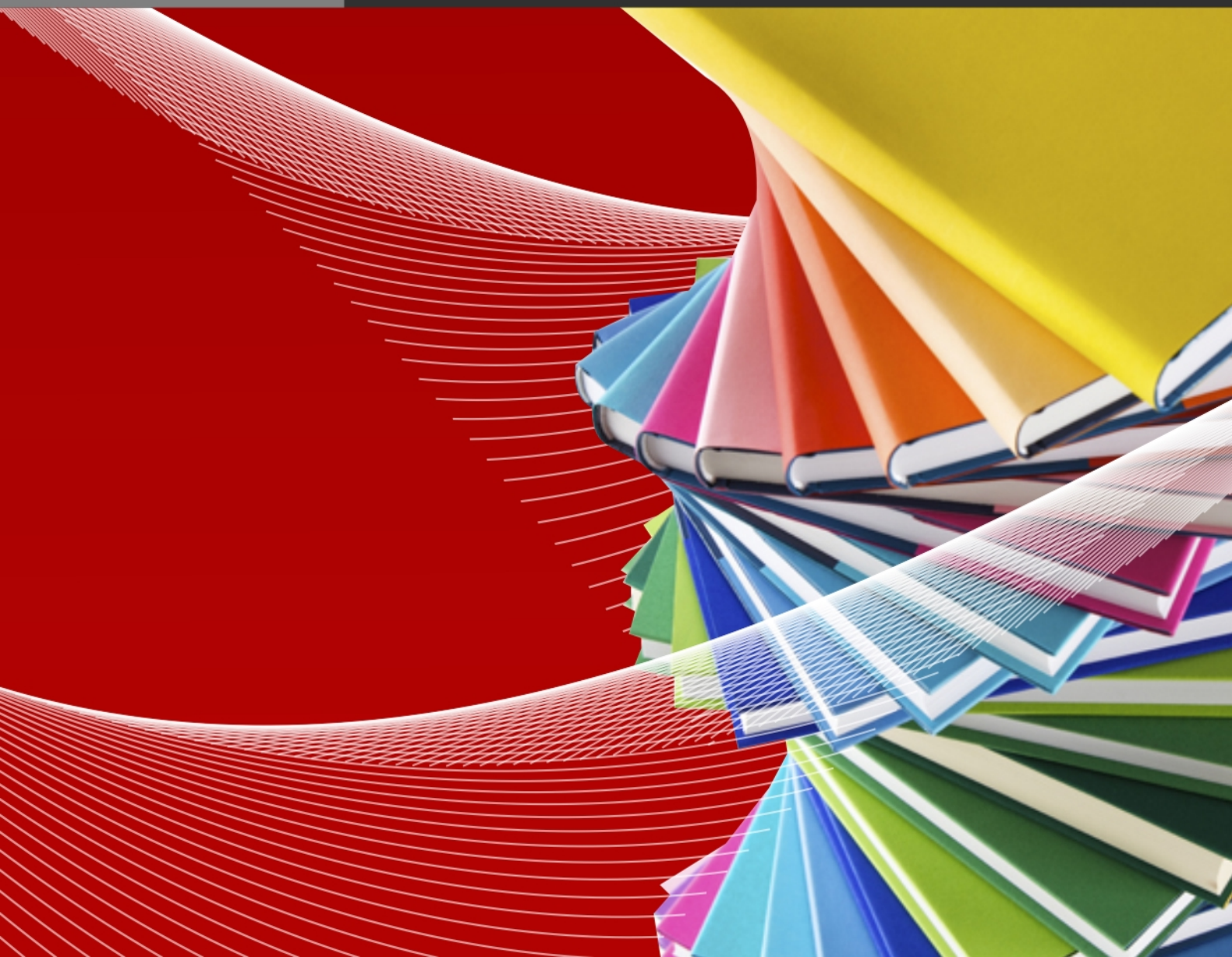

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Manage Your Mobile Time

by

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Final Project Report submitted in partial fulfillment
of the requirements of the Degree of
Bachelor of Science in Software Engineering

Project Supervisor

Dr. Zhuang Yan, Sofia

08 October 2014

DECLARATION

I sincerely declare that:

1. I and my teammates are the sole authors of this report,
2. All the information contained in this report is certain and correct to the best of my knowledge,
3. I declare that the thesis here submitted is original except for the source materials explicitly acknowledged and that this thesis or parts of this thesis have not been previously submitted for the same degree or for a different degree, and
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Date : 08 October 2014

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Last but not least, I want to thank my partner Ho Sin Nga Veronica. We worked very hard and we fight together in this project. This project can't finish without her intension.

ABSTRACT

Out of the world's estimated 7 billion people, 6 billion have access to mobile phones. The average smartphone user tends to spend around two hours a day using their gadget, according to a study. While time management is important for improving productivity, people are interested in finding out exactly how much time they have spent on their smartphone daily.

In particular, people may like to know how much time they have used in the various activities per day, including browsing the internet, checking social networks, listening to music, playing games, making calls, text messaging, checking/writing emails, reading books, watching TV/films, taking photographs, and etc. Statistics about time spent on a particular activity can be more specific (for example, people spend different time on different games). The project aims in helping people to know more about their time spent on their smartphone per day, thus opt for better time management.

To achieve the project goal – to help users to manage their time, we implement an application for android OS to track the time usage of the mobile phone. Since IOS can't provide enough permission for us to implement, so the project we only focus on implement the app in android OS.

Since my partner and me have not implemented app yet. So we do a lot of study and research of implementing app and understanding android OS at the beginning.

In this report is mainly talk about the main function of the app. Besides, including our understanding of developing the app. Other function in this app will be introduced by my partner Ho Sin Nga.

TABLE OF CONTENTS

CHAPTER 1. INTRODUCTION 1

1.1 Background 1

1.2 Objective 1

1.3 Work flow 1

1.4 Work Scheduling 1

1.5 Task Allocation 1

1.6 Environment 1

CHAPTER 2. LITERATURE SURVEY/RELATED WORK 5

2.1 Related application 5

2.2 Eclipse 5

2.3 Android SDK 5

2.4 Java SE Development Kit (JDK) 6

2.5 ADT plugin 6

2.6 AchartEngine 6

2.7 GenyMotion 6

CHAPTER 3. FUNCTIONAL SPECIFICATION 7

CHAPTER 4. SOFWARE DESIGN SPECIFICATION 9

4.1 Flow chart 10

4.2 Database design 13

CHAPTER 5. IMPLEMENTATION NARRATIVE AND DESCRIPTION 16

5.1 Programming language 16

5.2 Software environment 16

5.3 Implementation narrative 16

5.3.1 Implementation 16

5.3.2 Difficulty 21

CHAPTER 6. EVALUATION 22

6.1 Testing 22

6.2 Comparison 22

CHAPTER 7. SUMMARY 28

7.1 Future work 28

7.2 Conclusion 29

CHAPTER 8. REFERENCES 30

LIST OF FIGURES

Figure 1: Data Flow Diagram 9
Figure 2: Flow chart of the app usage function. 11
Figure 3: Flow chart of the usage chart function 12
Figure 4: Flow chart of monitoring battery 12
Figure 5: Flow chart of checking screen status. 13
Figure 6: the relationship between the table AppTime and TotalTable 14
Figure 7: The new record of App A in AppTime Table 14
Figure 8: Update the record of App A in TotalTable 14
Figure 9: The PowerTable 15
Figure 10: The CheckScreen table 15
Figure 11: Unlock Times Checking 20
Figure 12: MobileTime's size 22
Figure 13: The size of App Timer Mini 2 and AppUsage 23
Figure 14: consumption picture captured in 26th April 23
Figure 15: consumption picture captured in 19th May 24
Figure 16: consumption picture captured in 30th May 24
Figure 17: consumption picture captured in 5th June 25
Figure 18: App Timer Mini 2 page 26
Figure 19: App Timer Mini 2 Alert page 26
Figure 20: AppUsage screenshot 27

