

**BATTERY OPTIMIZER FOR ANDROID
DEVICE**

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BATTERY OPTIMIZER FOR ANDROID DEVICE

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ABSTRAK

Bateri Pintar adalah aplikasi mudah alih yang akan membantu mengoptimumkan penggunaan bateri. Aplikasi ini dilaksanakan fokus untuk pengguna peranti android sahaja. Masalah yang dihadapi oleh sesetengah pengguna adalah mereka kehabisan bateri telefon tetapi tiada sumber boleh mengecas semula bateri. Tidak semua orang mempunyai bank kuasa dan kadang-kadang mereka mungkin lupa untuk membawanya. Penyelesaian untuk menyelesaikan masalah ini adalah dengan mencadangkan aplikasi mudah alih yang dikenali sebagai Bateri Pintar yang boleh membantu mengoptimumkan penggunaan bateri walaupun meminimumkannya. Di halaman utama aplikasi, ia akan memaparkan kesihatan dan tahap bateri kesihatan. Dalam aplikasi ini terdapat tiga fungsi utama iaitu bateri sejuk, pengecas dan pemasa mod. Bateri Pintar akan bijak mengendalikan sistem dalaman peranti android untuk butiran bateri. dalam halaman Baterai Cool ia akan memaparkan suhu bateri. Berdasarkan penyelidikan yang dilakukan, hasil terbaik untuk mengecas bateri adalah antara 10°C dan 30°C . Seterusnya, halaman Pengecas menunjukkan status bateri dan paras bateri. Untuk status bateri, sama ada dalam proses pengecasan, tidak mengenakan bayaran atau sepenuhnya. Dan akhirnya di halaman penjimatan lif terdiri daripada tiga subfungsi iaitu Mod Kecemasan, Mod Hidup Panjang dan Mod Malam. ketiga mod ini mempunyai fungsi yang sama di mana ia akan mematikan sambungan Wifi, mematikan kelantangan dan mematikan bluetooth, tetapi perbezaan antara ketiga-tiga mod adalah nilai kecerahan skrin dan nilai tamat masa scren. Untuk Mod Kecemasan, kecerahan skrin akan ditetapkan kepada 15% dan masa akhir skrin ditetapkan kepada 15minute. Malah untuk Skrin Kecemasan Skrin Panjang Langsung akan ditetapkan 30% lebih tinggi daripada mod Kecemasan dan tamat masa skrin ditetapkan kepada 30 minit. Untuk penyelamat mod lepas, Mod Malam, kecerahan skrin ditetapkan 25% dan 30 saat di hujung skrin. Secara alternatif, kecerahan skrin akan ditetapkan secara automatik apabila pengguna menolak butang dari fungsi mod menyelamatkan nyawa. Kesimpulannya, Smart Battery adalah sistem pengoptimum bateri mudah yang mengoptimumkan penggunaan bateri secara tidak langsung boleh membantu pengguna menyelesaikan masalah mereka

ABSTRACT

Smart Battery is a mobile app that will help optimize battery usage. This app is implemented focus for android device users only. The problem faced by some users is they have run out of the phone's battery but no source can recharge the batteries. Not everyone has a power bank and sometimes they may forget to bring it. The solution to solving this problem is by suggesting a mobile app known as Smart Battery (SB) that can help optimize battery usage even minimize it. In the app's main page, it will display health and battery level of health. In this app there are three main functions namely cool battery, charger and mod timer. Smart Battery will smartly handle the android device's internal system for battery details. in Cool Battery page it will display battery temperature. Based on the research done, the best result for charging the battery is between 10c and 30c. Next, the Charger page shows battery status and battery level. For battery status, either in the charging process, does not charge or fully charge. And finally, at the Mode Saver page consists of three subfunction namely Emergency Mode, Long Life Mode and Night Mode. These three modes have same function, where it will turn off Wi-Fi connection, turn off the volume and turn off Bluetooth, but the difference between these three modes is the screen brightness value and the screen timeout value. For Emergency Mode, the screen brightness will be set to 15% and the screen end time is set to 15minute. Even for the Long Live Screen Brightness Screen will be set 30% higher than the Emergency mode and screen timeout is set to 30 minutes. For last mod saver, Night Mode, screen brightness is set 25% and 30 seconds at the end of the screen. Alternatively, the screen brightness will be set to auto when the user pushes the button from the lifesaving mod function. In conclusion, Smart Battery is a simple battery optimizer system that optimizes battery usage can indirectly help users solve their problems

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LIST OF ABBREVIATIONS

SB Smart Battery

CHAPTER 1

INTRODUCTION

1.1 Introduction

Battery is a compulsory hardware in any mobile devices. It can be either removable or non-removable. Nowadays batteries are rechargeable to ensure the mobile devices can operate at any time if they have source power to recharge their devices. Current technology in mobile device's battery use Lithium-ion or Li-ion. These technology for sure rechargeable and mostly use in smartphone and laptop. Charging and discharging of the battery is a chemical reaction as the ion from anode and cathode is exchanging. Even the battery is rechargeable, it also has its own life span. The power/performance of these battery will degrade alongside with the time of use. For example, two to three years or 300 to 500 of charge cycles is expected for a standard use.

Mobile devices like smartphone and tablets really in trend currently. Every person has either one or more of them. These devices can help a lot in completing our daily tasks. Unfortunately, without sufficient battery, it cannot help their user and become useless. These devices running by Operating System (OS) and most of them is running by Android. Besides them, iPhone OS (iOS) also a big company that evenly match the Android. Most of smartphone's user, faced problem with out of battery at a wrong time and wrong place several times. Therefore, the users' need to overcome this problem with some ideas and actions.

