Context-driven Audio Input and Output Control

BY

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Acknowledgment

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Abstract

People are involved in many activities that are planned, unplanned, routine, emergency in nature. Mobile phone user has one common problem with their audio control of volume. Generally, we need a system that is able to assist user especially on the audio profile and phone settings based on geographical location. Besides that, a system that able to assist mobile user to switch settings and audio profile based on phone sensors like microphone sensors from decibel meters which can benefits many people as well. Next, a system that is able to detect context phone user is in. For example, a moving vehicle, library, cinema, supermarket and so on. This project is about developing a mobile solution that is able to tune the smart phone audio profile automatically based on context. This will assist the user to be able to deal the input and output volume in different context.

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CHAPTER 1 INTRODUCTION

1.1 Problem Statement

Unable Control Loudness of Speaker, Sensitivity of Microphone and Vibration Based on Context

Currently smartphone users are unable to control the output and input audio and vibration pattern of the mobile device based on context (Example, in the meetings, supermarket, temple and so on). This can cause the users not able to hear the voice/sound of the phone. In the supermarket or others noisy places, this can make users not able to hear the ringtone of the phone or others messaging notification, this is not convenient while the call maybe is an emergency call, this can cause a serious issue. On the other hand, when in the meetings or silence places, the users also might face difficulty or ear-piercing when the phone output was too loud.

Unable Control Output and Input Audio Volume Based on Geographical Area

Current system not able to help user to detect context using geographical location. For example when user in a petrol station, the phone shall be deactivate or when in the supermarket, the phone should turn to a higher volume. In additional, the current system should be able to detect the user is in a moving vehicle as well.

Difficulty to Adjust the suitable Audio Volume Based on Different Context.

Now a day, adjusting suitable audio volume in each different location is quiet hard for all of the users. Here, we shall able to adjust a suitable volume based on different location through our mobile phone sensors (Microphone sensor) to detect context / environment for audio profile. Besides, a system that is able to detect indoor location (via Wi-Fi settings) of user is needed as well.

Difficulty for Elderly to Adjust Phone Settings

Smart phone become more and more popular, almost everyone having even elderly. But, for elderly there might be some problem like the font-size too small, brightness too low or audio output volume too low that they unable to satisfy with it, an automatically phone setting based on age might able to help and satisfy them.

1.2 Background Information

Since ages, mobile devices had been widely used by all of the human around the world. Now a day, human faces some problem which is cannot control the audio output (loudness of the sound) and input (sensitive of the sound) in a different context, for example, in the meetings room, in the Pasar Malam, and so on. If this problem continuously, this might bring inconvenience to user. Sometimes we might not able to speak too loud when in the class, temple or any others silence place, and this cause the caller or receiver are unable to capture our conversion. On the others hand, when in the Pasar Malam, shopping center and others noisy place, we might not able heard the ringtone of the mobile devices, and this can cause a serious issue if that was an emergency call. Therefore, a mobile application which capable to control the audio input and output based on different context will be appreciated by user.

Besides that, by using this mobile application, the algorithm inside will adjust the suitable output and input sound for user based on the current location and current place noisy level and the data will be calculated and make the adjustment.

Last but not least, while proposing this idea, an extra idea had come out from mind which is convert the sound to text form. This idea is to target the handicapped person (with hearing problem) because even the application had adjusted the max output volume, but those handicapped also unable to hear the conversation clearly, therefore, conversation from sound to text may be a good solution for them. This application converts the caller sound into text form, so that handicapped can read the conversation easily. This is a very convenience solution and hence help their conversation become easily and interested.

1.3 Motivation

Following the achievement of mobile application and satellite-based location, the challenge has the shifted to the provision of such services for the indoor and outdoor environment. Another achievement which is adjusting the font size, brightness, and audio output volume which also bring challenge to develop the useful mobile application to this provision. Develop such application can help users to solved their audio input output control of their mobile phone and also can help those elderly to have better conversation.

The reason develop this mobile application is now a day, most of the mobile users unable to control the sensitive of the microphone, vibration pattern and the loudness of the speaker of their mobile phone time to time. For example, when in the class room answering a call, the situation is we cannot talk to loud, and causes the caller unable to digest the conversation. Another example is when in the shopping center, there are full of sound pollution, the chances of we unable to hear our phone ringtone is very high, and what if it is an emergency call, this can lead to a serious case. Besides, when in the moving vehicle, we need to able to detect it so that we able to adjust the volume based on geographical area. Others than that, detect Wi-Fi settings also part of the important settings because we are able to know user's location. (E.g. Old Town White Coffee)

The other reason to develop this mobile application is, now a day, elderly having difficulty in their conversation when they are using mobile phone, like the font size are not suitable for them, the brightness of the screen is too low or the output audio are too low, this can cause user unsatisfied and unfair to those elderly persons.

1.4 Project Scope

The scope of this project will be covering not only the area in Malaysia but also covering the whole world. This project will just start with one country first and if no problem or obstruction, we will expand the scope of the area in the future to allow people from all around the world to be able to use the mobile application. Choosing Malaysia as the project area is the most suitable because I am more familiarize with Malaysia and it will be easier to continue with this project.

Basically, the target users are very wide regardless of the age as long as the person owns a smartphone and has the access to the Internet because this mobile application is suitable for every one especially those students, employees, business man and so on, it is likely suitable for everyone.

1.5 Project Objective

- To assists and help human to adjust the level of audio based on environment noise level and venue settings (e.g. Cinema, meetings).
- To develop an application that is able to detect current location name by using Google Image processing technology.
- To design an application that is able to utilize phone sensors to detect context/environment for audio profile.
- To develop an application that is able to adjust phone settings to assist human by either automatically or manually.

1.6 Impact, Significance and Contribution

The main purpose to develop this mobile application is to make smartphone user feel more comfortable and more convenience. The current smartphone user feels that, the audio input and output of the smartphone are unable to be adjust time to time, this is a very inconvenient problem. When in the classroom answering a call, the volume of the conversation must be low and we cannot adjust the sensitive of the microphone, therefore, with this application, the sensitive of microphone will be adjusted to high (and vice versa) so that although we talk with lower volume, the caller also able to capture our conversation. Therefore, by using this application, smartphone user no need to worry about their conversation in the silence places and vice versa.

Another feature of the mobile application are to convert voice to text form in any language to any language. The purpose of this feature is to target the handicapped (with hearing problem) having difficulty to hear the conversation by the caller. With this feature, handicapped are able to have an easy and relaxing conversation with their family.

As a conclusion, by having the mobile application, first, it can help a lot of mobile user to control their audio input output based on context, this can be a great benefit for user, second, it can help those handicapped to overcome their congenital disability, because every human is fair and have rights to enjoy every product in the world.

CHAPTER 2 Literature Review

2.1 Global Positioning System (GPS)

Global Positioning System (GPS) is a Global Navigation Satellite System (GNSS) which developed by United States Department of Defense. GNSS uses constellation of between 24-43 Medium Earth Orbit satellites that transmit precise microwave signals, it enable GPS user to clearly determine their current location, time, and velocity. To produce an accurate location calculation, GPS satellites and GPS user must have their clocks highly synchronized. If both of them have slightest difference in time, it can cause large errors when calculating the location. However, GPS is useful to determining user current location, it does have some drawback one of the drawbacks is the time it can take to calculate the current user position, and multiple satellites must be found in order to calculated the location. Many satellites are orbiting the earth, only a handful can be seen at any time because of line of sight is needed and it blocked by the earth. (Kinage, et al., 2013)

An application that develop by Zohaib, he has put forth major challenges faced in designing a ubiquitous application. Android operation system is the best tools recommended to designing application. Ubiquitous can locate the smartphone and track it, using the proposed approach, it also allow listen incoming calls, read incoming SMS and automatic reply. Through SMS it also can access and change GPS, WIFI and profile settings. The application uses Google map API to show location on map. (Jain, et al., 2014)

2.2 Android Phone Sensors Overview

Now a day, most of the Android devices have built-in sensors which able to measure the motion, orientation and various environment conditions. All of this sensors are able to provide raw data with high precision and accuracy. For an example, gaming might require track readings from the device' gravity sensor to infer user gestures and motion. Furthermore, a weather application might use a temperature sensor and humidity sensor to calculate and report the dewpoint and a travel application might use the geomagnetic field sensor and accelerometer to report a compass bearing. (Anon., n.d.)

The three major broad categories of sensors that support in Android platform is:

- Position Sensors—This sensors measure the physical position of a device. This category includes orientation sensors and magnetometer.
- Environmental Sensors— These sensors measure different type of environment parameters, example ambient air temperature and pressure, humidity and illumination. These categories include barometers, photometers and thermometers.
- Motion Sensors—These sensors aim to measure acceleration forces and rotational forces along three axes. This category includes accelerometers, gravity sensors, gyroscopes and rotational vector sensors.

2.3 Microphone Sensor in Smartphone

Microphone is the most primitive sensor in the phone in current technology, Microphone senses the sound waves in the air and converts it into digital signal and transmit it to listener on another phone.