LIST OF TABLES

Table 1: Work Scheduling 2

Table 2: Task allocation.....4

Table 3: function Description 7

Table 4: Flag Description.....21

CHAPTER 1. INTRODUCTION

1.1 Background

Nowadays, people have at least one smart phone in their pocket. Smart phone is so useful that people are more and more rely on it. We use it to check mails, browse the internet, play games, take photos, listen to music etc. If we spend too much time day by day, it will cause neck pain, short sight. Our app can show the usage of each application in your smart phone, also you can set up a reminder to alert you to put down your phone.

1.2 Objective

The objective of this project is to manage user's time to use smart phone so that user don't become a morbid. In the project, we develop an application to monitor the status of the mobile usage. It shows the time of each application which in the user's mobile. We hope the user can reduce the time on the phone through this application.

1.3 Work flow

We list the steps of the project. There are eight parts:

- The decision of the requirement
- The APP's design for the function
- The APP's design for the interface
- Implementation of function
- Implementation of interface
- Testing
- Modification
- Report

1.4 Work Scheduling

Table 1 shows the workload in the given period.

1.5 Task Allocation

Table 2 shows the task allocation.

1.6 Environment

Smart phone's operating system is mainly divided into two type: android and IOS. Since we need a permission to access to the system to get the other application's data and the system's resources, IOS cannot provide such big permission that we only focus on the mobile in android OS. In the project we have used java, SQLite and XML. All the collected data we stored in SQLite. The interface of the application was

written in XML. The activity and service between the application and the database was written by java.

Table 1: Work Scheduling

Date	Work
23/09/2013 to 31/10/2013	Search the related application to see the availability in both IOS and android. Report the progress to our supervisor.
01/11/2013 to 15/11/2013	Study how to develop an application for android. Study how to connect SQLite to the application.
16/11/2013 to 30/11/2013	Discussion for the functions of the application. Report the progress to our supervisor.
01/12/2013 to 15/12/2013	Confirm the four main functions and design the interface for the application. Report the progress to our supervisor.
16/12/2013 to 31/01/2014	Find related information of the android system. Study how to get the system information.
01/02/2014 to 15/03/2014	Implement the main functions: App usage, usage chart, and reminder. Meeting with our supervisor.
15/03/2014 to 20/03/2014	Design and create database table to save the record. Implement the main functions: 3G/WIFI. Meeting with our supervisor.
20/03/2014 to 04/04/2014	Improve the functions App usage & Usage Chart. Integrate the record in database to generate the chart.
05/04/2014 to 15/04/2014	Improve the function 3G/WIFI.

16/04/2014 to 07/05/2014	Redesign the reminder function. · Add settings for each application. · Add settings for reminder mode. Draft the report.
08/05/2014 to 14/05/2014	Improve the whole application. · Interface. · Add a sorting feature to count time. · Add custom setting.
15/05/2014 to 22/05/2014	Test the functions and find bugs for one week.
22/05/2014 to 28/05/2014	Fix all the bugs in the testing we found.
28/05/2014 to 05/06/2014	Write the final report

Table 2: Task allocation

Task	Responsible person
Project study	Sue & Veronica
System study	Sue & Veronica
Getting data	Sue
Creating database	Sue & Veronica
Create reminder & 3G/WIFI functions	Veronica
Integrate all the functions	Sue & Veronica
Testing	Sue & Veronica

CHAPTER 2. LITERATURE SURVEY/RELATED WORK

At the project beginning, we focus on search the applications that are related to our project. We hope we can find any clue in both IOS and android. Actually, we get many in android. Android is a good platform which is a fully open-source operating system. However, we can't find any applications that are related to our project in IOS. We only can find the applications that need to be installed in a jailbreak iPhone. We start to search why iPhone don't have such application to manage mobile time. The answer is that iPhone blocks some permissions to protect the phone and all the developer's application so that no one can get such information to implement this kind of application only if the phone is been jailbreak. A jailbreak iPhone relieves all permissions but it makes the phone become unstable. We don't expect the user jailbreak the phone for our application. So we decide to give up implementing the application in IOS, only implement an application that in android OS.

2.1 Related application

In the store, there are some related applications. They can count the time for your usage also but some have different addition functions.

In the beginning, we spend a period of time to search them in the word 'time', 'manage' etc. However, we can't find any related applications. We realized that may be such application's name didn't have those words. We started using another word 'count', 'track', and we get a little prospect. After the research process, we found a fact that was those applications are not been widely use.

Although we are familiar with java environment, we still need to study about the android system and specification. To develop an application, we need to design interface for user with XML.

2.2 Eclipse

Eclipse[1] are the tools for Java developers creating Java EE and Web applications, including a Java IDE, tools for Java EE, JPA, JSF, Mylyn, EGit and others. In this project, we use Eclipse for Java EE. Eclipse can install many plugins. In order to implement our project, we need to install the plugins android SDK and ADT plugin into Eclipse.

2.3 Android SDK

The Android SDK[2] provides us the API libraries and developer tools necessary to build, test, and debug apps for Android. API(Application Programming Index) is a group of library for android developer to develop android application. Android SDK also provides a set of virtual system for us to debug. This is the core tool to implement the application.

2.4 Java SE Development Kit (JDK)

Java SE Development Kit (JDK)[3] is for Java Developers. Includes a complete JRE plus tools for developing, debugging, and monitoring Java applications.

2.5 ADT plugin

Android Development Tools (ADT)[4] is a plugin for the Eclipse IDE that is designed to give you a powerful, integrated environment in which to build Android applications.

ADT extends the capabilities of Eclipse to let you quickly set up new Android projects, create an application UI, add packages based on the Android Framework API, debug your applications using the Android SDK tools, and even export signed (or unsigned) .apk files in order to distribute your application.

2.6 AchartEngine

It is user friendly that we use chart to present our data. AChartEngine[5] is a charting library for Android applications. It currently supports the following chart types:

- line chart
- time chart
- bar chart
- pie chart
- bubble chart
- doughnut chart
- etc.

As you see, there are many charts are provided. We want to use some of them also. But our instructor suggests us to choose a chart that is clear to express the usage is enough. So we decided using the pie chart to show the usage.

2.7 GenyMotion

GenyMotion[6] is a fast android emulator. It has wifi feature and we can control the battery. GenyMotion let us to simulate every environment that we will meet in real mobile. It is an emulator for us to test and demo our project.

CHAPTER 3. FUNCTIONAL SPECIFICATION

In our application, there are four main functions (see detail in Table 3). They are called app usage, usage chart, reminder and 3G/WIFI. They are shown in the top of the app, using four different tabs to divide. The parts I managed are the app usage and usage chart. The function reminder and 3G/WIFI is implemented by my partner.

