DEVELOPMENT OF SMOKE ALERT DEVICE FOR THE BLIND

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2017

DECLARATION

I hereby declare that the work in this thesis is my own except for quotations and summaries which have been duly acknowledged.

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ABSTRAK

Manusia telah diciptakan dengan ciptaan yang teristimewa. Sebahagian orang tidak bernasib baik kerana mereka serba kekurangan disebabkan oleh kecacatan semulajadi atau kemalangan. Buta dikategorikan sebagai salah satu kecacatan. Selama bertahun, orang buta memilih untuk menggunakan tongkat sebagai alat membantu mereka bergerak setiap hari. Namun terdapat kekurangan pada tongkat dalam membantu orang buta yang terperangkap dalam kebakaran. Walaupun alat pengesan kebakaran banyak dipasang di rumah atau pejabat, tetapi masih terdapat beberapa kelemahan yang boleh dipertingkatkan. Salah satu kelemahan pengesan kebakaran adalah ia hanya direka untuk mengesan asap setempat. Sebaliknya peranti amaran asap untuk orang buta ini, mudah alih dan boleh digunakan di mana sahaja. Ia juga penting untuk membantu orang buta mengesan haba dan menjauhkan diri dari api. Terdapat pengaturcaraan dan sistem amaran kepada penjaga untuk memberi bantuan menyelamat kepada mangsa. Jika mangsa terperangkap dalam kebakaran, LED terang digunakan untuk menjadi penunjuk kepada penyelamat. Peranti amaran asap mengeluarkan bunyi dan getaran untuk memberi amaran kepada pengguna walaupun semasa mereka tidur. Analisa menunjukkan pada jarak 2meter, pengguna mengambil masa 9saat untuk mendapatkan amaran pengesan haba. Manakala, pengesan asap kebakaran di dalam bilik bersaiz 400kaki persegi, pengguna mengambil masa 11saat untuk mendapat amaran. Kesimpulannya, peranti ini sangat berguna dalam membantu orang buta untuk menghindari asap dan api kerana tindak balas yang cepat daripada alat pengesan.

ABSTRACT

Humans are blessed with perfect body creation. Some people have limitation by natural disabilities or disabilities caused by accidents. Blindness is categorized as one of the disabilities. For years, visionless persons choose to use the white cane as the mobility for aiding their daily life. However, they have limitation in helping the blind to escape from fire. Although there are smoke alert in the house or office but there are still several weaknesses that can be enhanced. One of the weaknesses of the smoke alert is that, it is only designed to detect smoke in the static place. However, the smoke alert device for the blind is portable and can be use anywhere. The heat sensor is essential in helping the blinds to detect the heat and avoid the fire. There are programming and guardian setting to alert or message sent to the guardian. If the victims are trapped in the fire or fainted, a super bright LED is used as indicator to the rescuer. The smoke alert device produce a sound and vibration to warn the user, even when they are sleeping. The analysis shows that in 2meters distance, user takes 9seconds to get alert of the flame. While the smoke sensor in the room 400 square feet, user takes 11seconds to get alert. In conclusion, the smoke alert device is very useful to assist the blind escape from smoke and fire because the time response is very fast.

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CHAPTER 1

INTRODUCTION

1.1 TITLE

The Development of Smoke Alert Device for the Blind

1.2 PROBLEM STATEMENT

There are cases reported that the blind people are victim or trapped in a fire. Drowning in the smoke of a house fire is the risk and cannot find way to escape . Either normal or blind people have difficulties to escape from the fire. As a result, a smoke alert device for the blind is design to help the blind escape from the fire. "Deathmeta-analysis finds the presence of working smoke alarms is associated with significantly lower numbers of deaths caused by household fires."

1.3 OVERVIEW/INTRODUCTION

According to data collected at Fire Station Bukit Jelutong, from 2012 to 2015 there are increase in drastic about victim trap in fire that is 28844 to 41869 person. All victim including disable person such as paralyzed, deaf and also blind. When someone are trap in fire, and air drop from 21% to 17% can cause claustrophobic (fear of small room and having no escape). This also can cause asphyxia (condition when body is lack of oxygen).

1.4 OBJECTIVE

i. To investigate the needed of this smoke alert to blind people.
ii. To develop a device that can help blind people to escape from fire.
iii. To assist blind people to enhance their self-independence.

With the advance of technology, development of wearable assistive system and devices for the blind are might lead the improvements in their quality of life. This smoke alert device also can tell them when they are fire happened in the house while they were alone or maybe sleeping. It is equipped with rechargeable batteries which can be charged by a USB cable connected to a computer, or even by a mobile phone charger. With the low cost of smoke alert device and intelligent features on it may help blind people that comes from low-income also can afford to buy and use it. This also can be carried anywhere.

1.5 SCOPE AND LIMITATION

Scope of this project is blind people or someone that have problem in sightseeing. Smoke alert device is to help blind people to be alert and independence. Blind people can get alert quicker and try to escape from fire and if they were trap and faint, there will be superbright LED as indicator for rescue to find location of the victim. At the same time, the guardian will get alert to rescue them from massage through GSM.