Smartphones have the potential to become extremely precise sound sensing devices, as proved by several apps and projects. In 2009, a research team from Dartmouth College published a paper describing SoundSense, an iPhone application designed to recognise and classify sound events detected by the cell phones's microphone. In a similar fashion, the Batphone app works as a novel method of indoor localisation by recording room ambiance – the little snippets of noise are used to identify rooms previously tagged by the user. What's more, a study conducted by researchers at Queen Mary University of London has shown that acoustic scene classification algorithms, exploited by applications of this kind, can achieve a mean accuracy matching the median performance of humans.

Almost all android devices are phones, and so provide a microphone sensor to the user. Application can use the microphone sensor to record sound or audio in the environment and then analyze the resulting recording. For example, an application could detect a clap or a certain sound to help the user communicate a command. The use of MediaRecorder and AudioRecord APIs able to help us in recording and analyze audio to detect patterns. (Anon., n.d.)

2.4 Sound Measurement via Microphone

Microphone is the interface between measuring system and the acoustic filed. It respond to sound pressure and then transforms it into an electric signal which can be interpreted by the measuring instrument. (Malchaire, n.d.)

The microphone can be the following type: piezoelectric, condenser, electret or dynamic. Currently, all of our smartphone using electret microphone. In this case the potential difference is provided by a permanent electrostatic charge on the condenser plates and no external polarizing voltage but often contain an integrated preamplifier that does require power (often incorrectly called polarizing power or bias). This preamplifier is frequently phantom powered in sound reinforcement and studio application.

2.4.1 The Sensitivity of Microphone

The sensitivity of a microphone is defines as amplitude (in mV) of the output signal, next an incident sound pressure of amplitude 1 Pa (94 dB) at 1000 Hz. (Malchaire, n.d.) Besides, this also can transform into formula as below:

$$Sensitivity = 20\log_{10}\frac{Vp_0}{V_0 p} \quad \text{dB re 1V/Pa}$$

Therefore, the microphone give an output signal V of 10mV for a pressure signal p of 94 dB has a sensitivity of 10mV/Pa or -40dB. Here $p_0 = 1\text{Pa}$ and $V_0 = 1$ volt.

2.4.2 Measuring Noise Level

Amanda Tonkin (2014) explored that sound is a pressure wave caused when something vibrates, making particles bump into each other and then apart. The particles vibrate back and forth in the direction that the wave travels but do not get carried along with the wave. (Tonkin, 2014)

Volume (also called loudness) relates to the maximum pressure produced as particles are squeezed together as they are made by vibration. This is also related to the maximum distance particles are moved from their normal position as they vibrate. When showing the sound waves on a graph, the amplitude is the height of the waves from their middle position and reflects how loud the wave is. Loudness is measure in decibels (dB). This is actually a measure of intensity, which relates to how much energy the pressure wave has. For human ear, the quietest noises are around 10dB and the noisiest sound around 130dB.

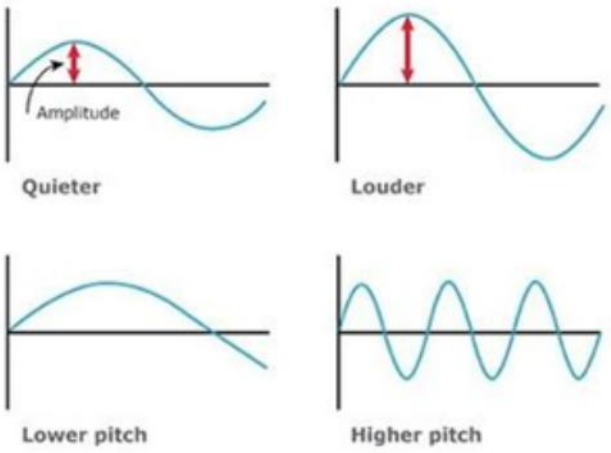


Figure 1-2.4.2-F1 Sound Pattern

2.4.3 Algorithm and Expression to Measure dB (decibel)

The decibel (**dB**) is used to measure sound level. The dB is a logarithmic way of describing a ratio. The ratio may be power, sound pressure, voltage or intensity or several other things. (Gresovnik, 2002)

a) **Sound intensity—** is a amount of energy that is transferred through a unit surface perpendicular to the direction of wave propagation, in unit time:

$$w = p^2/\rho c \ [W/m^2],$$

where the first p refer to the effective pressure, second p refer to air density and c refer to the speed of sound.

b) **Sound Level** in dB (decibles) is defined as

$$L = 10\log(w/w_0) = 20\log(p/p_0)\,dB \ .$$

$w_0 = 10^{-12}\,W/m^2$ is the threshold of human ear (the smallest sound intensity that can hear by human ear), p is the effective pressure and $p_0 = 20\mu Pa$ is the effective pressure that correspond to w_0.

c) **A-Weighted sound pressure** level in dBA:

$$L_A(t) = 10\log\left(\frac{p_A(t)}{p_0}\right)^2 dB,$$

where $p_A(t)$ is the effective sound pressure, measured by an instrument with frequency weighting A.

2.5 Compare Existing System (Sound Measurement Apps)

a) dB Volume Meter—This application able to measure audio volume in the environment around us. This dB Volume Meter shows the approximate decibel level, wherever our smartphone located. Although quite accurate, this application is mainly for detecting noise level in casual settings such as in high level of noise venues or airport. Besides, those operating heavy machinery, they should rely on professional SPL meter. This application require a build-in microphone to work.

b) TooLoud— This is a sound level meter that show us the environment noise level and warns you if we should wearing an earplugs. It is easy to take loud noises for granted as part of the necessity of living or working in certain conditions. This application provide decibel meters in numerical display and allow us to specify filters and offset value for normal background noise. The offset value can be set to positive or negative.

c) decibel – This is a noise level meter application which developed in Android market. It is a tool that use the smart phone's microphone to measure the Sound Pressure Level (SPL). deciBel display the maximum, minimum and current noise around us and display the whole result in a chart. This application developed by Peter Tschudin.

2.5.1 Comparison Table

	dB Volume Meter	TooLoud	deciBel
Accuracy	Medium	Low	High
Sensitivity of sound	Medium	Low	High
Measurement level	20-160 (dB)	20-120 (dB)	20-120 (dB)
Display method	Text-form	Graph	Analog decibel meter
Support Disabling sleep mode	Yes	No	Yes
Digital Meter with Average, Peak and max decibel	No	No	Yes

Table 1-2.5.1-T1 Comparison of applications

2.5.2 Noise Level Chart

dBA	Example	Home & Yard Appliances	Workshop & Construction
0	healthy hearing threshold		
10	a pin dropping		
20	rustling leaves		
30	whisper		
40	babbling brook	computer	
50	light traffic	refrigerator	
60	conversational speech	air conditioner	
70	shower	dishwasher	
75	toilet flushing	vacuum cleaner	
80	alarm clock	garbage disposal	
85	passing diesel truck	snow blower	
90	squeeze toy	lawn mower	arc welder
95	inside subway car	food processor	belt sander
100	motorcycle (riding)		handheld drill
105	sporting event		table saw
110	rock band		jackhammer
115	emergency vehicle siren		riveter
120	thunderclap		oxygen torch
125	balloon popping		
130	peak stadium crowd noise		
135	air raid siren		
140	jet engine at takeoff		
145	firecracker		
150	fighter jet launch		
155	cap gun		
160	shotgun		
165	.357 magnum revolver		
170	safety airbag		
175	howitzer cannon		
180	rocket launch		

Figure 2-2.5.2-F1 Noise Level Chart

2.6 Conversion of Speech to Text (Google Speech to Text API Review)

Recently, Google has included the Speech to Text feature in the Android platform which is a more convenience way let Android users have more and more functionality for their smartphone. This speech to text API has break down into 2 part which is: (Anon., n.d.)

Interfaces

RecognitionListener is used to receiving notifications from the SpeechRecognizer when the recognition related events occur.

Class

RecognitionService which provides a based class for recognition service implementation.

RecognitionService.Callback which receives callbacks from the speech recognition service and forward them to user.

RecognizerIntent which constants supporting speech recognition through starting an Intent (is an abstract description of an operation to be performed, can used to startActivity, launch activity and so on.)

RecognizerResultIntent which constants for intents related to show speech recognition results.

SpeechRecognizer which provides access to the speech recognition service.

2.7 Conversion of Voice to Text (Microsoft Speech to Text API review)

Microsoft had developed Speech Application Programming Interface which is SAPI to allow the use of speech recognition and speech synthesis within windows application. In general, this API have been designed so that software developer are able to write an application to perform speech recognition by using standard interfaces, accessible from variety of programming language. (Anon., 2015)

The major features of the Microsoft API are listed as below:

- Shared Recognizer—Which mean a recognizer object can be used that runs in a separate process. This allow all application communicate with the single instance. Allow sharing resources, removes contention for microphone.
- Grammar objects—Speech grammars are used to specify words that recognizer listening. SAPI5 defines as XML markup for this specifying grammar, methods exist for instructing the recognizer to load a build in dictation language model.
- Audio interfaces—The runtime includes objects to perform speech input from microphone or speech output to speaker.
- User lexicon object—Allow custom words or pronunciations add in by user or application.