Table 3: function Description

Function	Description
App usage	Counting the time of each application's usage in the smart phone.
Usage Chart	Show the application usage in the diagram by using the time counting data.
Reminder[14]	The reminder is optional. The user can set the amount of the time of using which/which kind application. When the user uses the application over the limit, the reminder will warn the user.
3G/WIFI[14]	To show the usage of 3G/WIFI, also it shows the detail of each application's data usage.

The functions above are the main functions we'll implement. The installed application in the mobile is our app mainly concern. In addition to show the using time of the application, the information of application will also appear in our app. The information includes the application type, the size.

The app usage's tab is showed the counting time of the application, it shows a ranking of the applications by alphabet or by the time descending.

The usage chart's tab shows a pie chart. It is according to the data that shows in the ranking function to generate. We choose pie chart because it is clear to show what user's most used application is. We hope the chart can be as a warning for user when they see in first sight.

The reminder's tab is liked an alarm. It alerts users when the application is used over the limit, which is set by the users themselves.

The 3G/WIFI's tab also have a chart. The chart shows only 3G and WIFI. The detail usage is shown below the chart.

After the main functions, we have some additional function to make our application different. The functions below are also developed by me.

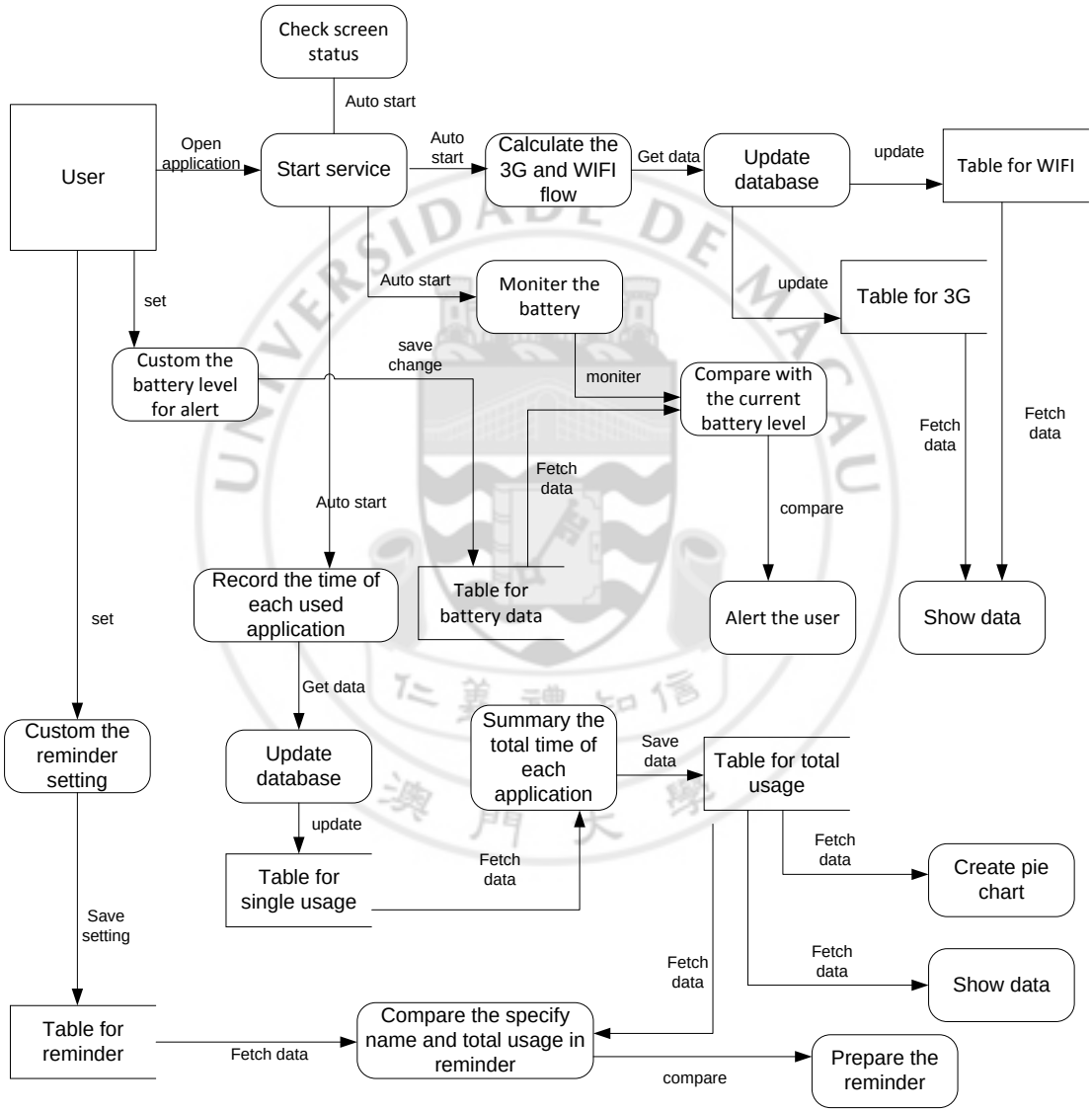
One is to check your battery usage. When your phone's battery is lower than the limitation (the default is 30), it will alert you to charge your phone. The limitation and the alert type can be set by the user.

The other is to check how many times the users turn the mobile's screen on. Nowadays, people rely on their mobile more and more. They don't realize that they turn on screen is meaningful or don't. People have got used to play with their mobiles consciously and even unconsciously. We hope user through this function can aware this problem and reduce the time to turn on mobile.

CHAPTER 4. SOFWARE DESIGN SPECIFICATION

In our project, data are very important and all the functions are relied on these data in our database (see 錯誤! 找不到參照來源。錯誤! 找不到參照來源。). The Data Flow Diagram doesn't contain all tables in the database, it focuses on the activity flow because other tables is made by my partner. My partner's report will contain the other in detail.

Figure 1: Data Flow Diagram



In the Data Flow Diagram, These functions are the core function of the application. When users open our application, it will start the service in the back-end. The service contains several functions: tracking the usage time of the application, calculating the 3G and WIFI flow, the reminder and monitoring battery.

As you see, there are five tables in the Data Flow Diagram. But this is not the real in our application. There are ten tables in the database actually. Because I don't know the details of the function that my partners handles so some tables are omitted in the data flow diagram.

In the next, I will introduce the part that I am response for. In this project, I am handling the app usage, usage chart, monitoring battery and checking screen status. I will separate them to talk about.

4.1 Flow chart

First I will introduce the work flow of the app usage (see Flow chart of the app usage function.Figure 2). When the service is start, first it checks the mobile whether is activated. If the mobile is not activated, it won't start counting any usage, the service is on standby. Once the mobile is activated, then the service goes to next step – to check whether any application is ongoing. If one application is used, the service will temperately save the application name in memory and start to count the usage. When the application is finished used, the application name and the usage time save to the database immediately. And then start to check the screen again until the service is closed by user.

Other major function is the usage chart. The chart is according to the data that the pervious function gets then is generated. To avoid the problem that does not prompt an error to user, I make a condition to judge the table is empty or has elements. If the table has no elements, then the page will not show the chart and no error shows to user. The flow chart of the usage chart function is below (see Figure 3). This function is only activated when users open our application, so it does not have a recursion in its flow.