1.6 SIGNIFICANT OF THE STUDY

The significant of the study/project is to provide or come out with an effective smoke alert device for the blind. Besides, the next intention for the significant of the study is to produce a product with reasonable price and make it more practical. The smoke alert device which may create less of a social stigma and show up the technologies nowadays are able to improve rehabilitation devices for blindness.

1.7 EXPECTED OUTCOMES

i. Come out with smoke alert device for the blind. In order to make it more practical and user friendly.

ii. Providing an effective smoke alert device to help blind people when there were trap in fire.

iii. Produce the product with reasonable price by planning the budget in order to make it affordable by everyone to purchase

1.8 THEORETICAL STUDY

By using smoke alert device for the blind they can get alert anywhere because this is portable and give them alert to react. If there are fire in the room when they are alone, with this smoke device then can hear loud buzzer sound. If they were nearer to the fire, with the heat sensor will give them alert to be far away from fire and danger. If the users are faint in fire, with the superbright LED, the rescue can get indicator where is the location of user. At the same time, when the system are triggered, GSM will automatically send alert massage to the guardian.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

Basic principle for trainning people with visual impairment

Overall Cognition

- Encourage people with visual impairment to touch physical objects more frequently and use simple verbal descriptions, to strengthen conceptual understanding of objects and events.

Sensory Training

- Strengthen sensory training on senses other than vision, e.g. the sense of touch, hearing, smell and taste.

Residual Vision

- Assist people with visual impairment in protecting and making good use of their residual vision.

Personal Experience

- Encourage people with visual impairment to participate actively in activities so as to enrich life experience. Avoid helping on everything and allow them learn independently as appropriate.

2.2 ASSISTIVE TECHNOLOGY FOR THE BLIND

Technologies today have been develop wearable device for the blind to help them for reading, navigation, security, and many more. Wearable devices is currently a "hot" research topic in assisting people with disabilities such as the blind. There are not many mature commercial products with a wide user base because it is still through an innovation until it recognized safe to use. For example the most successful reading tool is the Braille dot code. Introduced by Louis Braille in the 19th century[2]. It is widely for all class traning in assiosiation blindness.

Consider visual impairment are disable to see but still have another senses to give them alert or signal. Researcher found through hearing and touch can transmit visual information to the blind. Therefore, several protypes of wearable assistive devices develop from time to time. Figure 1 overviews the body areas involved in wearable assistive devices: fingers, hands, wrist, abdomen, chest, feet, tongue, ears, etc. Most of the wearable assistive devices are more focused on upper body.

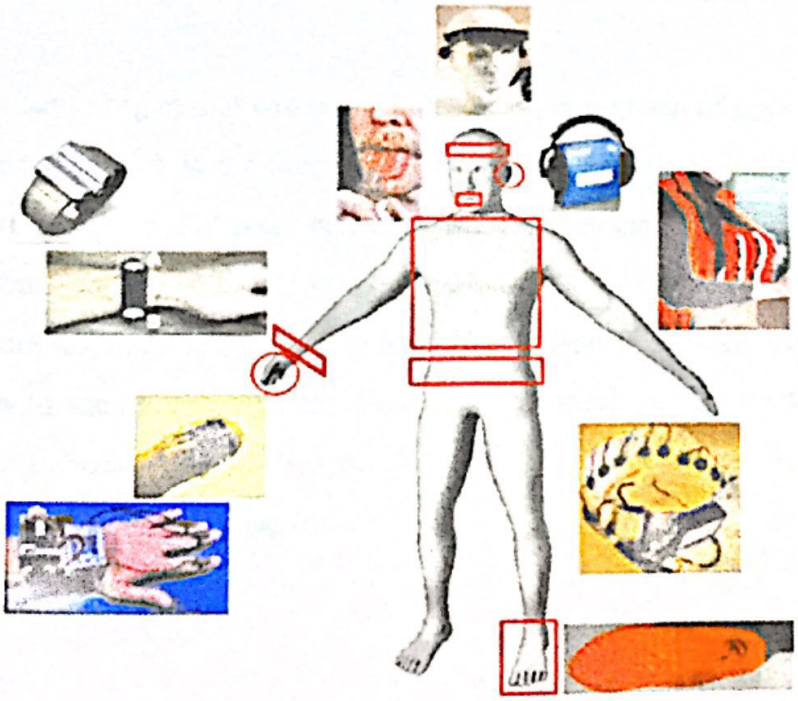


Figure 2.1: Overview of Wearable Assistive Device for the Blind

2.3 CONSIDERATION OF HEARING AND TOUCH

The major senses for the blind is hearing and touch. Blind people rely on hearing environmental cues for key tasks such as safety, mobility and awareness. For example when they are walking with their stick they swept from side to side while touch to the ground and heard the sound cane tapping on the surface to ensure every step they are safe before landed their foot.

The ear is the sense organ that detects sound vibrations. It is responsible for transducing vibrations into nerve impulses that are perceived by the brain. Brain process possible for human able to determine or detect the characteristic of sound such as pitch, loudness, distance and direction to the source.