For the suggestion, a battery optimizer that can help user to optimize battery consumption that will reduce this problem to a certain point. Therefore, here a proposed an application for mobile application named Smart Battery (SB) which can optimize the battery usage of a device. SB has several functions which are Battery Cooler, Charger and Mode Saver. These functions can help the user in managing their battery

performance, consumption and even details. Smart Battery will extend battery life and optimize battery usage. It will save battery by dealing with phone's network connectivity, screen time out and screen brightness. SB also will let user customize their own power mode to save more power in a long time period.

In a conclusion, Smart Battery can help their user in optimizing the battery consumption. So that, the user can plan well to manage their device's battery and no more out of battery at a wrong time and wrong place.

1.2 Problem Statement

Smart Battery is a mobile application that will be developed to help user extend their phone battery life by optimizing the battery.

- i. Run out of battery in wrong place and time
- ii. Android device users use more battery consumption
- iii. The battery uses a lot of energy to work on and response to it

1.3 Objective

The objective of this project is to develop a mobile application that can optimize usage of battery for android device.

- i. To minimize battery consumption
- ii. To avoid more work load when there is no battery
- iii. To propose mobile application to optimize and help user to manage the battery

1.4 Scope

The developed project will only focus on android device user.

1.5 Thesis Organization

There are four chapter will include in this thesis. Chapter 1 will be discussing on the introduction to the project. In this introduction chapter, it contains brief information

of the system, problem statement, objective and scope of the project. Meanwhile, in chapter 2 will contain the literature review which it's has information about the study of the project in general. It also consists of comparison of three different existing systems. while in chapter 3, it will discuss the overall approach and framework of the system. The chapter 4, is the part of conclusion that will conclude all the project.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter will describe in detail on how to optimize usage of battery for android device that already exist such as DU Battery Saver, PowerPro: Battery Saver, and Battery Doctor – Battery Life Saver & Batter Cooler. This chapter will explain the comparison between this three-existing system in term of operating system, the advantages of operating system and in term of design architecture.

2.2 Review of Existing System

This part explains about three existing system that related to Battery Optimizer System. All the features, methods and processes that are used in these three existing systems are summarize in the review session

2.2.1 DU Battery Saver – Battery Charger & Battery Life

DU Battery Saver is the simplest and easiest way to keep android device working well when needed and protect the battery from overheating during charging. The features from this system that can help user optimize their battery usage such One-Touch Battery Saver, Battery Saver, Battery Monitoring, Cool Down, Junk Cleaner, Battery Mode and Battery Skin.