Figure 2: Flow chart of the app usage function.

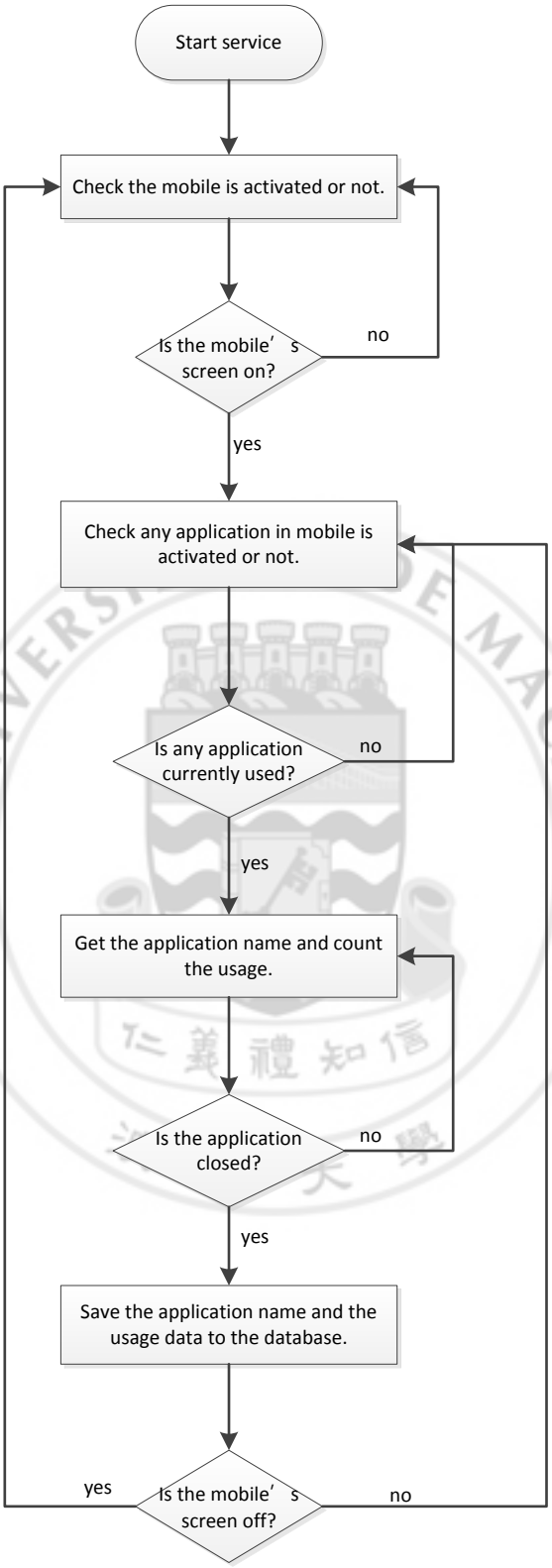
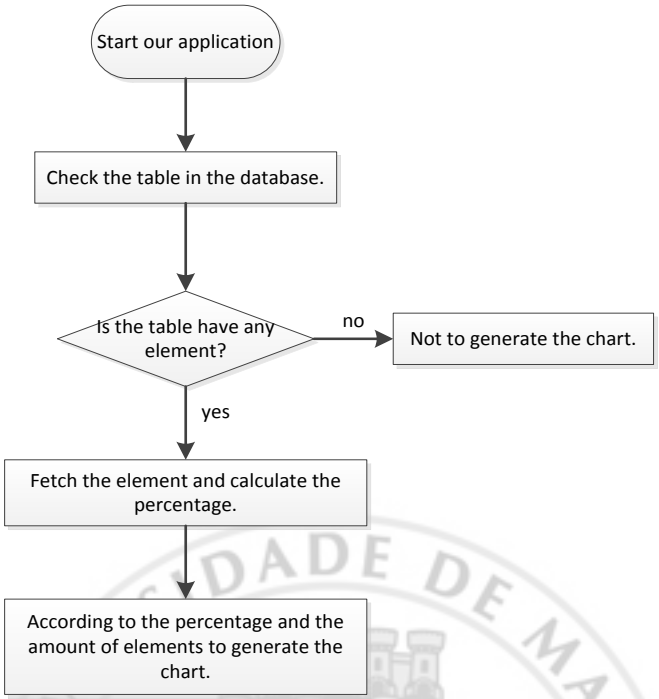
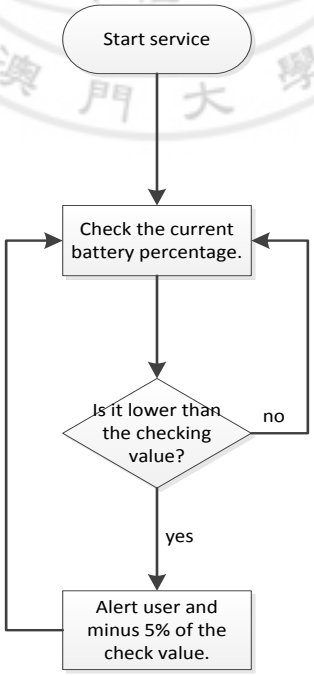


Figure 3: Flow chart of the usage chart function



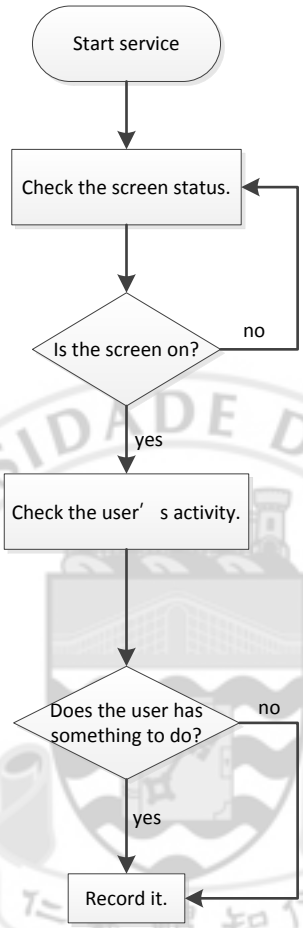
The third function is monitoring the battery in order to remind the users to charge their phone. The flow chart of monitoring battery is below (see Figure 4). We set 30% is the default percentage for alerting user. Furthermore, users can reset the percentage which they want our application to reminder and the remind method, and then it will update the value to the database. When the current battery percentage is lower or equal than the setting percentage, the alert is prompt and decrease 5% of the setting percentage for the next alert.

Figure 4: Flow chart of monitoring battery



Moreover, we have a function that checking the screen status. Screen status has two states: screen on and screen off. This is to check the users' activity. Detect what the user is doing.

Figure 5: Flow chart of checking screen status.