For the blind, touch becomes the primary input for the receipt of non-audible physical information. Blind people can rapidly and accurately identify three-dimensional objects by touch. They can also locate and orient themselves in known environments by touching objects. Braille readers access information through touch.

Skin is sense organ that can be includes of 3 main group of sensor arranged by biological function which is the thermoreceptors, responsible for thermal sensing, the nociceptors, responsible for pain sensing and the mechanoreceptors, sensitive to mechanical stimulus and skin deformation. Mechanoreceptor is more interested to focus as they are responsible for sensing and transmission of physical deformations by external forces to the nervous system. Four kinds of mechanoreceptors can be found on the human glabrous skin in Figuure below: Pacini corpuscles, Ruffini endings, Merkel cells and Meissner corpuscles.

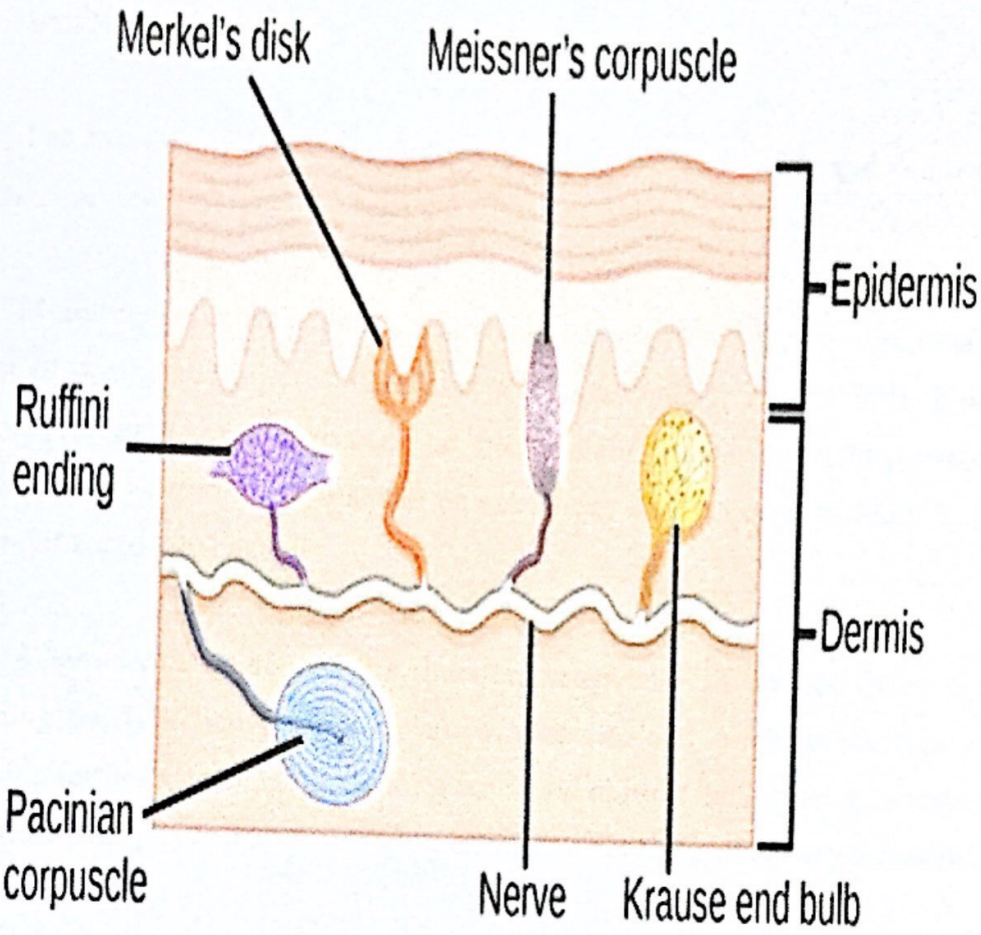


Figure 2.2: Mechanoreceptors

Four kinds of mechanoreceptors can be found on the human glabrous skin: Pacini corpuscles, Ruffini endings, Merkel cells and Meissner corpuscles. According to [3], Meissner corpuscles respond to touch, Pacini corpuscles respond to vibration, Ruffini endings respond to lateral extension of the skin and articular movement and Merkel cells perceive pressure. The ability to discriminate stimuli on the skin varies throughout the body. The physiologic classification of mechanoreceptors follows a two-class designation based on the receptor's responses to ramp-and-hold-like stimuli which is a stimuli that quickly indent and sustain in contact with the mechanoreceptor. The two general names of these classes are Fast Adapting (FA, also called quickly adapting and rapidly adapting) and Slowly Adapting (SA). There are subclasses of FA and SA mechanoreceptors: FA I, FA II, SA I and SA II.

2.4 SMOKE DETECTOR

The association between smoke alarm presence and injury and death rates: A systematic review and meta-analysis.

Mounting evidence suggests that smoke alarms play a key role in reducing the number of deaths and injuries associated with household fires each year. This study brings together the current literature on smoke alarm effectiveness. In particular, we are interested in determining whether or not smoke alarms decrease death and injury rates and if so, to what extent.