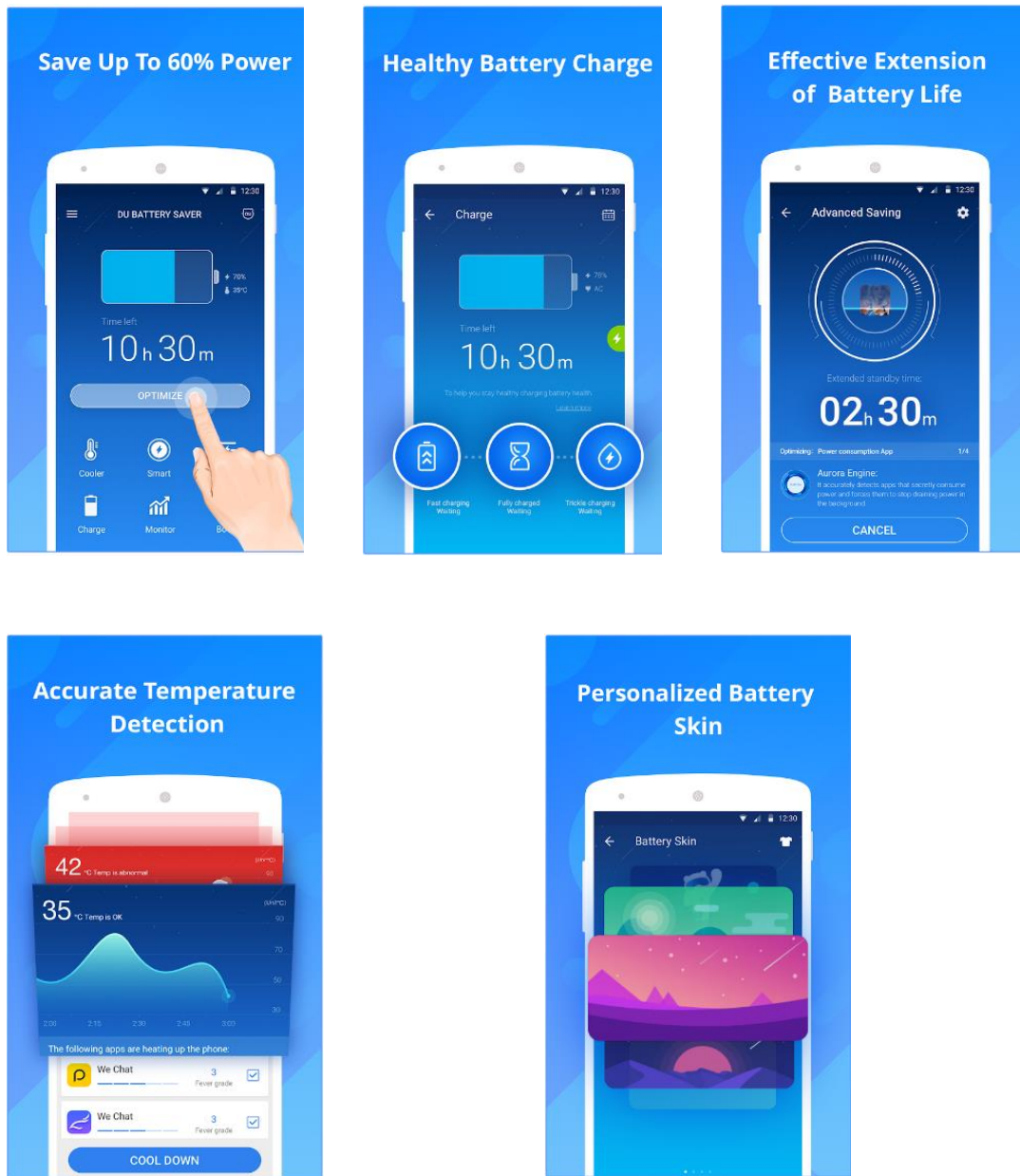


Figure 2-1 Features that available in DU Battery Saver

2.2.2 PowerPRO: Battery Saver

PowerPRO is a apps of battery saver that can helps you maintain battery life in a variety of ways. It closes inactive applications running in the background that are consuming battery life while allowing you to select the ones that you want to keep open. It also acts as a power saver by controlling the brightness of your phone's screen. PowerPro is comes with powerful features as shown in Figure 2.2 such as Quick

Optimization, Super Optimization, Battery Cooler, Customizable Profiles, and Battery Health Report.

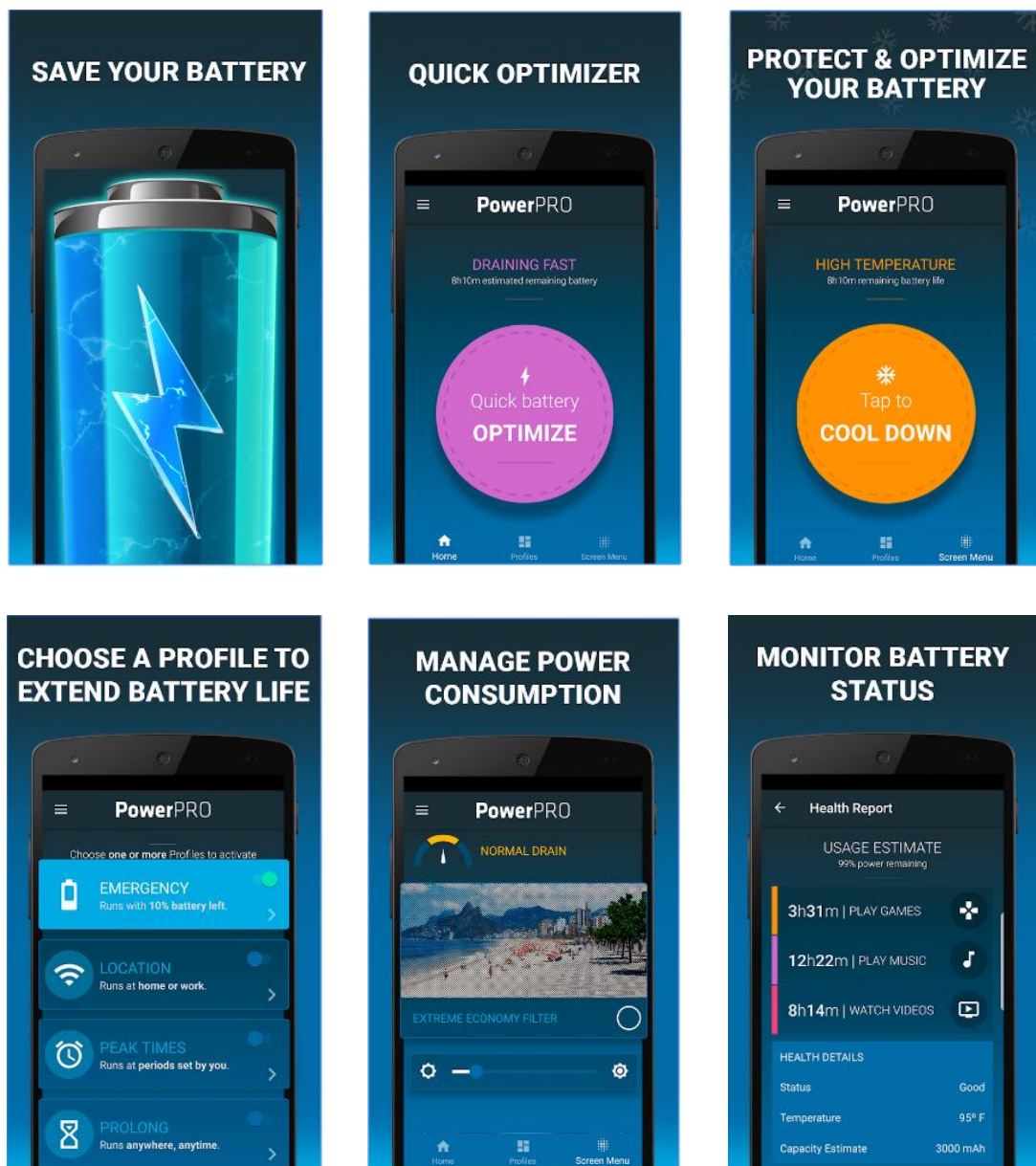


Figure 2-2 Features that available in PowerPRO Battery Saver

2.2.3 Battery Doctor – Battery Life Saver & Batter Cooler

Battery Doctor is the simplest way to keep battery in a good condition by stop all the apps in the background system that can cause the battery power to run out too quickly, cooling down battery temperature and monitoring battery status. Key features for this system as shown in Figure 2.3 are Power Optimization, Health Charge Master, Smart Use of Batter and Battery Cooler.