Chapter 3 System Design

3.1 System Overview

In this session, how the project is designed will be describe in details by using diagrams. Diagrams included in this session are use-case diagrams, activity diagrams, and use case description. All the diagrams will help explain the functions and features and the work flow of Sound Shifter.

Next, sound shifter is a mobile apps that will help human adjust phone ringtone, notification volume based on different context, therefore, detection user current location and collecting environment noise level is very important for Sound Shifter. All functions of this applications will work in real time therefore no data need to be store and so no database are require for this application.

Furthermore, sample screenshot of Sound Shifter will be provided. The screenshot will as a guidance to users on how to use this application. Last but not least, all the functions and features will be guide step by step in use-case description so that user able to understand all functions accordingly.

3.2 Use-case Diagram

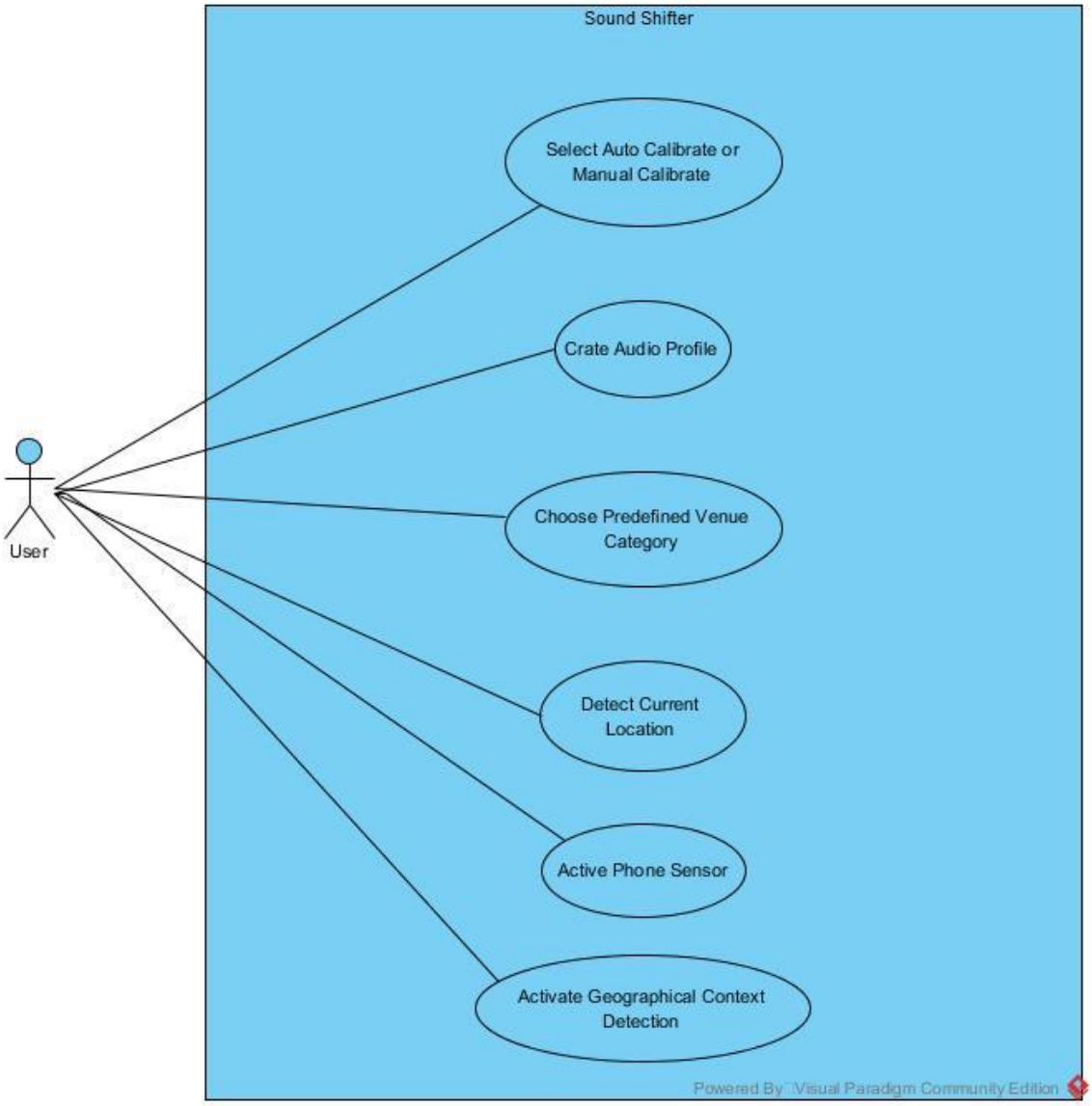


Figure 4-3.2-F1 Use-case Diagram

Figure above show the use case diagram of the application. Basically, all user able to choose whether they want use auto calibrate or manual calibrate and other such as create audio profile, choose predefined venue category, detect current location, activate or deactivate phone sensor and geographical context detection.

3.3 Use-case Description

Use Case Name: Select Auto calibrate or Manual Calibrate	ID: 1	Important Level: High
Primary Actor: User	Use Case Type: Essential, Detail	
Stakeholders and Interest : User – want to select Auto calibrate or Manual Calibrate		
Brief Description: This use case describe how we handle Auto calibrate or Manual Calibrate		
Trigger: User want to select Auto calibrate or Manual Calibrate Type: External		
Relationships: Association: User Include: Extend: Generalization:		
Normal Flow of Events: 1. The user want to select Auto calibrate or Manual Calibrate. 2. The user press on auto or manual button. 3. The system will set phone volume based on user preference. 4. The system displays the result to user.		
Sub Flows: Not Applicable		
Alternate/Exceptional Flows: Not applicable		

Figure 1-3.3.1-F1 Select Auto Calibrate or Manual Calibrate Use-case Description

Use Case Name: Create Audio Profile	ID: 2	Important Level: High
Primary Actor: User	Use Case Type: Essential, Detail	
Stakeholders and Interest : User – want to create audio profile		
Brief Description: This use case describe how we handle user create audio profile		
Trigger: User want to want to create audio profile Type: External		
Relationships: Association: User Include: Extend: Generalization:		
Normal Flow of Events: 1. The user want to create audio profile. 2. The user press on auto calibrate button. 3. The system will set phone volume based on environment noise. 4. The system displays the result to user.		
Sub Flows: Not Applicable		
Alternate/Exceptional Flows: Not applicable		

Figure 2-3.3.2-F2 Create Audio Profile Use-case Description

Use Case Name: Choose Predefined Venue Category	ID: 3	Important Level: High
Primary Actor: User	Use Case Type: Essential, Detail	
Stakeholders and Interest : User – want to choose predefined venue category		
Brief Description: This use case describe how we handle user choose predefined venue category		
Trigger: User want to choose predefined venue category Type: External		
Relationships: Association: User Include: Extend: Generalization:		
Normal Flow of Events: 1. The user want to choose predefined venue category. 2. The user press on venue category button. 3. The system will set phone volume based on user preference. 4. The system displays the result to user.		
Sub Flows: Not Applicable		
Alternate/Exceptional Flows: Not applicable		

Figure 3-3.3.3-F3 Choose Predefined Venue Category Use-case Description

Use Case Name: Detect Current Location	ID: 4	Important Level: High
Primary Actor: User	Use Case Type: Essential, Detail	
Stakeholders and Interest : User – want to detect current location		
Brief Description: This use case describe how we handle user detect current location		
Trigger: User want to detect current location Type: External		
Relationships: Association: User Include: Extend: Generalization:		
Normal Flow of Events: 1. The user want to choose detect current location. 2. The user press either upload an image or capture an image and upload it. 3. The system process the image. 4. The system displays the result to user. 5. The system will set phone volume according to result.		
Sub Flows: Not Applicable		
Alternate/Exceptional Flows: Not applicable		