A systematic search of the literature uncovered 13 studies concerned with examining the link between smoke alarm presence and death and/or injury rates. Following further screening, 4 studies were found to meet the inclusion criteria for the death meta- analysis and 3 studies were deemed suitable for the injury meta-analysis.

Overall we found the death rate in households with working smoke alarms to behalf the death rate of households without working smoke alarms. In contrast, our injury meta-analysis uncovered do significant link between smoke alarm presence and injury rates. We critically discuss these findings and highlight areas for future investigation.[1]

2.5 FIRE EARLIEST STAGE

Application of Aspirating Smoke Detectors at the Fire Earliest Stage

Point detectors have a certain limitation in many monitor area, and standard smoke detectors are not qualified when consider the challenging environment condition and interference factors. So these applications need to use special fire detection technology, for example, aspirating smoke detectors (ASD). Driven by the new European standard EN 54-20, ASD achieved a new level in detection speed and reliability. New European standard EN 44-20 plays an important role in the

application of ASD. The automatic fire detector is divided into three types: Grade A represents a very high sensitivity, Grade B represents a high sensitivity, and Grade C represents a standard sensitivity. In addition, it is worthless as the response sensitivity of detector whose sample aperture is Grand C equals to the normal point smoke detector [4]. In the past, the tests focus on the reactive state of the ADS's evaluation device. But now, what we pay attention to are the reactive state of the whole system, including the sample line, sample aperture and sample device of ASD. ASD has been applied on some special places like large space, high building, logistics storage, and clean room.

2.6 ASD535

ASD535 was predicted by the Secrition Company, the subsidiary of Securitas Group in Switzerland and the most advanced and integrated fire detection manufacturers in European. Through the aspirator pump, ASD inhales the sample air into the detectors for analysis with an active method. Since the detector uses a high-power infrared LED light source, it is 1000 times more sensitive than the ordinary smoke detectors. As a result, it can detect the fire promptly which allow the fire brigade to deal with the fire before it has time to breaks out, protecting the safety of people's life and property.

ASD can detect the fire at the earliest stage. Fig.1 shows the evolution of a fire. Traditional fire alarm installations usually detect the fire and trigger an alarm at the visible smoke stage when the fire had caused huge economic losses. Before the visible smoke stage, an invisible smoke stage was gone through. For ASD 535, smoke changes can be reliably detected at a minimum level of 0.002% obscuration per meter – a level invisible to the human eye. So, it can detect smoke in good time and nip the fire in the bud. [5]