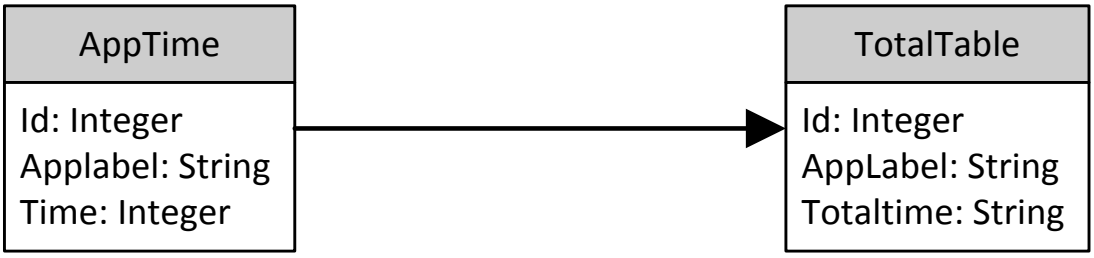


4.2 Database design

The database is used SQLite. SQLite[7] is a software library that implements a self-contained, serverless, zero-configuration, transactional SQL database engine. SQLite is an embedded SQL database engine, which means that our application reads and writes in the local disk and we don't need to create a server to hold the data. Also, it is small and easy to configure. Next I am going to introduce the tables which I created.

In the database, my functions need four tables. In the app usage function, it uses two tables to save data. The AppTime table save every application usage record. E.g. Dropbox opens 10 seconds, and then Facebook opens 30 seconds. Then AppTime table will have two records. In the AppTime table, ID is to ensure that every record is unique. And other two columns make up a record.

Figure 6: the relationship between the table AppTime and TotalTable



Users may want to know the total usage time of each app. So TotalTable contains the total usage of each application. In this table, id and applabel is also unique. The application only updates the Totaltime when the applabel is appeared. The figures below shows an example for the record updates (see Figure 7 & Figure 8).

Figure 7: The new record of App A in AppTime Table

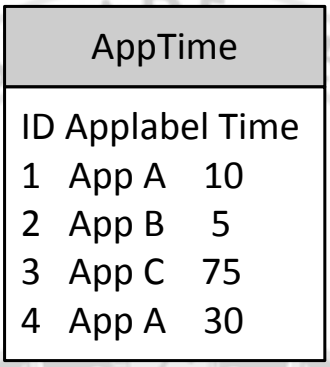
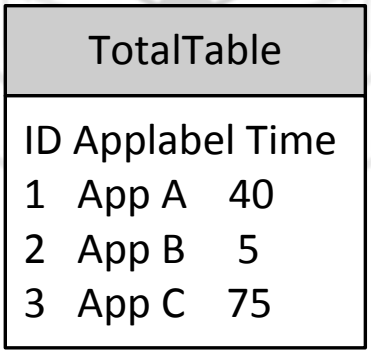
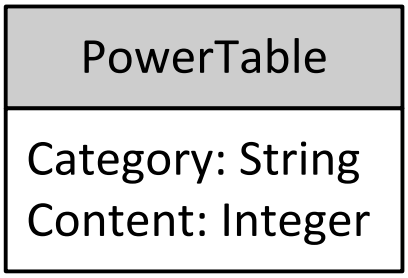


Figure 8: Update the record of App A in TotalTable



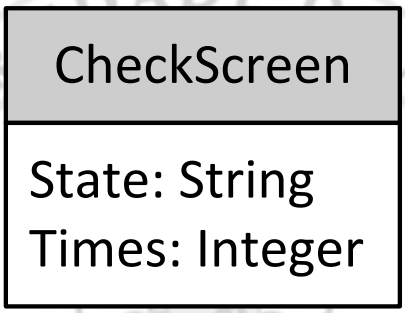
The PowerTable is used by monitoring battery function. It only contains two records. One is the minimum percentage for checking. The other is the type of alert. Both are use an integer value to save in the content column. To distinguish these two values, one is named power and the other is named type in the category column.

Figure 9: The PowerTable



The CheckScreen table is used by the checking screen status function. It contains two records also. One is the total time of turning screen on. The other record is the time of turning screen on but does nothing. The purpose of this function will talk about in the next chapter.

Figure 10: The CheckScreen table



CHAPTER 5. IMPLEMENTATION NARRATIVE AND DESCRIPTION

Since I am in charge of the App usage and usage chart two parts, so in this report I will introduce the data structure and the function in these two parts.

5.1 Programming language

In the project we use java because it is the programming language of android application development.

5.2 Software environment

The application needs to run in android 3.0 platform above. To have a good performance, we suppose the phone have 2GB RAM. The minimum requirement is 1GB RAM.

5.3 Implementation narrative

5.3.1Implementation

In this part is mainly talk about how I do the implementation step by step. The implementation is following the design.

5.3.1.1 App Usage

As the pervious part Chapter 4 told before, the data of app usage's accuracy effects the usage chart's display. So the calculation of the app usage must be correct. This function needs a permission of retrieving the running app. Getting the application in the mobile has a function provided in the ADT library package. Inside the function getInfo(), I use several functions from the library to get the current using application package name.

```
public String getInfo(){

    pm = getPackageManager();
    apps = pm.getInstalledApplications(0);
    installedApps = new ArrayList<ApplicationInfo>();
    k = apps.size();
   ActivityManager am= (ActivityManager)getSystemService(ACTIVITY_SERVICE);

    recent = am.getRecentTasks(k, 1);
    List<ActivityManager.RunningTaskInfo> run = am.getRunningTasks(k);
    ActivityManager.RunningTaskInfo task = run.listIterator().next();
    String b = task.baseActivity.getPackageName();

    return b;
}
```

Package name is not the name we see on the mobile. It is a unique name to identify the application. The form of a package name is liked a website link. Our application package name is com.mobiletime. I need to display an application name to user. So I do a transform between package name and application name.

```
public String getAppLabel(){
String nameF = "";
```

```
                for (ActivityManager.RecentTaskInfo info : recent) {
                Intent intent = info.baseIntent;
                ResolveInfo ri = pm.resolveActivity(intent, 0);
                String name = "";
                if (ri != null){
                        name = ri.activityInfo.packageName;
                }
                String name2 = "";
                String name3 = "";

                ApplicationInfo a = null;
                try {
                        name2 = pm.getPackageInfo(name, 0).packageName;

                } catch (NameNotFoundException e) {
                        // TODO Auto-generated catch block
                        e.printStackTrace();
                }
                if (name.compareTo(name2) == 0){
                        name3 = (String) pm.getApplicationLabel(a);
                        nameF = name3;
                        break;
                }

        }
        return nameF;
    }
```

The method I use is first to get the recent running app and current time when the app is in the first of the recent app's list. Then when the app is closed or user open another app, the system will get the current time again and do the subtractions of two times we get before. Finally save the result to the database. This method reduces the memory usage because it doesn't do the calculation every second.

```
    public Runnable work=new Runnable(){
        public void run() {

         PowerManager powerManager = (PowerManager)getSystemService(POWER_SERVICE);
        boolean isScreenOn = powerManager.isScreenOn();
                if (isScreenOn){
                        flag = true;
                        s1 = getInfo();
                        if(s1!=null&& s1!=""){

                                if (!s1.equals(s2)){
                                        String appname = getAppLabel();
                                        s2 = s1;
                                        timenow = System.currentTimeMillis();

                                        if (time2 == 0){
                                                time1 = timenow;
                                                time2 = time1;
                                                Insertname = appname;
                                                }
                                        else{

                                                time2 = timenow-time1;
                                                time1 = timenow;
                                                int time = (int) (time2 / 1000);
                                                dh.Insert(Insertname, time);
                                                Insertname = appname;

                                                }
                                }
                        }

                }else{
                        timenow = System.currentTimeMillis();
                        if (flag&&Insertname!=null&&Insertname!="")
                                {
                                        time2 = timenow-time1;
                                        time1 = timenow;
                                        int time = (int) (time2 / 1000);
                                        dh.Insert(Insertname, time);
```

```
                                    Insertname = appname;

                                    }

                                flag = false;
                                screen = true;

                            }

                                    handler.postDelayed(work, 1000);
                    }

            };
```