Figure 4-3.3.4-F4 Detect Current Location Use-case Description

3.4 Activity Diagram

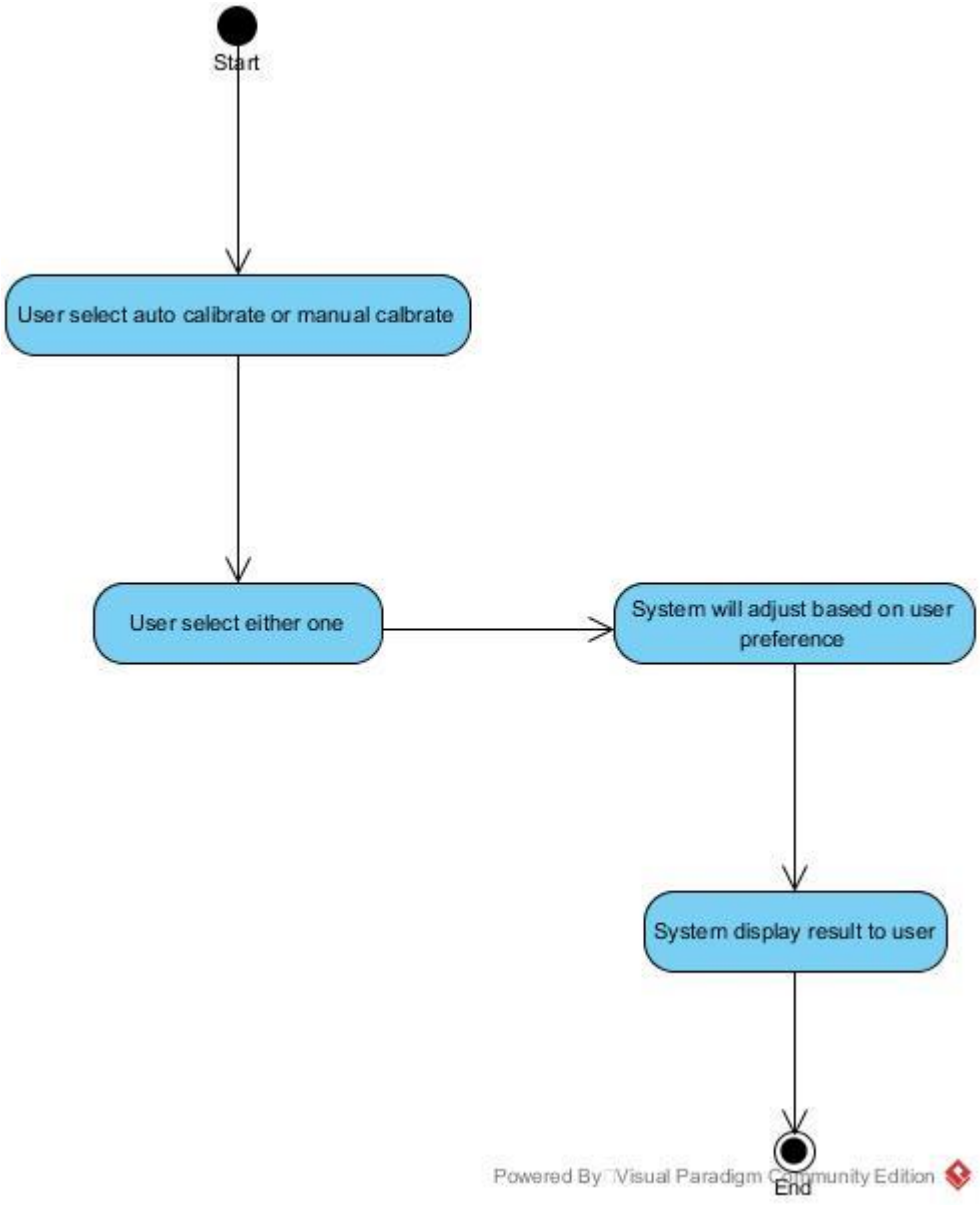


Figure 5-3.4.1-F1 Select Auto Calibrate or Manual Calibrate Activity Diagram

Figure above shows the select auto calibrate or manual calibrate activity diagram. First, use choose either use auto or manual calibrate. After decided, system will perform according to user choice, and lastly system will display result to user.

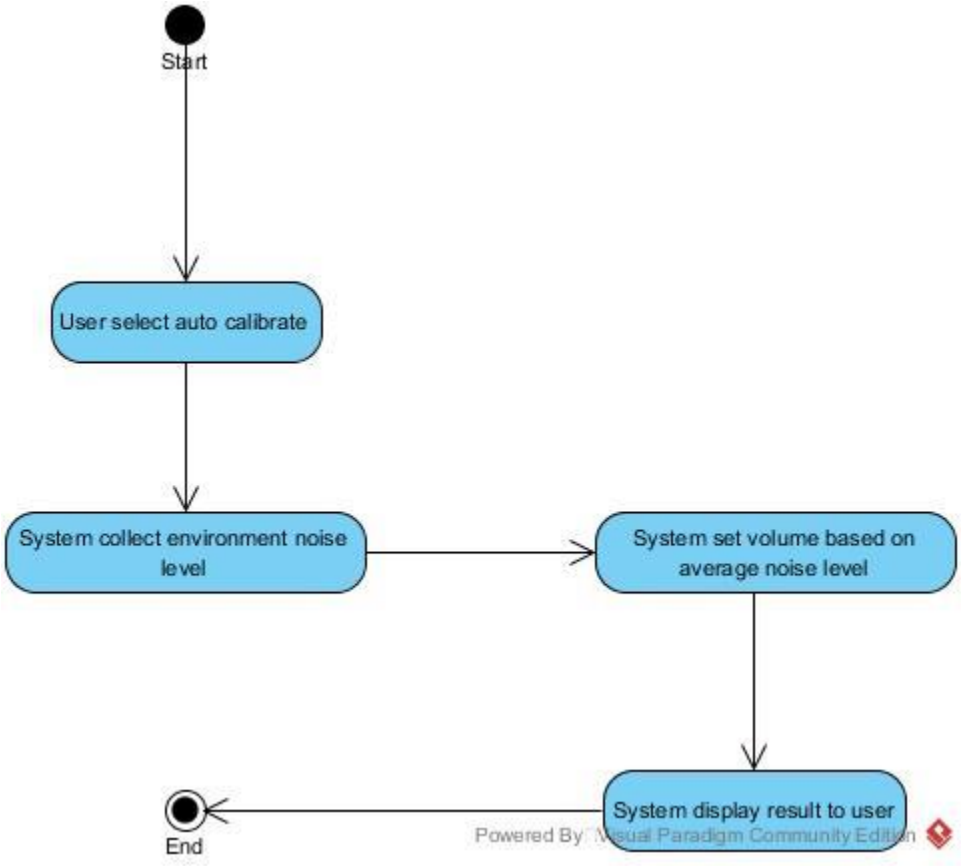


Figure 6-3.4.2-F2 Create Audio Profile Activity Diagram

Figure above shows the create audio profile activity diagram. First, user select auto calibrate. The system will collect environment noise level and calculate the average noise level and set to the suitable volume accordingly. Lastly, the system will display the result to user.

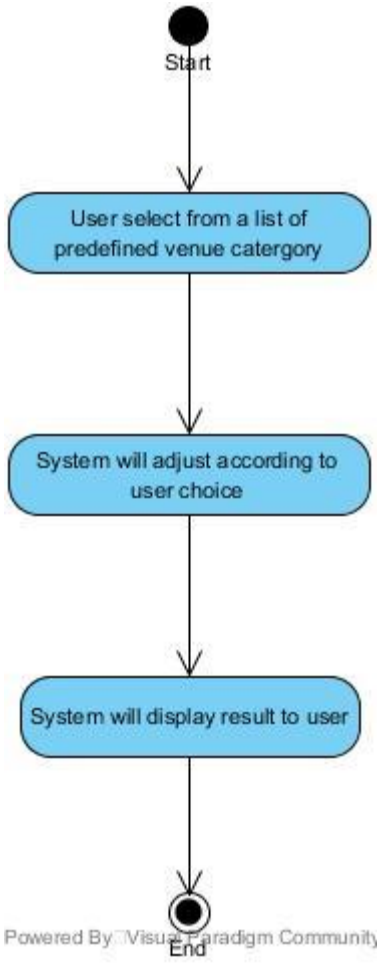


Figure 7-3.4.3-F3 Select Predefined Venue Category Activity Diagram

Figure above shows the select predefined venue category activity diagram. First, user select from a list of venue category, then the system will adjust volume based on user preference. The system will then display result to user after the system successful set the volume.