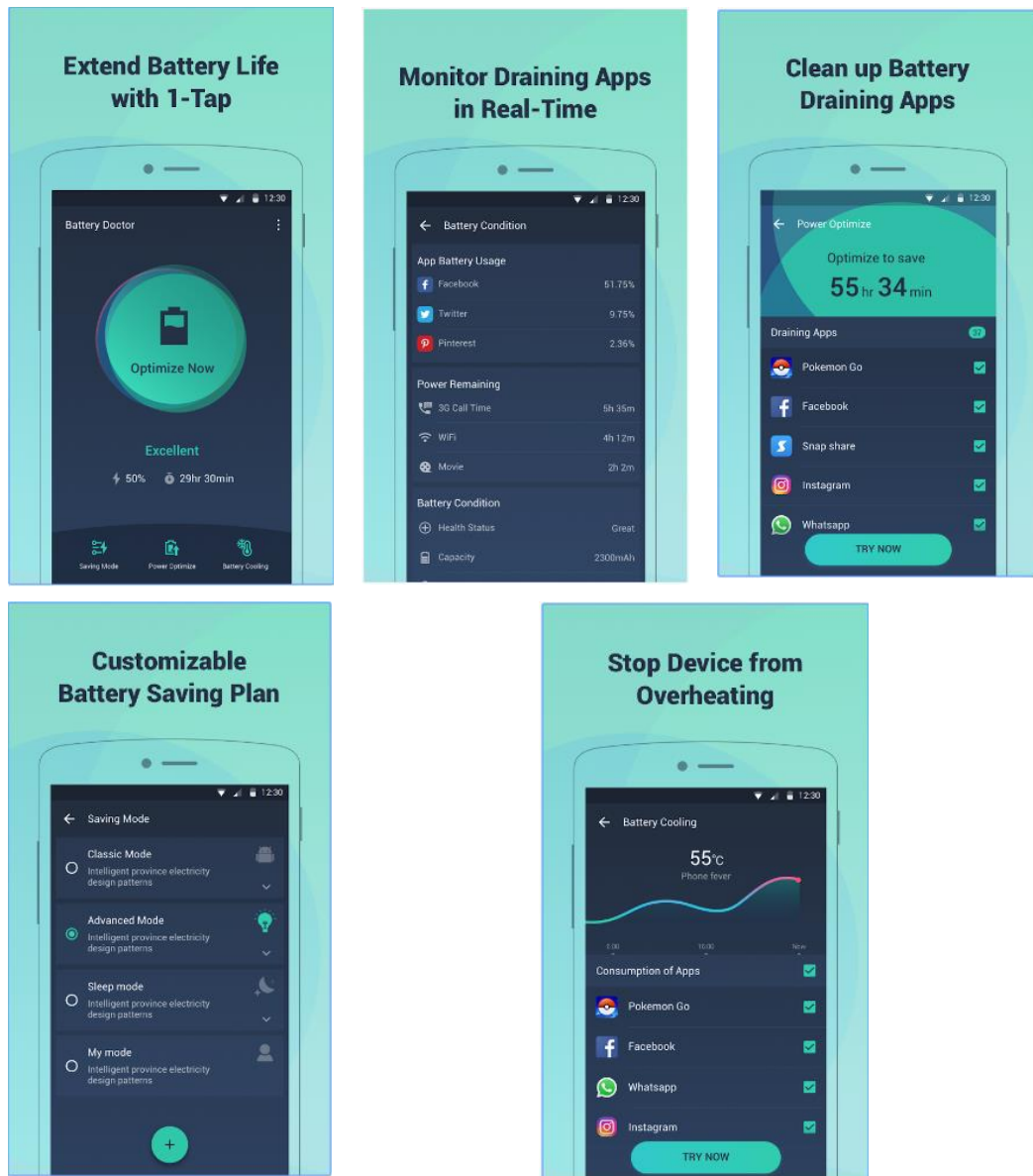


Figure 2-3 Features that available in Battery Doctor

2.3 Comparison of The System

Table 2-1 show Comparison among three existing system that related to Smart Battery Application. From the comparison below any limitation from this system will take for upgrading and will be improve for better performance

| Name | Du Battery Saver | PowerPRO: Battery Saver | Battery Doctor |
|---------------------------------------|--|---|---|
| Features Logo |  <p>DU Battery Saver - Battery Saver DU APPS STUDIO - BAT</p> <p>★★★★★ </p> |  <p>PowerPro: Battery Saver PSafe</p> <p>★★★★★ FREE</p> |  <p>Battery Doctor-Battery Doctor Cheetah Mobile Inc. (NYSE:CMO)</p> <p>★★★★★ FREE</p> |
| Main Function | <ul style="list-style-type: none"> • Optimize the battery usage • Improve performance and extend battery life | <ul style="list-style-type: none"> • It helps to conserve battery life in variety of way • It close unnecessary application that running in background • Controlling the brightness | <ul style="list-style-type: none"> • It stops any application that draining power • Help to protect and improve battery health • Colling down battery temperature • Monitoring battery status |
| Available in | Android device | Android device | Android device |
| Graphical User Interface (GUI) | The interface is simple and easy to user. The home page is not crowded but systematic and user easy to understand. | The interface is simple but too many advertisements has been advertised. It makes user feel uncomfortable with the system | The interface is good and user friendly because all what user need to optimize their battery the system appears it in home page, so user can click |

| | | | |
|----------------------------------|--|---|--|
| | | | on any of them to optimize their battery |
| Navigation User Interface | Good navigation by state the percentage of the remaining battery, remaining hour to charging it and state the temperature of the battery | Good navigation by state the percentage of the remaining battery and remaining hour to charging it. | Good navigation by state the percentage of the remaining battery and remaining hour to charging it. |
| User Rating | 4.5 ★★★★★ | 4.6 ★★★★★ | 4.5 ★★★★★ |
| Advantages | It shows detailed about battery scan such as capacity, max capacity, voltage and technology that used | Ask for setting permission either to change screen brightness, or to activated profiles that fit user needs. | <ul style="list-style-type: none"> ❖ User feel easy when use the system because easy to understand ❖ The advertisement is put together on one interface so user did not feel disturbed |
| Disadvantages | <ul style="list-style-type: none"> ❖ User need to download an apps if user want to secure any privacy from the phone | <ul style="list-style-type: none"> ❖ In home page, there is only a button where user can click on it to optimize their battery ❖ Too many advertisements make user feel uncomfortable | <ul style="list-style-type: none"> ❖ The combination of color and it keep moving make user feel disturbed |