The work flow is that:

1. To check the screen is on or off;

```
PowerManager powerManager = (PowerManager)getSystemService(POWER_SERVICE);
boolean isScreenOn = powerManager.isScreenOn();
```

2. If the screen is on, then get the current using package name;

```
s1 = getInfo();
```

3. If the current package name is changed, get the application name and record the current time.

```
if (!s1.equals(s2)){
    String appname = getAppLabel();
    s2 = s1;
    timenow = System.currentTimeMillis();}
```

4. Do this function again one second later.

```
handler.postDelayed(work, 1000);
```

Since the method needs to run by itself and continuously, it needs to put into a service. A Service[8] is an application component that can perform long-running operations in the background and does not provide a user interface. Another application component can start a service and it will continue to run in the background even if the user switches to another application. In the service, it has several threads to manage different functions in our application. The thread makes the functions can be run synchronously. In app usage, it uses one thread called work() and I make it runs a second again.

5.3.1.2 Usage chart

Since the chart needs to show to the user, it can run when our application starts and destroyed by the application closes. So this function runs as activity. An Activity[9] is an application component that provides a screen with which users can interact in order to do something. Each activity is given a window in which to draw its user interface. We use a Fragment to make up four functions. So I draw the chart in the fragment is like that:

```
public View onCreateView(LayoutInflater inflater, ViewGroup container,
                Bundle savedInstanceState) {
        v = inflater.inflate(R.layout.chart, container, false);
        return mainActivity.getChartData();
}
```

The getChartData() function is in the mainActivity class. This function contains another function which is prepared the chart's data called openCharts().

```
public GraphicalView getChartData(){
        dh = new DatabaseHelper(this);
        GraphicalView View = openChart();

        return View;
}
```

This function is easier because we found AchartEngine library, the library makes us omit the step of drawing the chart. We can use the function provided in the library. We fetch the data that is collected in pervious function from database and then generate the chart. Since the function is so long because using many defined function to make the chart clear, so I only copy the major part for the work flow.

1. I get the data from the totalTable and put into a cursor.

```
Cursor cr = DatabaseHelper.getInstance(MainActivity.this).fetch2();
```

2. Then I deal with the data to be the percentage and put in to a CategorySeries which is provided in the library.

```
CategorySeries distributionSeries = new CategorySeries(" App Usage Pie Chart");
for (int i = 0; i < count; i++){
                    cr.moveToNext();
                    name[i] = cr.getString(1);
                    time[i] = dh.getTime(name[i]);
                    timetotal += time[i];

}

        for (int i = 0; i < count; i++){
                timepercent[i] = (time[i] / timetotal) * 100.00;
        }
        for(int i=0 ;i < timepercent.length;i++){

                distributionSeries.add(name[i], timepercent[i]);
        }
```

3. Then generate the chart and return it.

```
    mChart = ChartFactory.getPieChartView(getBaseContext(), distributionSeries,
defaultRenderer);

        return(mChart);
```

5.3.1.3 Addition function

Then I present the minor functions. Since smart phone has many features, this causes the power consuming very fast. You may have no idea that the battery is low when you are focus on you work or business. The function in our application is monitoring the power consumption. When it is lower than the setting amount, our application will alert. The function is run is the service also.

```
private void batteryLevel() {

  IntentFilter batteryLevelFliter = new IntentFilter(Intent.ACTION_BATTERY_CHANGED);
  registerReceiver(mBatteryLevelReciver, batteryLevelFliter);
}
```

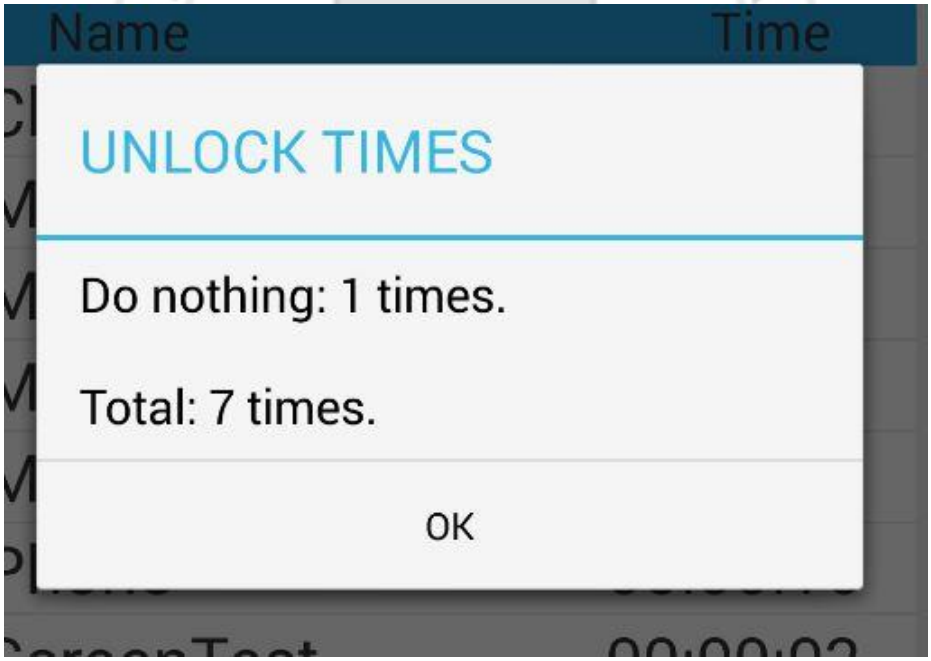
The intent filter is a target that monitoring the battery, and we put this filter into a receiver to trigger the mBatteryLevelReciver when the battery level is changed. The mBatteryLevelReciver() is below. The variable *a* is a value which may be entered by user is saved in database (if the user doesn't do any change, the default value is 30).

```
private BroadcastReceiver mBatteryLevelReciver = new BroadcastReceiver(){
```

```
@Override
public void onReceive(Context context, Intent intent) {
    dh = new DatabaseHelper(context);

    int rawLevel = intent.getIntExtra(BatteryManager.EXTRA_LEVEL, -1);
    int scale = intent.getIntExtra(BatteryManager.EXTRA_SCALE, -1);
    int percent = -1;
    if (rawLevel >= 0 && scale > 0) {
            percent = (rawLevel * 100) / scale;
        }

        if (percent <= a){
           if (dh.getType() == 1){
                   dialog(1);
           }else if (dh.getType() == 2){
                   notifyBar();
                   }
           a = a-5;
        }
    }

};
```

Then I introduce a function that I think is useful. This function has no any setting, it is running in back-end also. According to the survey I saw in CNN website, there are 66% of people suffer from nomophobia[10]. Nomophobia is the fear of being out of mobile phone contact [11]. People who have nomophobia may always touch the mobile unconsciously. This function only has a prompt dialog shows to user. To tell the user that he or she opens the phone how many times a day.