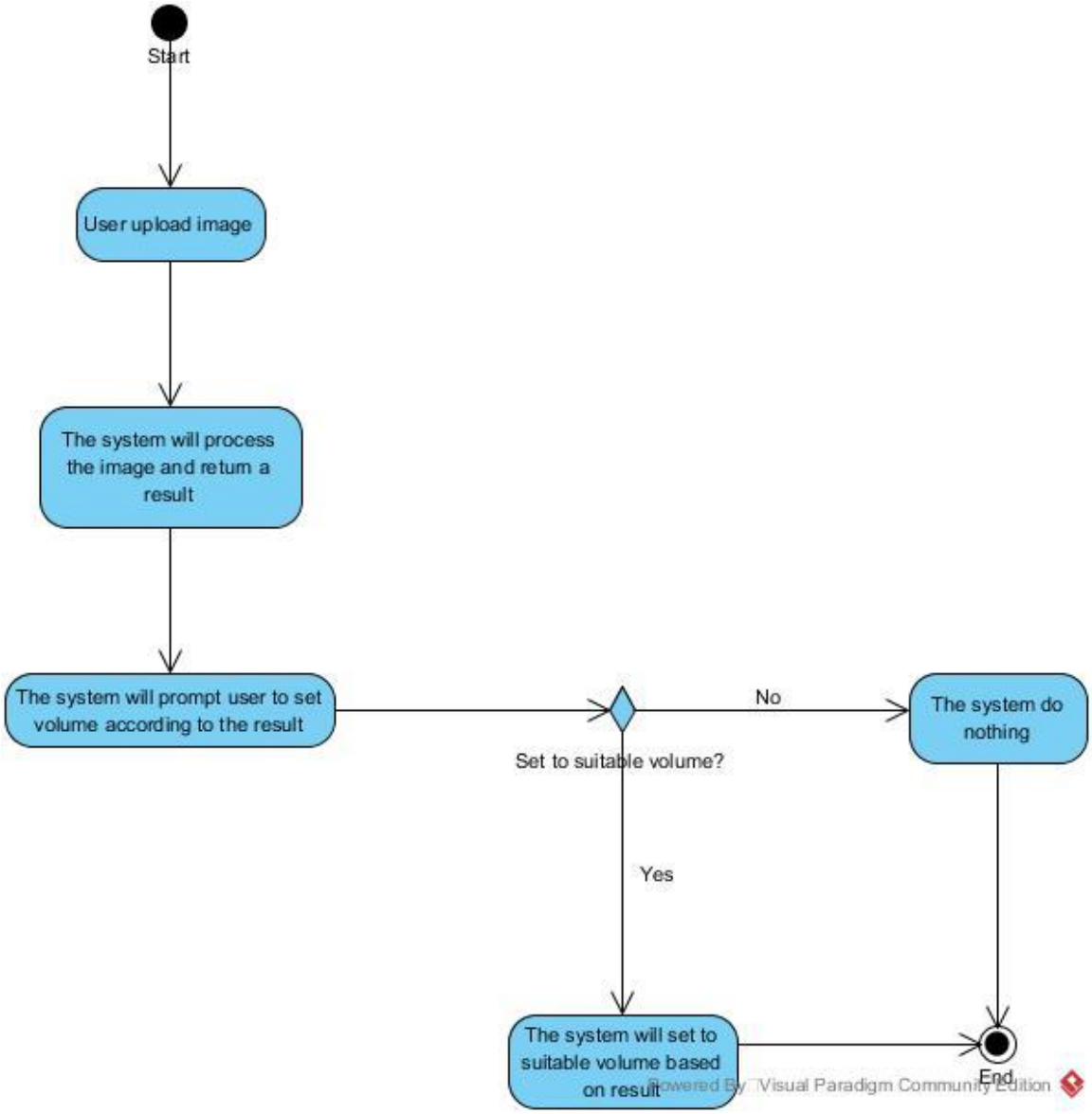


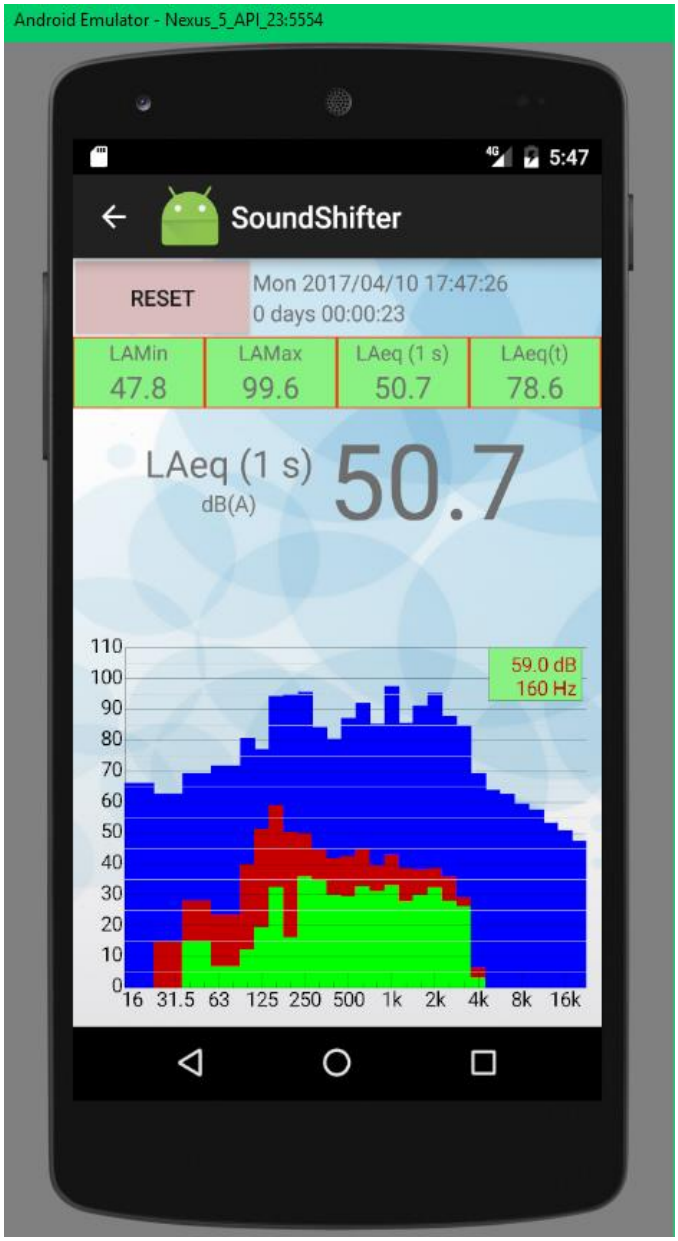
Figure 8-3.4.4-F4 Detect Current Location Activity Diagram

Figure above shows the detect current location activity diagram. First, user will either upload an image from phone gallery or capture an image. User upload the image, the system will process the image and return the result (location). System will prompt user to set to suitable volume based on result.

3.5 Interface of Sound Shifter

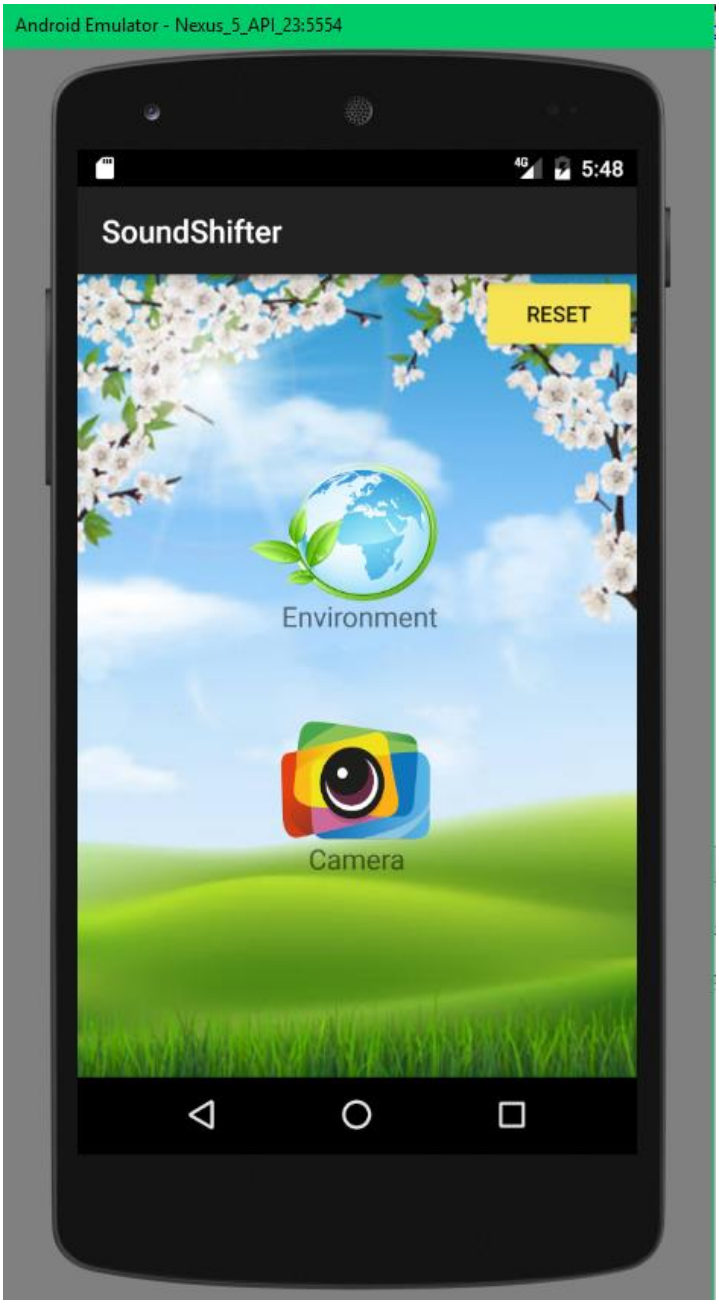
Startup Page

Basically, this startup page designed with two button, which is “Auto Calibrate” and “Manual Calibrate”. User are able to choose which calibrate method they want to use. A friendly startup page able to let user easily understand it.