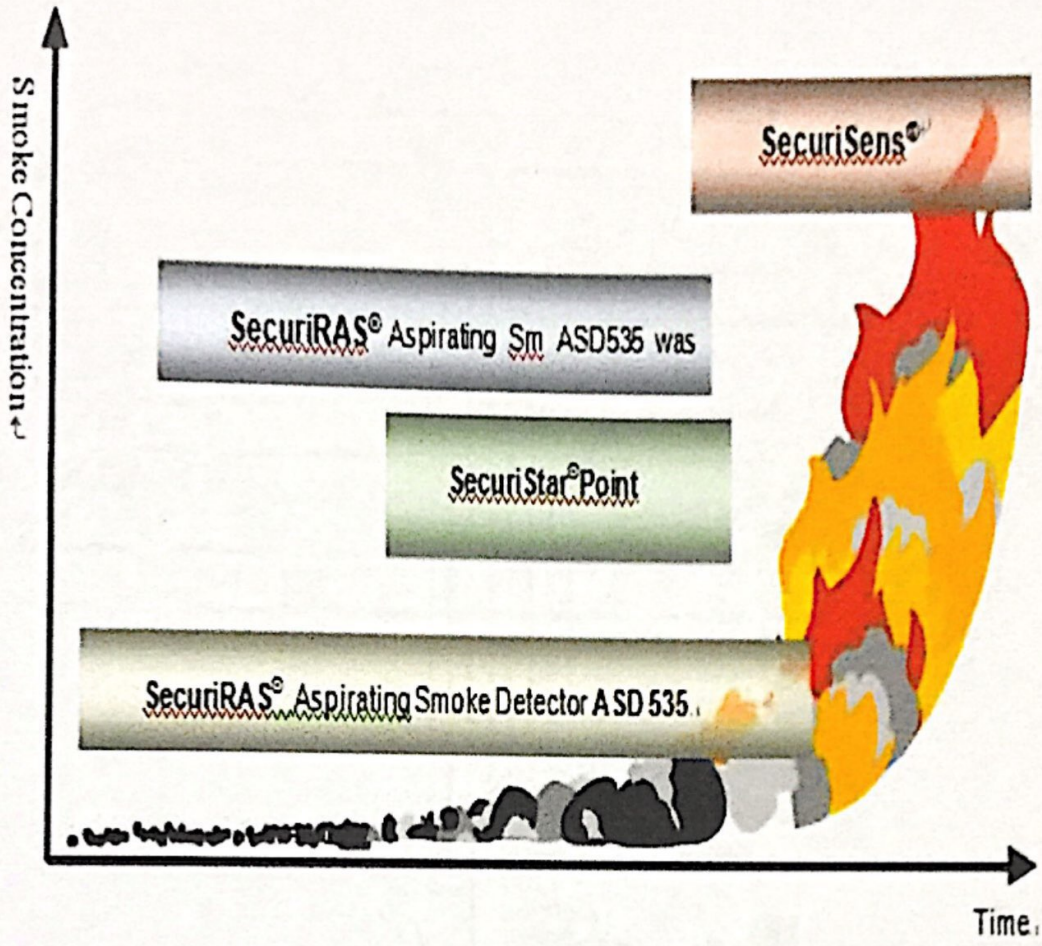


Figure 2.3: The Evolution of A Fire

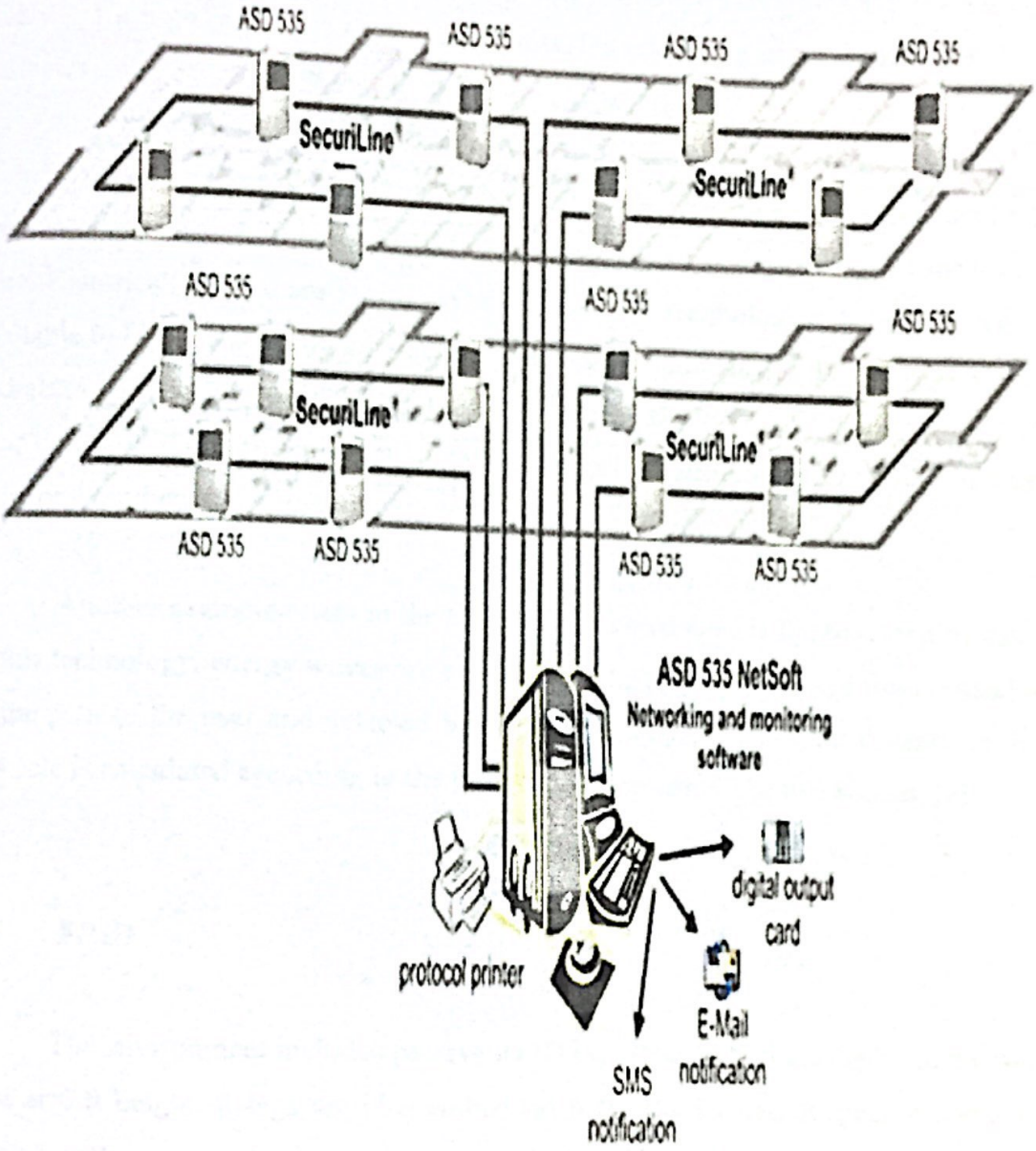


Figure 2.4: Networking of ASD535

2.7 AUTOMATED MOBILITY

Blind mobility is one of the main challenges that scientists are still facing around different parts of the world. According to the World Health Organization, approximately 0.4% of the population is blind in industrialized countries while the percentage is rising to 1% in developing countries. The simplest and most widely used travelling aid used by all blinds is the white cane. It has provided those people

with a better way to reach destination and detect obstacles on ground, but it cannot give them a high guarantee to protect themselves and being away from all level of obstacles.