Figure 11: Unlock Times Checking



The function is embedded in the thread work() which is the app usage function used. I add some code to judge the user open the mobile is doing something or doing nothing. You can see the code below has several flags. Table 1Table 4 is the flag description.

```
if (isScreenOn){
                if (screen){

                //the total screen open times
                dh.update10();
                check = true;
                screen = false;
```

```
                }

                s1 = getInfo();

                if (!s1.equals(s2)){
                        check = false;
                        //some code omitted
                        …
                }
        }else{
                //some code omitted
                        …
                if (check){
                        //do nothing
                        dh.update10a();
                        check = false;
                }

                screen = true;

        }
```

Table 4: Flag Description

Flag name	Description
Screen	To check the screen is on or off. When it is true that means the status is just turn on this time. So I assign false when the update is finished.
Check	To check the user's activity when the screen is on. It is true when the user don't do any action that means user turn on the screen only.

5.3.2Difficulty

It is the first time for me to implement an android application, but overall it is not so difficult during whole implementation. I think that is because it uses java as their develop language. However, I still have some bottleneck in implement the app usage function.

In this function, I have spent the most time in how to count the usage. I've spent almost one month in only the counting part. I feel so awkward that is I know how to do the counting and get the current using application, but I can't combine them together since the get application service will run once per second in the thread, and this is continuously and cannot interrupt with another function, so do the counting. Furthermore, this method makes the counting error. The result is not correct. And it needs many resources. But I don't have time to find out what the error is. After that I've tried to make these two features in two threads, but this action makes two features don't have any connection.

Then I met an eldership who is expertise in develop IOS application. I tell him the situation and he gives me a suggestion. He told me that counting has many methods, not only addition, but also subtraction. That is the method I use now. This method only does calculation when there are another application opens.

CHAPTER 6. EVALUATION

6.1 Testing

We use android mobile too. So we use our mobile for testing. The app has been tested for two weeks. When all the function is getting finished, our supervisor gives us an advice that is to put on the application store. Our application has released on Google play for two weeks. There are eight users have downloaded our application, and we keep to update it about once or twice a week according to the users' error report. So our application has been tested for one month. We hope our application can not only be used for many different mobile, but also will widely be used.

For the testing, we don't have any test plan because every device is different. My partner and me both use Samsung mobile. My friend use android mobile also but the mobile is Sony's product. The application released after we has tested already. It is no problem on our mobile but my friend's mobile cannot open our application. It is difficult to judge the successful rate.

I think release the application on Google play is good. If we only use two mobiles for testing, we only do a specification change. I realize when the application has released on Google play. It is a platform for developers provide the application to user to download and test. Because user can report me the error, and I can see the error report on the Google play developer console.

6.2 Comparison

We have downloaded two similar applications in the project beginning, I do some comparisons between them and our application. these two applications are called App Time Mini 2[12] and AppUsage[13].

First is the size of storage. Our application is very small, only is about 2 MB(see Figure 12). Other two applications' size is 4.75 MB and 7.24 MB(see Figure 13). The Figures is captured from my mobile.

Figure 12: MobileTime's size

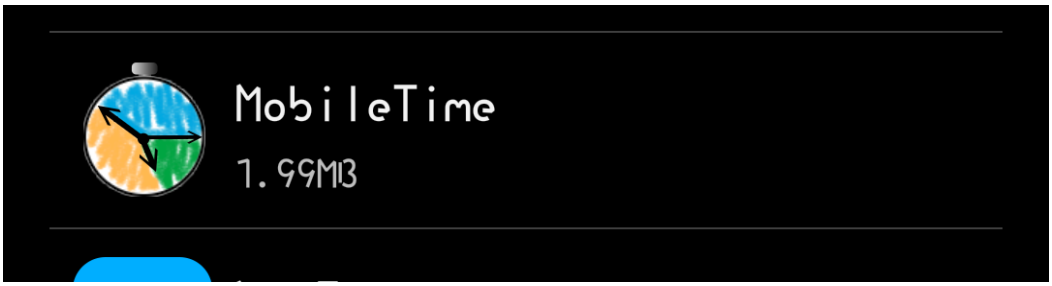


Figure 13: The size of App Timer Mini 2 and AppUsage

Next is the consumption. Our application has modified many time. And the consumption has change in every modification. The consumption data is captured from the system manager in my mobile. There are four pictures. Each picture was captured in different day. In 26th April, we found the consumption is large, and then we did an adjustment. You can see the consumption became lower in 19th May. Until 5th June, the consumption was still bigger, it had 11% of whole consumption. This is much more than two other applications.