Auto Calibrate

Upon press "Auto Calibrate", user can get into this interface which the system will record environment noise every second and calculate its average and then adjust the volume accordingly. This interface got show the minimum, maximum, and average environment noise, and a graph will display accordingly so that user able to view it clearly with the help of graph.

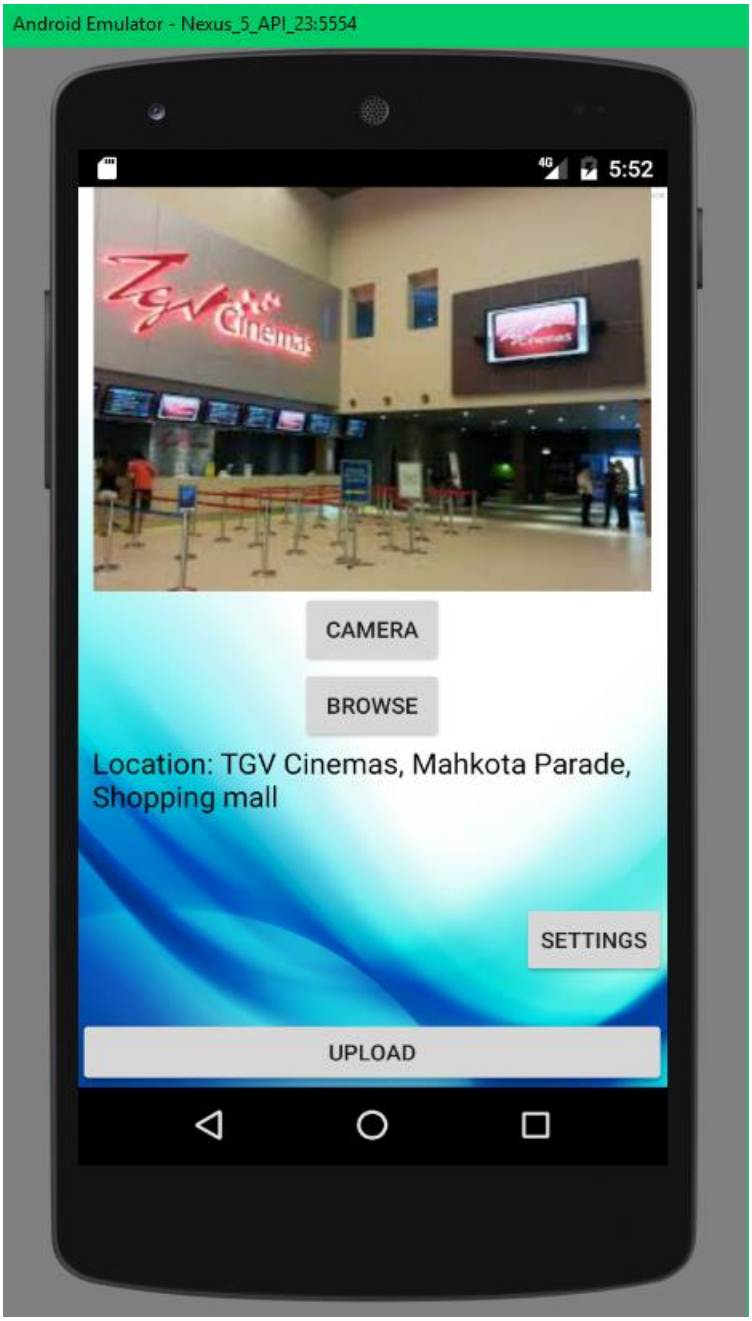


Manual Calibrate

When user pressed on “Manual Calibrate”, there are two choice user can choose to manually control the volume of their smart phone. It either by predefined venue settings or upload an image to know their current location so that they can adjust the volume accordingly.

Manual Calibrate (Environment)

Upon user pressed “Environment”, a list of predefined venue category will shown out. A friendly interface easily make user understand those environment need. When user pressed on it, system will set to the suitable volume accordingly so that it will not disturb others or unable to hear ringtone.



Manual Calibrate (Camera)

When user pressed "Camera", the interface like above will shown out. And user able to capture a photo or browse a photo from phone gallery and upload it, Google Vision API will return the result after processing the image. So that, user able to know their current location and how should they set their volume.

3.6 Noise Level Description

After few weeks of testing in different context (venue & environment), a list of data has been collected in Kampar areas to provide more accuracy in adjusting the phone's volume.

Venue	Noise Level (dbA)	Suitable volume
1. Meetings	45-55	Ringtone L3, Notification L3
2. Market	70-80	Ringtone L7, Notification L7
3. Library	30-35	Ringtone L1, Notification L2
4. Cinema	38-47	Ringtone L3, Notification L4
5. Hospital	33-43	Ringtone L2, Notification L2
6. Church	41-43	Ringtone L2, Notification L3
7. College	40-48	Ringtone L3, Notification L4
8. Jogging	32-37	Ringtone L2, Notification L3

After collecting these data, we have test with the suitable volume in different venue and had decided to use this reference in my application.

**Android smartphone volume Level 1 (Min) to Level 7 (Max)

**Data collect using real smartphone sensor (Huawei p9)

CHAPTER 4 PROPOSED METHOD

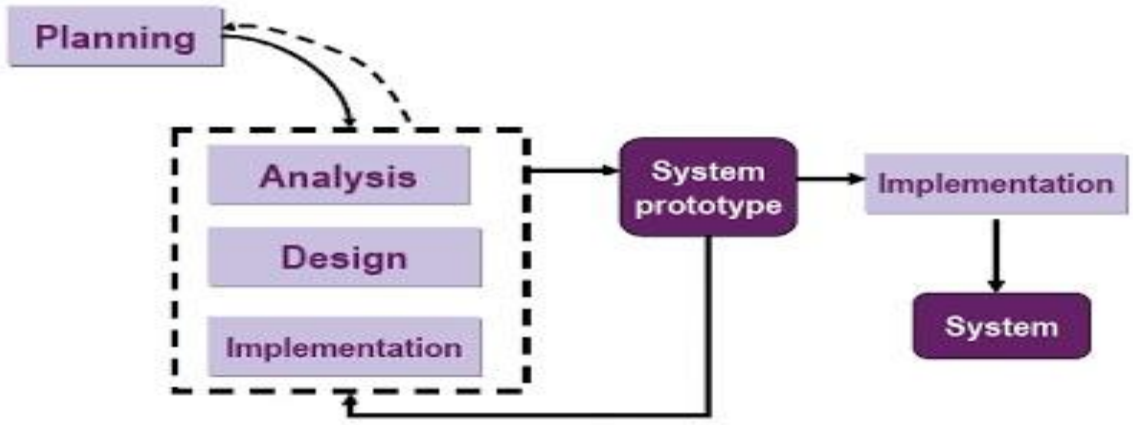


Figure 3-3.0-F1 Prototyping Methodology

Prototyping Methodology

There are some advantages of using prototyping methodology which able to helps in doing this project. Prototyping methodology enable fast and quick development of incomplete but functional system. In such, prototype can be shown to supervisor to get some feedback and guideline about the prototype and do it until get a better prototype to be developed. If mistake was found in any of this phase, there is no problem to go backward to fix and identify it. Any missing functionality can be identified and add easily.

There are 4 phases of prototyping methodology which are planning, analysis, design and implementation. All this phases are equally important and badly conducting of project in any of the phase will lead to a low performance and quality project. Planning phase is a starting point for a project before going further. Analysis phase involve requirement gathering for project to make sure the project is on the right path. Design phase concerns about the physical construction of system and implementation phase delivers the system to achieve the desired deliverables.

4.1 Planning Phase

Planning is an important phase to initiate a project. Shoddy work during project planning will be a failure no matter what reason. This phase is the crucial factor to the success of project as it establishes all the core foundation project. During this phase, frequently consult supervisor is a best way to clarify project doubt and objective that can be achieve. Through the objective statement, the project charter together with scope statement will be defined and feasibility analysis has also been carried out to study about the feasible project scope for my project.

Main Deliverables:

- Objectives
- Problem Statement
- Project Scope

4.2 Analysis Phase

This phase is where the lifecycle begins. During this phase, requirement gathering is the main focus. The literature review that have been done on the mobile applications that related to my project which is deciBel, dB Volume Meter (which to measure sound frequency), Insoft Product, Guardly Product (which related to Indoor Positioning System), Google Product, Microsoft Product (which related to conversion of voice to text form, speech recognition). Analysis requirements is to determine the feasibility of the requirements to and figure out the solutions to solve the identified problems. The solution planned to be developed will be described at high level. A baseline, change control process and ways to track the requirements will be established in the plan. A suitable methodology will be choosing after a careful analysis from different aspects.