METHODOLOGY

3.1 Introduction

In this chapter will discuss in detail about the methodology that will be used to develop the Smart Battery application for android device. The specific selection of methodology, project method, tools and techniques will be used for making the project achieve its goal and objective. The selected methodology will guide to complete this project from beginning to ending before it will be launch to the customer. To ensure that this application can be developed, a great software development methodology is needed.

3.2 Project Development Phase

The methodology that has been choose for this system is Waterfall SDLC Model. The Waterfall Model is a linear sequential flow. In which progress is seen as flowing steadily downwards (like a waterfall) through the phases of software implementation. This means that any phase in the development process begins only if the previous phase is complete. The reason of choosing this methodology is this model is simple and easy to understand and easy to use. It is easy to manage because each phrase has its own specific deliverable and a review process.

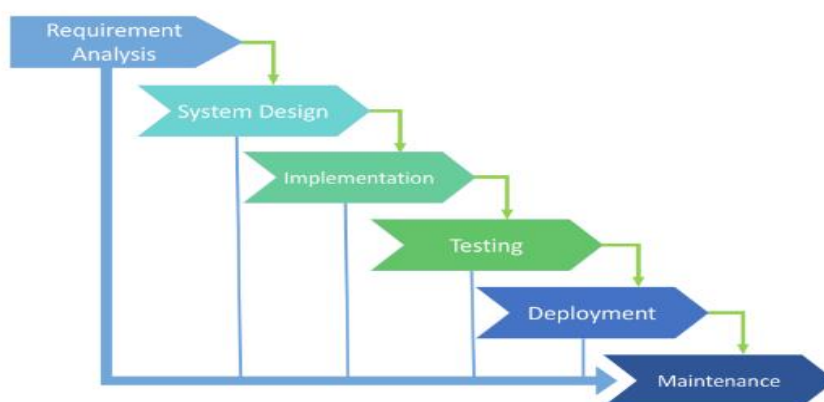


Figure 3-1 Phase in Waterfall Model

3.2.1 Requirement Analysis

The first phase in Waterfall model is Requirement Analysis which it involves of idea or suggestion on how the system will be. In this phase it involves on analyzing user requirement for this application. Based on the research that has been made, all possible requirement for this application are captured in this phase. Either in term of operating system, software and hardware that has been use for this application, and study in detail about android battery. Plus, what are major cause that can affect the battery drain too fast. All the description of each interface is explained as show below:

First interface: Homepage

- Consists of three main function which are Battery Cooler, Charger, and Mode Saver. This Homepage will display Battery Health and Battery Level. For displaying the health and level of the android device battery. The Application will deal with Battery Manager that responsible to interact with inner system of the android.

Second interface: Battery Cooler

- Battery Cooler will act to estimate temperature of the battery by display the battery temperature

Third interface: Charger

- This function will display the level of the battery and status of the battery either charging, not charging and fully charging.

Fourth interface: Mode Saver

- For Mode Saver interface it contains three option which are Emergency Mode, Long-Life Mode, and Night Mode. User only be allowed to choose one mode to be activated.

Fifth interface: Emergency Mode

- When user click on button, emergency mode will reduce the screen brightness to 15% and screen timeout to 15 second. Will automatic turn off Wi-Fi connection and disable Bluetooth. Set to vibrate. Else if user click off button, the application will set the screen brightness to auto and screen timeout will become 10minute.

Sixth interface: Long-Life Mode

- This mode will disable WLAN and data service. When user click on button, emergency mode will reduce the screen brightness to 30% and screen timeout to 30 second. Will automatic turn off Wi-Fi connection and disable Bluetooth. Set to vibrate. Else if user click off button, the application will set the screen brightness to auto and screen timeout will become 10minute.

Seventh interface: Night Mode

- Night Mode Saver will minimize usage of battery when at night. When user click on button, emergency mode will reduce the screen brightness to 25% and screen timeout to 30 second. Will automatic turn off Wi-Fi connection and disable Bluetooth. Set to vibrate. Else if user click off button, the application will set the screen brightness to auto and screen timeout will become 10minute.

3.2.2 System Design

The second phase is System Design. Where it was specifications of requirement that has been analyzed in system requirement phase and through the specification system design is develop. System Design helps in identify hardware and system requirements that suitable for the system and helps in figuring the overall of system architecture. For design the system, first need to identify on software and hardware that are suitable to run the application successfully. In this phase, many changes have been made for improvement purpose in order to make sure specification and requirement fulfill user requirement.