Figure 14: consumption picture captured in 26th April

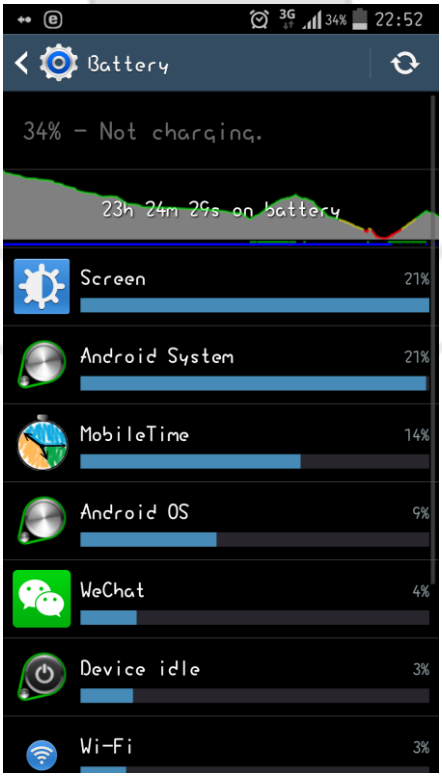


Figure 15: consumption picture captured in 19th May

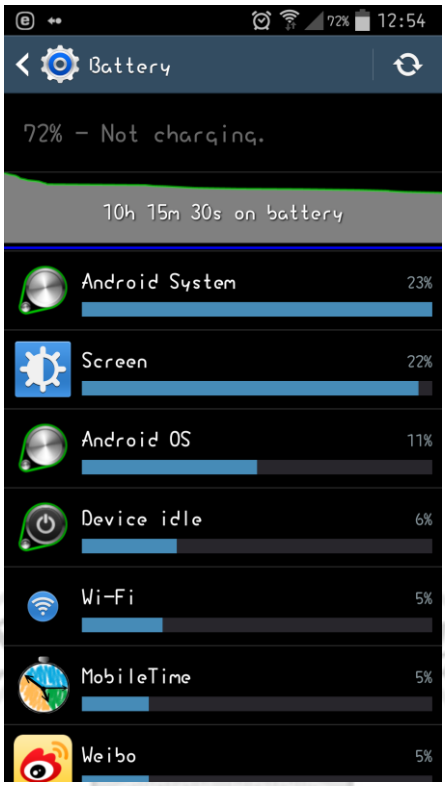


Figure 16: consumption picture captured in 30th May

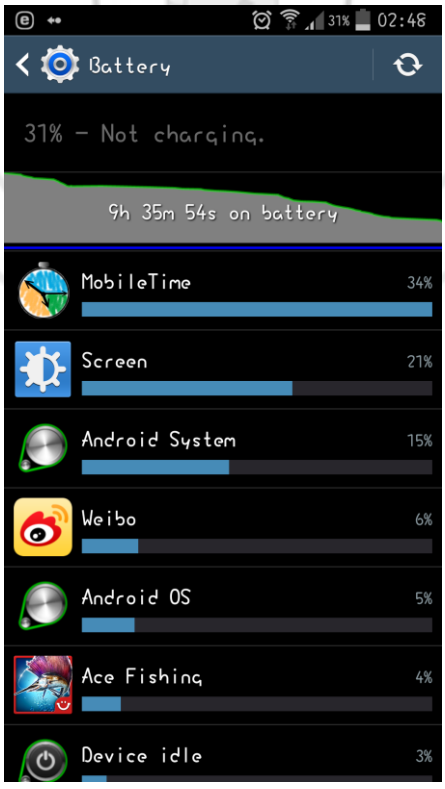
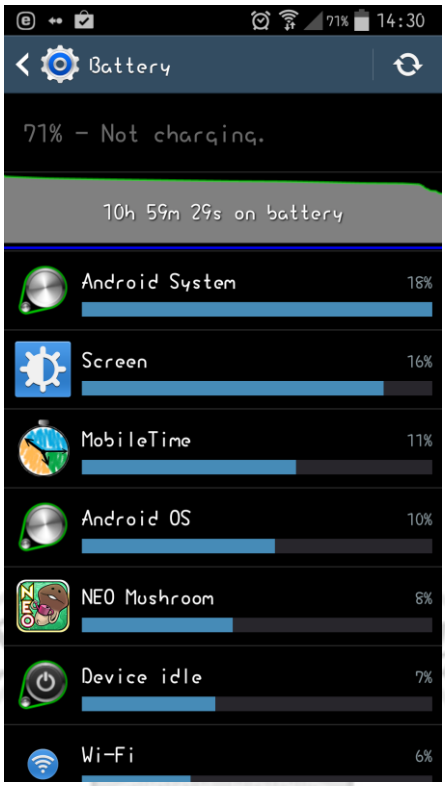
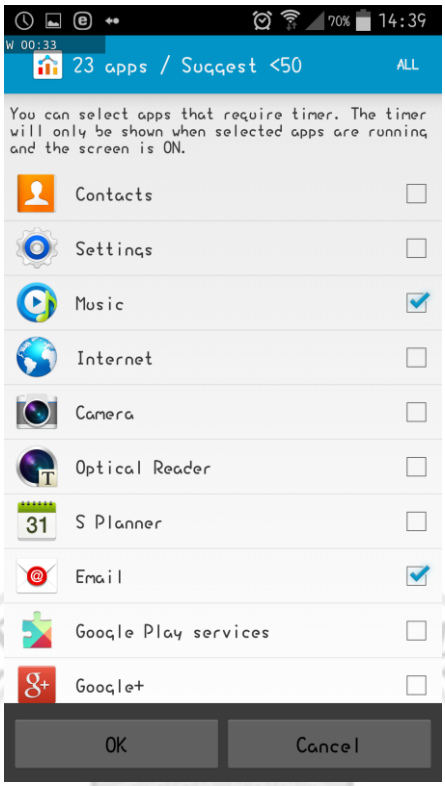


Figure 17: consumption picture captured in 5th June



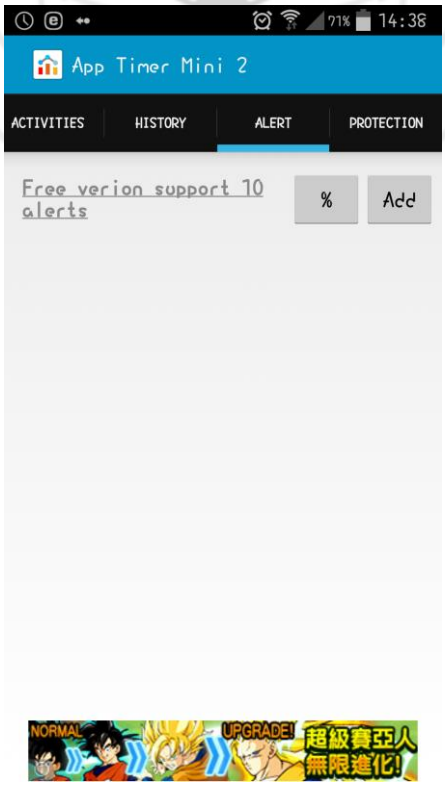
After that is the feature comparison. They also have the counting usage feature. But the app timer mini 2, it needs users to choose which application to counting. I think that is loss the purpose of counting because users have a choice. They don't know the real situation of using mobile.

Figure 18: App Timer Mini 2 page



Furthermore, App Timer Mini 2 also has a reminder. But it only supports 10 alerts in free version. Our application is free in every feature. Users can add more than 10 records in our application's reminder.

Figure 19: App Timer Mini 2 Alert page



The other application only has counting feature. No any additional feature.

Figure 20: AppUsage screenshot

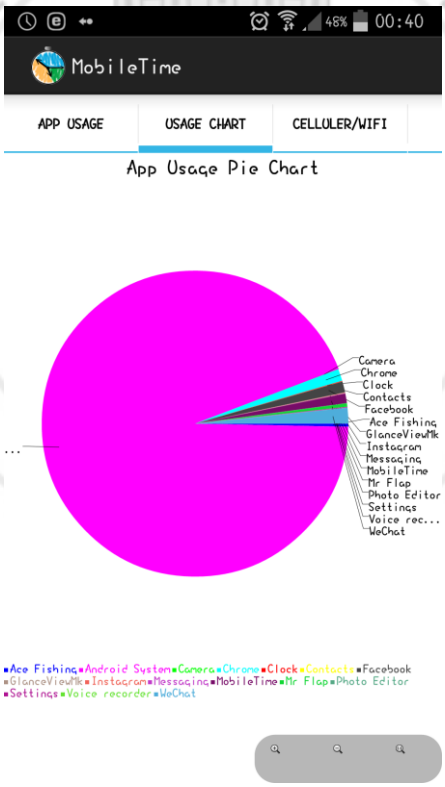
CHAPTER 7. SUMMARY

7.1 Future work

We still have many ideas to implement in our application. Since we are still a novice and we need time to study android system. If we have more time, I will implement the application in more detail.

To classify the applications is really want to achieve. In the Google play, the categories are chaos. An application may be appeared in one or two categories. This is very confused if there are a hundred applications in the mobile and our application needs to show a hundred records. This may lead to app non responsible. If I can divide the application in different category, it will reduce the memory usage and also the chart can see clearly. The picture is captured in my mobile. The chart is generated with 17 records. It is hard to see the small pieces. If the chart can show in categories is much clear.

Figure 21: Usage Chart screenshot



Second, we want to show more detail in app usage. For example, to show the user use Facebook for chatting, or watching friend's status. But we still not find the permission for this.

Finally, I want to improve the consumption to be much lower, as I mention in the comparison.

7.2 Conclusion

In this project, I've learnt so much. I know that there is no such perfect application or software in the world unless the developer keeps update. Each application needs maintenance, there must be some bugs that the developer do not know. A perfect application needs to be testing a thousand times or more to be complete.

We've successful to implement the application but there is still some inadequate. If we have more time to check out the method, we can finish the future work above. Then the application will be perfect.

Last but not least, I want to thank my partner doing this project with me. We usually discuss for a long time. We studied how to implement an android application together. Also, thanks my supervisor, Dr. Sofia Zhuang, she gives us many suggestions to help us to think more in detail and improve the application's feature.

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