Main Deliverables:

- Gathering requirements
- Gathering analysis
- Chosen Methodology

4.3 Design Phase

Design phase is where the software and system design being prepared from the requirements specifications. System design helps to specify the hardware and system requirement and also define the overall system architecture. Tools and technology will be chosen and utilized in this phase.

During this phase, a system prototype that is workable will be developed. All the modules will be combined. Discussing with supervisor is a must to keep supervisor updated with our process and plan.

Main Deliverables:

- Develop software and system design
- Chosen tools and technology
- Develop prototype

4.4 Implementation Phase

Implementation will be the final phase of moving solution from development to production. This is the part where coding and testing take place. It is also the most complicated phase as the deployment of system will be carried out and hardware is going to be used. A schedule of the implementation will be conducted for the production of system. Testing and evaluating will be done to ensure no flaws in the system. After went through several re-analyzed and re-design process, the system prototype is improved to a better version. The final product will be demonstrated and presented to supervisor.

Main Deliverables:

- Scheduling
- Coding and testing
- Evaluation system
- Demonstrating and presentation

4.5 Software Requirement

4.5.1 Android Studio

Android Studio is an integrated development environment (IDE) for developing for the Android platform based in IntelliJIDEA.

4.5.2 Eclipse Kepler

The Java programming language will be used to develop this mobile application. This will be our main console to develop the applications.

4.5.3 MYSQL database

The MYSQL database will be our main database to store our necessary information in this project.

4.5.4 Application Programming Interface (API)

Google Speech Recognition API, Microsoft Speech to Text API, Android API

4.5.5 Java Development Kit

JDK5, JDK6

4.5.6 Android Development Tools

SDK

4.6 Hardware Requirement

4.6.1 Smartphone

A Smartphone with operating system in Android since this project is about developing an Android platform application.

4.7 Gantt Chart

Task Name	D...	Start	Finish
Gathering Requirement	14d	06/01/16	06/20/16
Prepare FYP1 Report daft	8d	06/21/16	06/30/16
First daft fyp1	2d	06/30/16	07/01/16
Build Interface	5d	07/02/16	07/07/16
Prepare FYP1 Report second daft	5d	07/08/16	07/14/16
Second daft fyp1	5d	07/15/16	07/21/16
Report final daft fyp1	3d	07/21/16	07/25/16
Develop Prototype	21d	07/26/16	08/23/16
User Evaluation	4d	01/01/17	01/04/17
Enhance Prototype	70d	01/06/17	04/13/17
Report draft fyp2	5d	04/12/17	04/18/17
Report final daft fyp2	5d	04/19/17	04/25/17

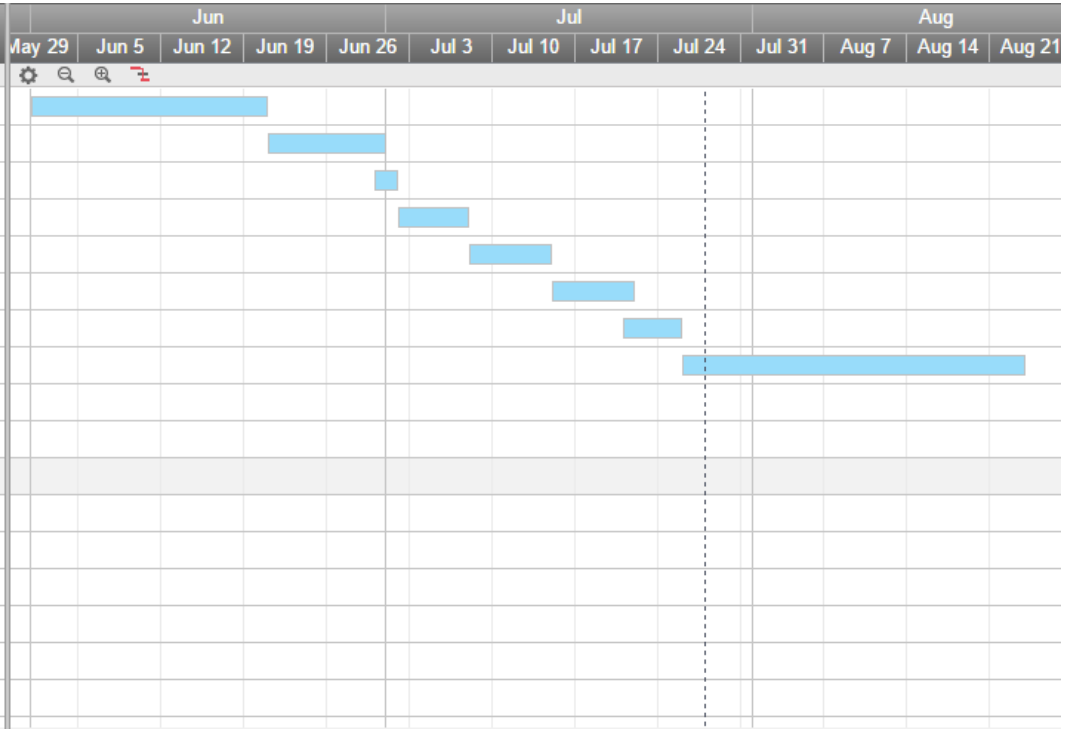


Figure 8-3.9-F1 Gantt Chart

CHAPTER 5 TESTING

5.1 Unit Test

Unit test is a testing method that is used to test every single component of a system. Unit test is use to test every functions of Sound Shifter to ensure that the system is suitable to use.

5.1.1 Auto Calibrate Test

No	Event	Action	Expected Result	Actual Result
1	When user choose "Auto Calibrate", the system will collect environment noise and calculate the average noise level, and the adjust the smartphone's volume based on environment noise level.	Click on "Auto Calibrate" button	Navigate to main page which show the current noise level and change volume accordingly.	Same as expected result
2	A functions will trigger when same caller call this smartphone more than 2 times, the ringtone and notification volume will increase immediately	Make a call to same destination more than 2 times, and the call cannot be answer or reject.	Ringtone and notification volume increased.	Same as expected result

Table 3-5.1.1-T1 Auto Calibrate Test Table

5.1.2 Manual Calibrate Test

No	Event	Action	Expected Result	Actual Result
1	When user choose “Manual Calibrate”, they can either use predefined venue category settings and upload an image to recognize current location	Click on “Manual Calibrate” button	Navigate to page that has 2 options, which is use predefined venue category settings or use image processing technology	Same as expected result
2	When user choose predefined venue category, they click on the button to set to suitable volume according to venue	Click on some button like “Meetings”, “Library” and so on.	Change the phone’s ringtone and notification volume to suitable volume.	Same as expected result
3	When user choose to determine current location through image processing, they upload an image to check the location name.	Either capture an image or upload image from gallery (Image category either Text, Logo or Landscape only)	If result return is in Cinema, system will prompt a notification to user tell that current place is cinema, asking them to set to cinema suitable volume.	Same as expected result

Table 4-5.1.2-T1 Manual Calibrate Test Table

CHAPTER 6 CONCLUSION

As a conclusion, this is very interesting mobile application and helpful to human. Although process of development will be very tough, with limited information and limited sources and guideline and support from friends and lecturer is enough to support a beginner. Learning and exploring from literature review is a good way of learning and acquiring knowledge from the location detection, conversation of speech to text and others. However, for our beginner, sometimes might face difficulty on the language for develop this mobile application. Knowledge coverage is wider than expectation.

Communication between Java language and other Python language is difficult to maintain because of different language development. But, it is still maintainable because guideline from Google, Microsoft and other open source platform.

Finally yet importantly, learning to propose innovation idea and creative solution towards problem is a good way of learning. Being part of this proposal was the most knowledgeable area to learn in this semester. Proper structure and correct path to write a proposal is delivered upon timeline. Besides, learning how to identify the current situation and propose the idea to solve is also a good chance of learning and acquiring knowledge and also can assist mobile phone users to improve the phone functionality and features and make it more convenience to all mobile phone users by this effort.

6.1 Application Analysis

Strength

The strength of this mobile application is, it can be very dynamic for user to use it, because they is an “Auto Calibrate” mode which means that, user just have to open this application then everything will be done automatically in the background. It is very convenient to user because user does not need to click here and there and interact with all the functions.

Weaknesses

The weaknesses of this mobile applications is, as we all know that, different mobile phone use different type of sensor, therefore, when in “Auto Calibrate” mode, maybe there is some different when adjusting the phone’s volume. Besides, if user wear a pants that is very thick, it may also cause the sensor unable to sense the environment noise clearly. Therefore, they might a possible problems occurs on this functions.

Limitation

It is impossible to develop a perfect application. The limitation of this mobile application is when user use “Manual Calibrate”, the image processing technology, it is a must to connect to a network so that user can get result, if there is no network available, therefore this functions is unable to be use, so, this application unable to use in offline mode, and mobile data is very important for this application.

6.2 Future Enhancement

As mentioned in limitation, every application have strength and weaknesses. All people have different point of view, some people think that this application is useful while others think this application is useless.