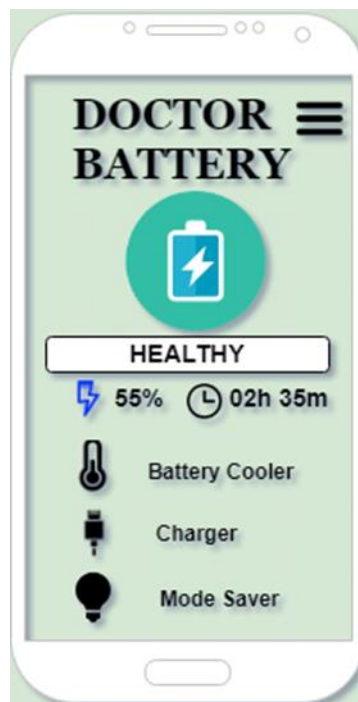


Figure 3-2 Homepage interface.

This is the home interface for Doctor Battery. It will display battery level and battery health condition.

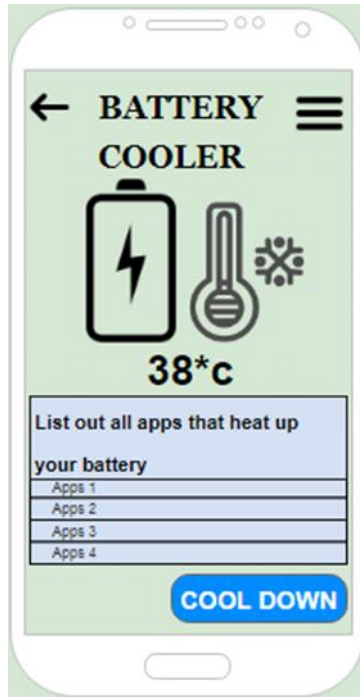


Figure 3-3 Battery Cooler interface.

It will be able to list down any application that consume a lot of battery usage.

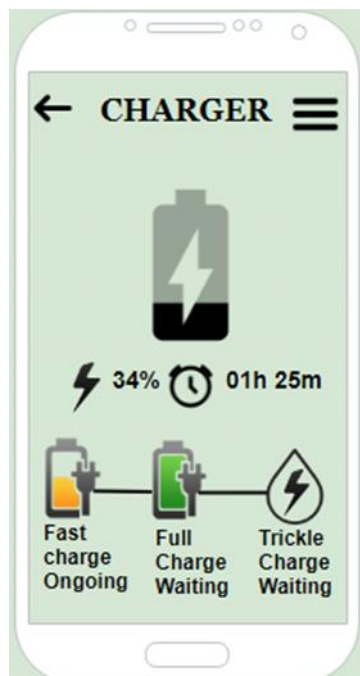


Figure 3-4 Charger interface.

It will show charging process that occur during charging.



Figure 3-5 Mode Saver interface.

Consist of three mode which are Emergency, Location, and Night Mode

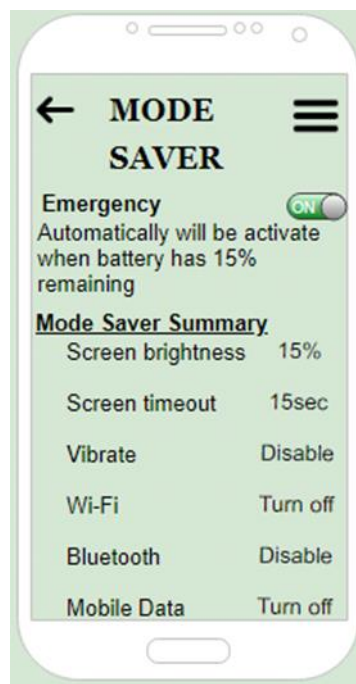


Figure 3-6 Emergency Mode interfaces

It will display the description of what the Emergency Mode will do in order to optimize battery.

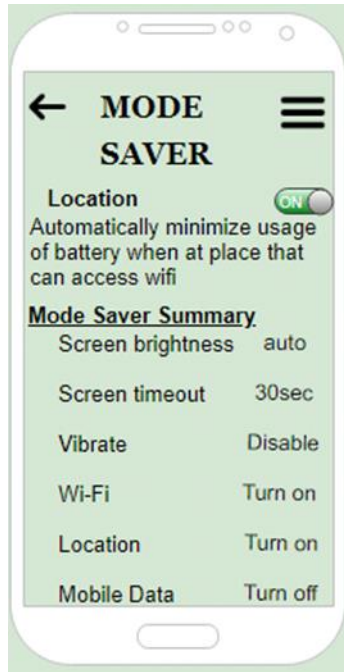


Figure 3-7 Location Mode interfaces.

It will display the description of what the Location Mode will do in order to optimize battery.

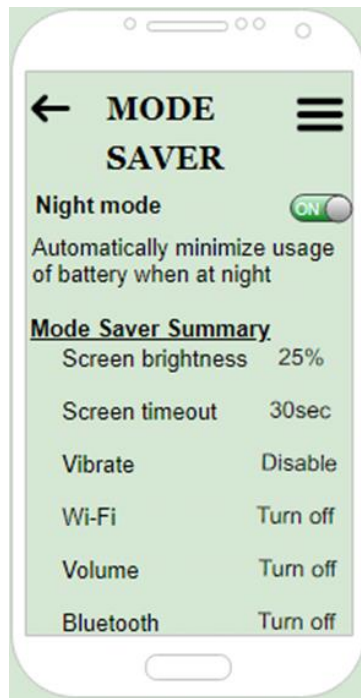


Figure 3-8 Night Mode interfaces.

It will display the description of what the Night Mode will do in order to optimize battery

3.2.3 Implementation

The third phase is Implementation: With inputs from system design, the system is developed in small unit, which is it been develop interface by interface. This is because to test that the small unit of interface can function well. For this phase, after design all the requirement then implement the application program to integrate the codes for the next phase.

3.2.4 Testing

The fourth phase is Integration and Testing: All the small unit interface that has been developed into a system need to be test to make sure if it works as expected. Perform testing activities to test either its functional well or not function. This is to make sure that the system meets the requirements. So that the user will not face any problem when using the system of Smart Battery.