With the recent advances in assistive technology, it is possible to extend the support provided to blind people taking into consideration the concept of the white cane. Historically, there are various types of assistive technologies that are currently available to blind or visually impaired people. One example is the smart phone, which addresses some of the concerns that the blind and partially sighted people needed in their daily life. The smart phones allow those people to listen to voice mails and even write and send emails.

Another example refers to the electronic oriented aids, is the laser or ultrasonic. In this technology, energy waves are emitted ahead, then it is reflected from obstacles in the path of the user and detected by a matching sensor. Thus, the distance to the obstacle is calculated according to the time variance between the two signals. [6]

2.8 FRID

The environment includes passive RFID tags (Rtags) that are deployed on each door at 4 ft height. R-tags are also embedded in kiosks located at specific points of interest such as the entrances/exits to a building, at the elevators and at emergency exits. Granularity was the main reason behind selecting this technology. Proximity of 2-3 cm is required to transfer data from the R-tag into the reader. Other reasons for selecting these R-tags were their cost and the fact that they do not need any power source. On each R-tag we incorporate the room number in raised font and its Braille equivalent.[7]

2.9 A-GSM – BASED FIRE DETECTOR

The fire alert design was built around techniques for digitalizing analogue signals obtained from transducers used to monitor (i.e. sense) temperature of the room and the light intensity of the room. The room temperature to be monitored, being analogue, is measured through the use of a thermistor, while the light intensity of the room is detected using Light Dependent Resistor (LDR).

The LDR's resistance increases with reduced light intensity causing the voltage input into the inverting input of the comparator used to be higher than the reference voltage set at the non-inverting input of the comparator which makes the comparator to output a LOW. The thermistor resistance decrease with increase in temperature and this would cause a decrease in the voltage input to the non-inverting input of the comparator thereby causing the voltage reference set at the inverting input to be greater. In this state the comparator outputs a LOW, to indicate high temperature (i.e. fire). The two LOW outputs were ORed and coupled to the astable stage of the circuitry; the lamp and the buzzer were energized to sensitize everyone in the room or the building. [8]

CHAPTER 3

METHODOLOGY

3.1 PREFACE

Designation of smoke alert device for the blind based on research that has been made by using several journals, lectures, biomedical engineers and blind people at Malaysia Association Blind (MAB), Brickfields. A decision has been made during the discussion in how to help blind people in a fire. In this section will showed and explain about the design and flow of constructing the Smoke Alert Device For The Blind.

3.2 DESIGN SMOKE ALERT DEVICE FOR THE BLIND

The design of the device can be divided into two parts which are inner and outer (frontal) part.