Sound shifter should add in more features like detecting current location when require, so that, it is more dynamic and more user convenient and user feel like lazy to use the image processing technology, this features could be solve people issues more faster.

Besides, Sound Shifter should let user to login and register just like Facebook, gathering social power can make this application more successful, for an example, if there are 10 people in same restaurant, the system volume is set to suitable volume, when another people come in, they can detect others people's smartphone are using this level of volume, therefore it can set accordingly to prevent an possible problems occurs.

Furthermore, Sound Shifter should add in host and client mode, this is useful for exam purpose. For example, when in the exam hall, lecture (host) can control all student (client)'s smartphone volume, like set all student's smartphone to silent mode so that it will not disturbing others student if suddenly the smartphone ring up. Hopefully in future, this features can be added so that it can benefit and help this social from being disturb by some noise and unable to pick up an emergency call.

References

Anon., 2015. *Google app store.* [Online]
Available at: https://play.google.com/store/apps/details?id=com.fsp.android.c&hl=en

Anon., 2015. *Google Apps Store.* [Online]
Available at: https://play.google.com/store/apps/details?id=com.fsp.android.friendlocator&hl=en

Anon., 2015. *Google Apps Store.* [Online]
Available at: https://play.google.com/store/apps/details?id=uberall.android.appointmentmanager

Anon., 2015. *Insoft.* [Online]
Available at: http://www.infsoft.com/indoor-navigation-wiki

Anon., 2015. *Microsoft.* [Online]
Available at: https://msdn.microsoft.com/en-us/library/hh378337(v=office.14).aspx

Anon., 2016. *Google Play.* [Online]
Available at: https://play.google.com/store/apps/details?id=dimstools.calendar

Anon., 2016. *Google Play.* [Online]
Available at: https://play.google.com/store/apps/details?id=com.appointfix

Anon., n.d. [Online]
Available at: https://pypi.python.org/pypi/SpeechRecognition/

Anon., n.d. *Android.* [Online]
Available at: http://developer.android.com/guide/topics/sensors/sensors_overview.html

Anon., n.d. *Audio Capture (Android Developer).* [Online]
Available at: https://developer.android.com/guide/topics/media/audio-capture.html

Decadt, J. D. W. W., 2014. A Novel Model for Speech to Text Conversion. *International Refereed Journal of Enginerring and Science.*

Gresovnik, I., 2002. Sound Level Meter. *Relevant Wuantities with Relations Between them.*

Jain, A., Mudgil, P., Dabla, R. & Sataphathy, K., 2014. *Android Base Tracking Application Dope Hunt.* [Online]
Available at: http://www.ijsce.org/attachments/File/ICCIN-2K14/41-ICCIN-2k14.pdf

Kinage, R., Kumari, J., Zalka, P. & Kulkari, M., 2013. *Mobile Tracking Application.* [Online]
Available at: http://www.ijirset.com/upload/march/15_Mobile%20Tracking.pdf

Malchaire, P. J., n.d. Sound Measuring Instruments.

Nor Aida Mahiddin, N. S. E. N. S. S. E. F., n.d. Inddor Position Detection Using Wifi and Trilateration Techniue. p. 2013.

O.Osunade, A., J. O. & S., O. O., 2014. *Android Appointmnet Manager Application Development with Google API.* [Online]
Available at: http://www.tjournal.org/tjst_april_2014/06.pdf

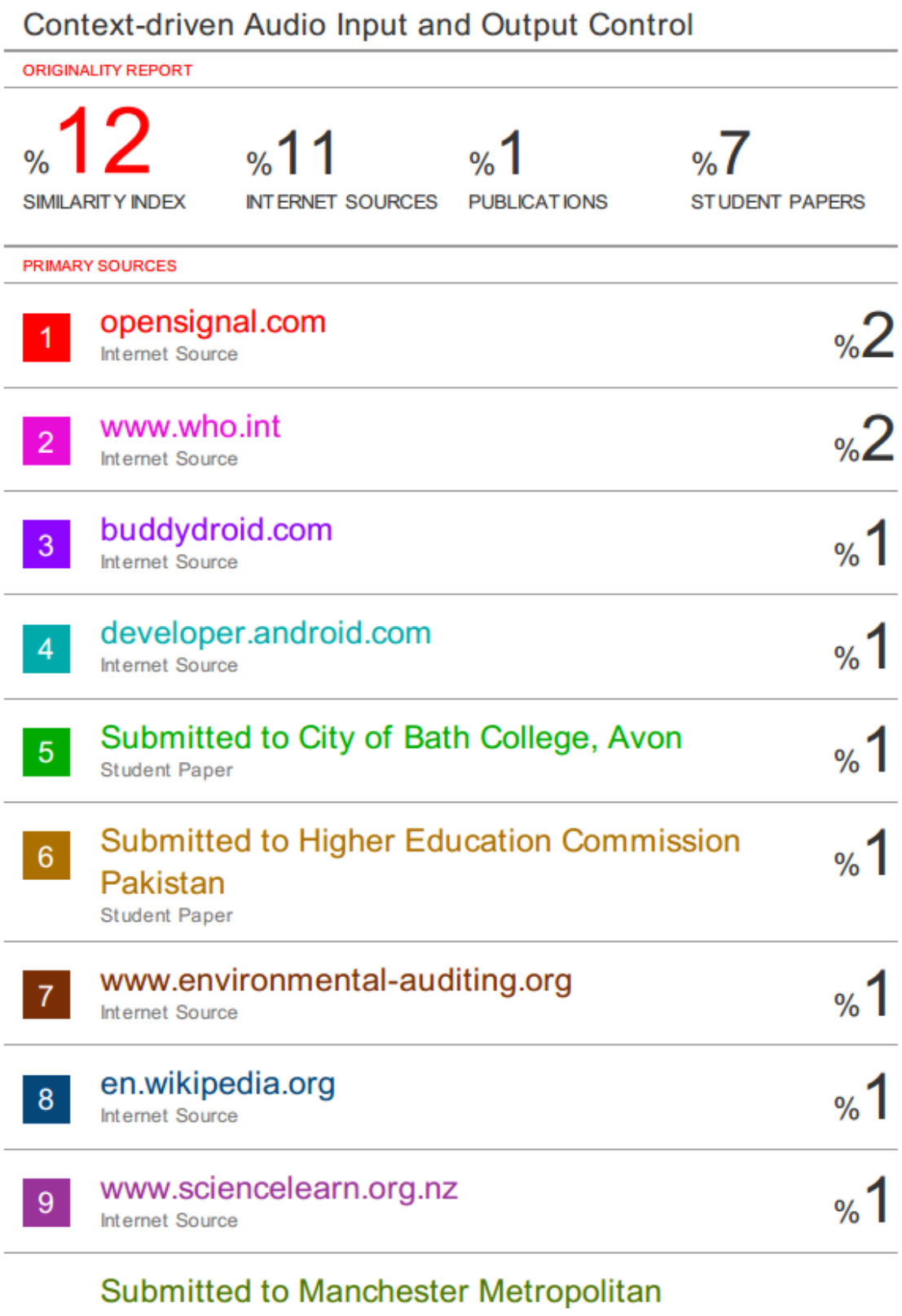
SOOKMAN, J., 2015. Lastest Software Release Indoor Positioning System. *Guarly.*

Sultana, S. M. A. P. H. R., 2014. A Novel Model for Speech to Text Conversion. *International Refereed Journal of Engineering and Science .*

Tonkin, A., 2014. Mobile Apps to Measure Noise Level. *Healthy Hearing.*

APPENDIX

APPENDIX A



Context-driven Audio Input and Output Control

ORIGINALITY REPORT

%12	%11	%1	%7
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

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4	developer.android.com Internet Source	%1
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11	en.gsnote.org Internet Source	%1
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13	diva-portal.org Internet Source	<%1
14	pedagog.hubpages.com Internet Source	<%1
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APPENDIX B

Title of Final Year Project	CONTEXT DRIVEN AUDIO INPUT AND OUTPUT SYSTEM
Full Name(s) of Candidate(s)	CHAI CHEE FUNG
ID Number(s)	13ACB03643
Programme / Course	INFORMATION SYSTEM ENGINEERING

FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY

Similarity	**Supervisor's Comments** **(Compulsory if parameters of originality exceeds the limits approved by UTAR)**
Overall similarity index: _____ % **Similarity by source** Internet Sources: _____ % Publications: _____ % Student Papers: _____ %	
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(i) Overall similarity index is 20% and below, and

(ii) Matching of individual sources listed must be less than 3% each, and

(iii) Matching texts in continuous block must not exceed 8 words

Note: Parameters (i) – (ii) shall exclude quotes, bibliography and text matches which are less than 8 words.

Faculty/Institude Note: Faculty/Institute is/are required to provide softcopy of full set of the originality report to

Based on the above results, I hereby declare that I am satisfied with the originality of the Final Year Project Report submitted by my student(s) as named above.

Signature of Supervisor

Name: _____

Date: _____

Signature of Co-Supervisor

Name: _____

Date: _____