3.2.5 Maintenance

The last phase is Maintenance this step involves in make any modifications or improve performance to the system.

3.3 Hardware and Software Requirement

This section will show the hardware and software that has been selected to be used in this project. That are consider to suitability with the mobile application environment. Every tool used in this project assists in documentation. All the hardware and software involve will be explained in the following table 3.1 and table 3.2.

3.3.1 Hardware Requirement

Table 3.1 show hardware requirement that has been used in order to implement a Battery Optimizer Apps

Table 3-1 Hardware Requirement

| Hardware | Version | Function/Purpose |
|-----------------|-------------------------------|--|
| Laptop | HP | <ul style="list-style-type: none">○ To prepare documentation○ To design and develop the system○ To run the system as planning |
| Printer | HP Deskjet Ink Advantage 2135 | <ul style="list-style-type: none">○ To print out all proposal, documents and any related source |
| Smartphone | Vivo V5 | <ul style="list-style-type: none">○ To install any battery optimizer apps for reference purpose○ To do some research on what process that consume a lot of battery usage. |

3.3.2 Software Requirement

Table 3.2 shows the software requirements that involve during the implementation process to build a application

Table 3-2 Software Requirement

| Software | Version | Function/Purpose |
|-----------------|----------------|--|
| Draw.io | - | <ul style="list-style-type: none">○ To draw interface |
| Microsoft Word | | <ul style="list-style-type: none">○ To create and edit documentation |
| Android Studio | Version 3.1.2 | <ul style="list-style-type: none">○ A software that help me to build apps of Battery Optimizer |

3.4 Gantt Chart

The Gantt Chart for Battery Optimizer Android Application indicate the progress and activities that involve making sure that this system can be done within the time given. Refer Appendix A for the Gantt Chart

3.5 Conclusion

As the conclusion, this chapter discuss about the method that have been choose. I have chosen Waterfall Model because it more suitable for this system. The design has been finalized in section 3.2.2 System Design. However, the development process has not been done yet, but this will be developed in the next semester.

RESULT AND DISCUSSION

4.1 Introduction

The testing phase must be proceeding once the development phase is completely done. The reason why needs to do testing on the system is to identify if there is any error that need to be corrected or any interfaces that need to be upgrade. The other reasons are to check the functionality of the system either its function well or have an error mistake. This chapter will be discussing on the finding the ways to make Smart Battery Application work well as planned. This discussion will include the objective that need to achieve, the problem statement that need to be solve and the method that the used to implement the system

4.2 Project Implementation

4.2.1 User Permission Code

Figure 3.9 show user permission code in order to allow the application to access android system to change setting of the phone

```
<uses-permission  
android:name="android.permission.ACCESS_WIFI_STATE"/>  
<uses-permission  
android:name="android.permission.CHANGE_WIFI_STATE"/>  
<uses-permission  
android:name="android.permission.BLUETOOTH_ADMIN"/>  
<uses-permission  
android:name="android.permission.BLUETOOTH"/>  
<uses-permission  
android:name="android.permission.WRITE_SETTINGS"  
tools:ignore="ProtectedPermissions" />
```

Figure 4.1 User permission code in AndroidManifest.xml

4.2.2 Coding for Emergency Mode

```
eTogglebtn.setOnCheckedChangeListener(new
CompoundButton.OnCheckedChangeListener() {
    @Override
    public void onCheckedChanged(CompoundButton buttonView,
boolean isChecked) {
    if(isChecked){
        WifiManager onwifi
=(WifiManager)getApplicationContext().getSystemService(Context.W
IFI_SERVICE);
        onwifi.setWifiEnabled(false);
    }else{
        WifiManager offwifi =
(WifiManager)getApplicationContext().getSystemService(Context.WI
FI_SERVICE);
        offwifi.setWifiEnabled(true);
    }
    if(isChecked){
        bluetoothAdapter.disable();
    }else{
        bluetoothAdapter.enable();
    }
    if(isChecked){

audioManager.setRingerMode(AudioManager.RINGER_MODE_VIBRATE);
    }
    else {

audioManager.setRingerMode(AudioManager.RINGER_MODE_NORMAL);
    }
    if(isChecked){
        //set to 15second
        setScreenTimeout(15000);
    }
    else{
        //set to 10minute
        setScreenTimeout(600000);
    }
    if(isChecked){
        Context context = getApplicationContext();
        boolean settingCanWrite =
hasWriteSettingPermission(context);
        if (!settingCanWrite) {
            changeWriteSettingPermission(context);
        }
        else {
            changeScreenBrightness(context, 38);
        }
    }
    else{
        Context context = getApplicationContext();
        boolean settingCanWrite =
hasWriteSettingPermission(context);
        if (!settingCanWrite) {
            changeWriteSettingPermission(context);
        }
    }

Settings.System.putInt(context.getContentResolver(),
Settings.System.SCREEN_BRIGHTNESS_MODE,
Settings.System.SCREEN_BRIGHTNESS_MODE_AUTOMATIC);
    }

});
```