3.2.1 Frontal View

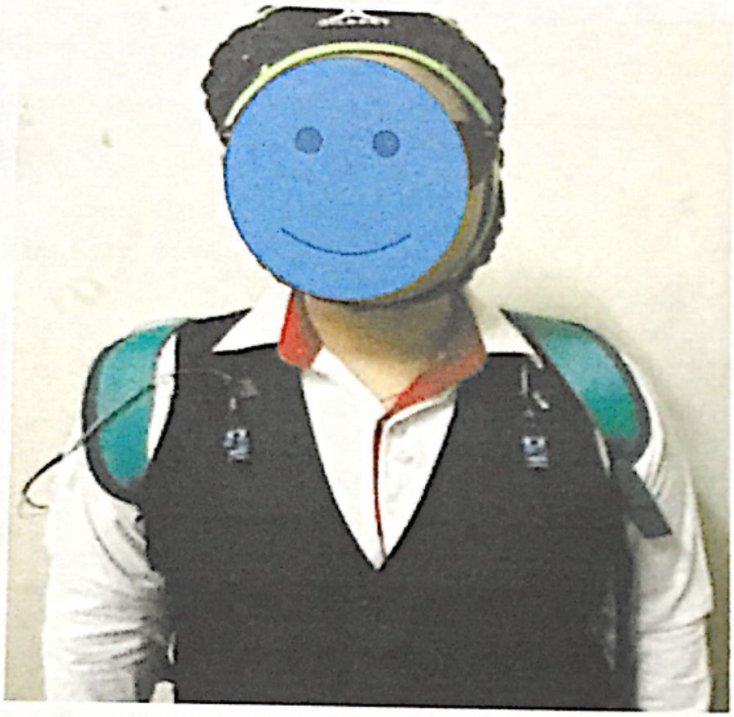


Figure 3.1: Frontal View

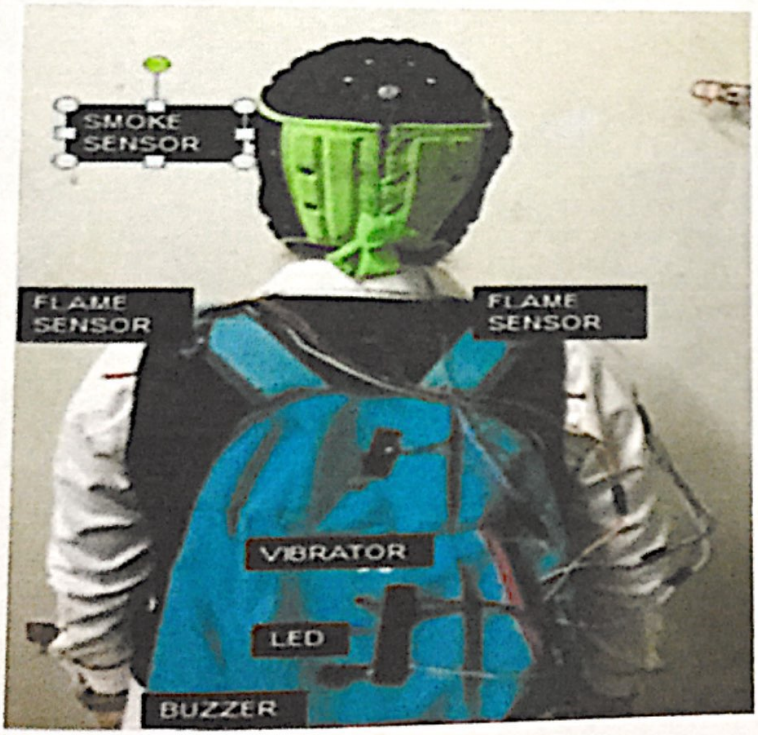


Figure 3.2: Frontal Part

3.2.2 Inner Part

In this section will discuss about inner part of the device. This section will implement hardware and software in obtaining the accurate and proper alert with the sensor. They are alarm and also alert massage to the guardian.

3.2.3 Top Part

Figure 3.3: Top Part

3.2.4 Body Part

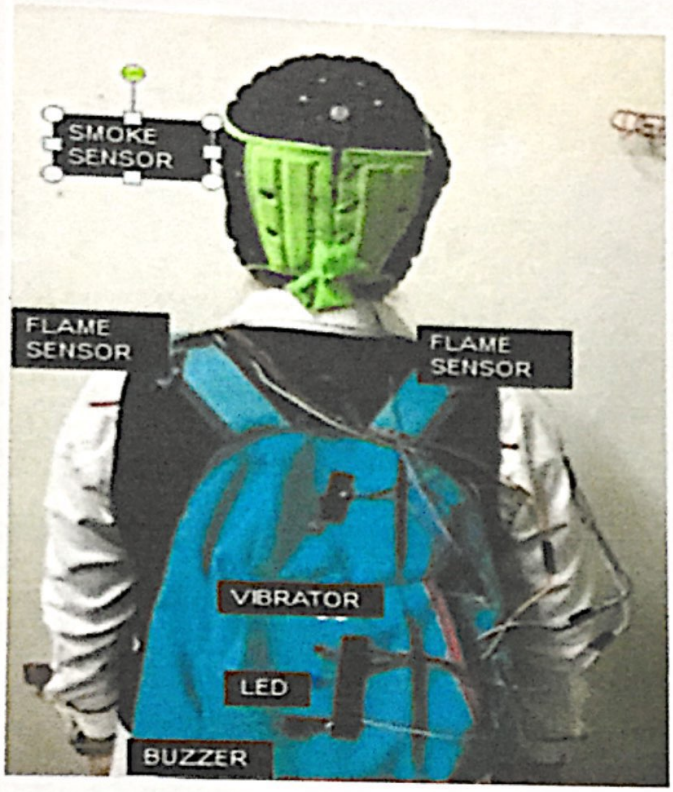


Figure 3.4 : Body Part (Back)

Figure 3.5: Body Part (Front)