Figure 4.2 Emergency Code

4.3 Result

Figure 4.3 shows a homepage interface for Smart Battery System

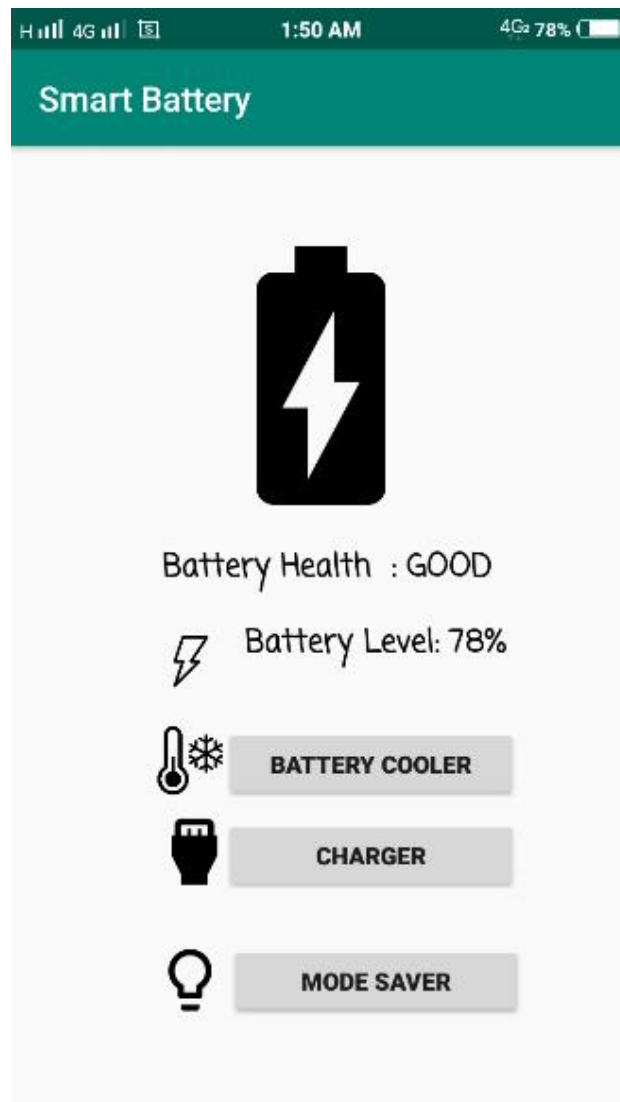


Figure 4-3 Homepage Interface

Figure 4.4 shows an example of Mode Saver Interface

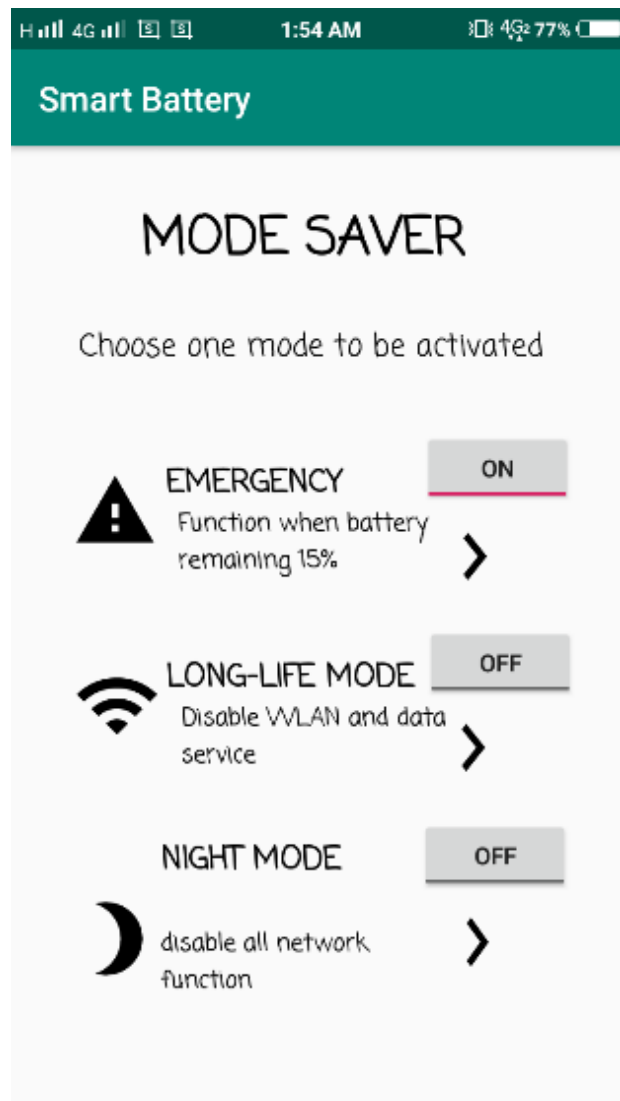


Figure 4-4 Mode Saver Interface

CHAPTER 5

CONCLUSION

5.1 Introduction

Smart Battery is Simple Battery Optimizer Application that will help user to optimizing their battery consumption. This is because SB only can-do simple function such as display battery level, display battery health, display battery status either charging, not charging or other else, display battery temperature. And directly connect with Battery Manager where its responsibility to interact with android device to get battery details. Smart Battery help user more in manage the battery consumption according to the mode saver option. Among three mode saver its help save function where it will turn off all network connectivity, Bluetooth and set the volume to vibrate. This is because when the connectivity of the network is on, the android itself need to interact to find Wi-Fi. And when the connectivity is off it did not use more battery consumption to work. The different between this three-mode saver is the screen brightness. The less screen

brightness is set the less battery is used. But Smart Battery is limited only for android users only.

5.2 Development Constraint

The constraint in this system will be listed as below. All limitation and constraint will be taken as improvement or upgrading for next future work.

- i. Fail to detect estimation time to recharging and estimation time for fully charging.
- ii. The system only can display the battery status, cannot display the charging process occur while charging
- iii. The system fails to list down the application that use a lot of battery consumption.

5.3 Future Work

There are several improvements needed in this application for better performance in the future. The future work is list as below:

- i. System will be applicable for Android n iOS users.
- ii. There should be estimation real time for recharging and fully charging
- iii. The system should be able to list down the application that use more battery

APPENDIX A

GANTT CHART