3.2.5 Guardian emergency massage

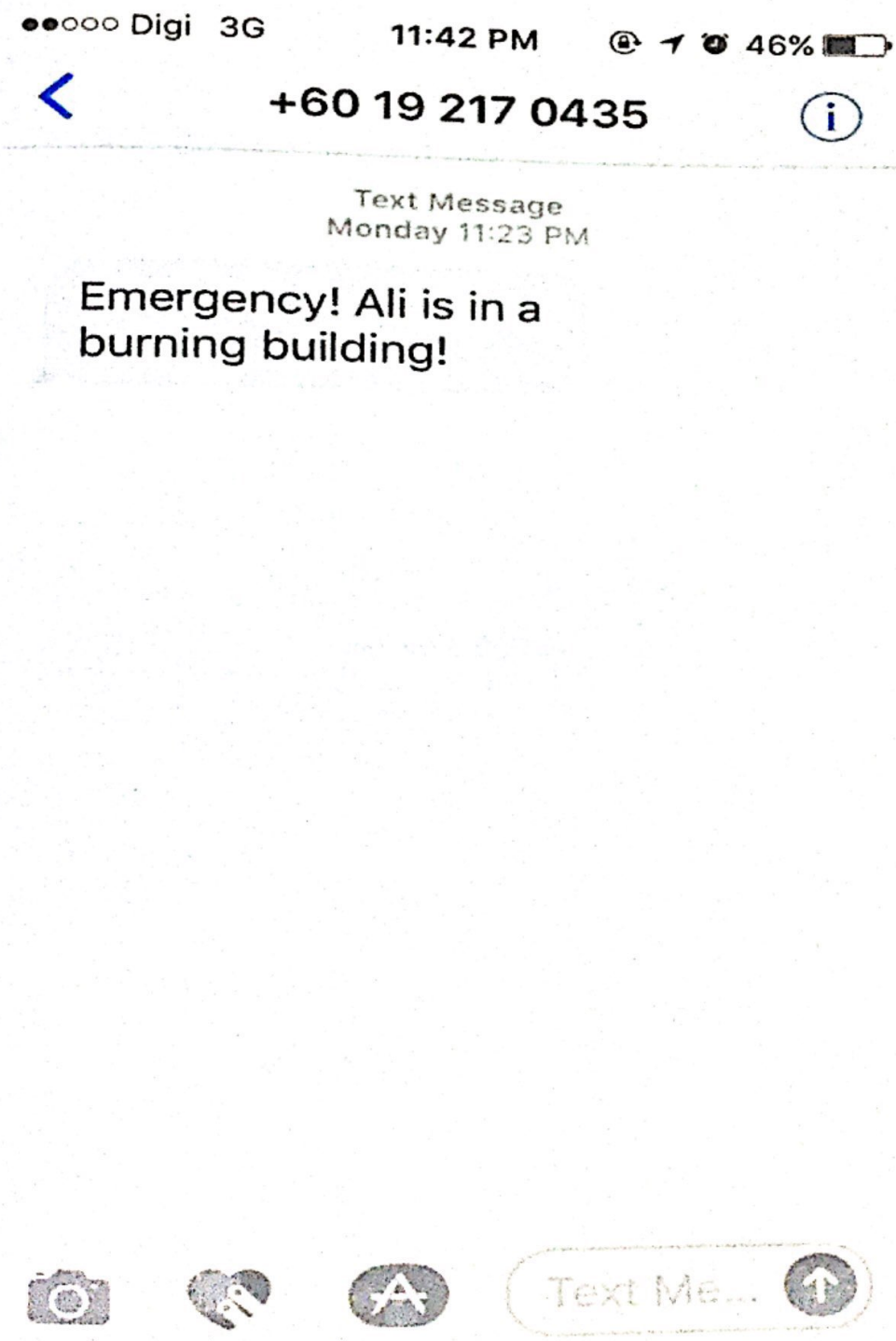


Figure 3.6: Guardian Emergency Massage

3.3 HARDWARE

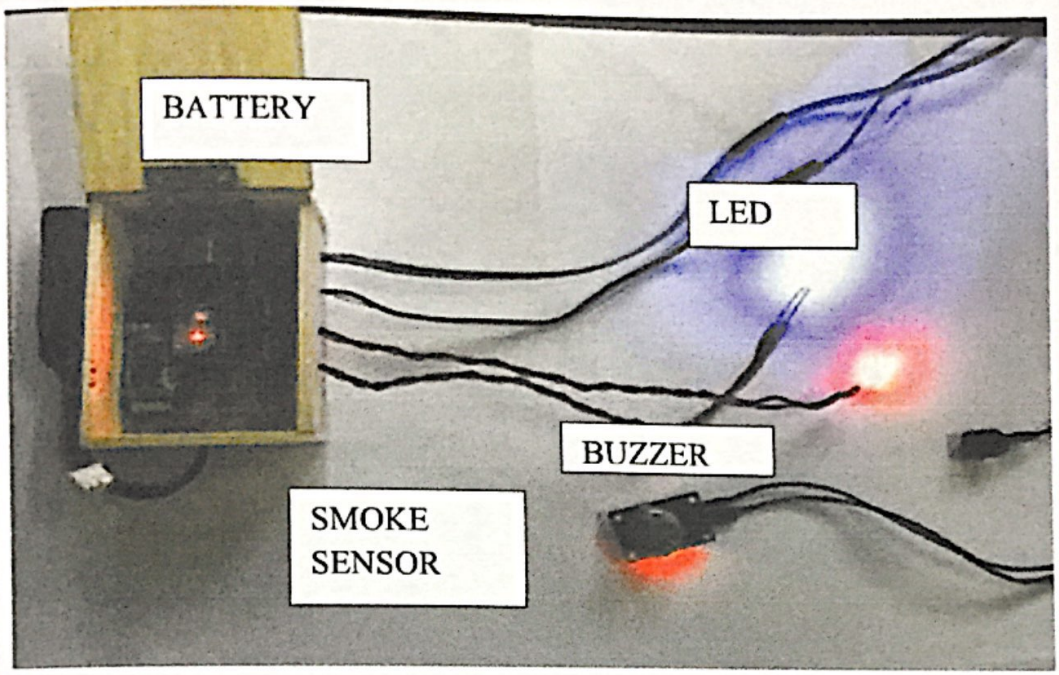


Figure 3.7: Top Part

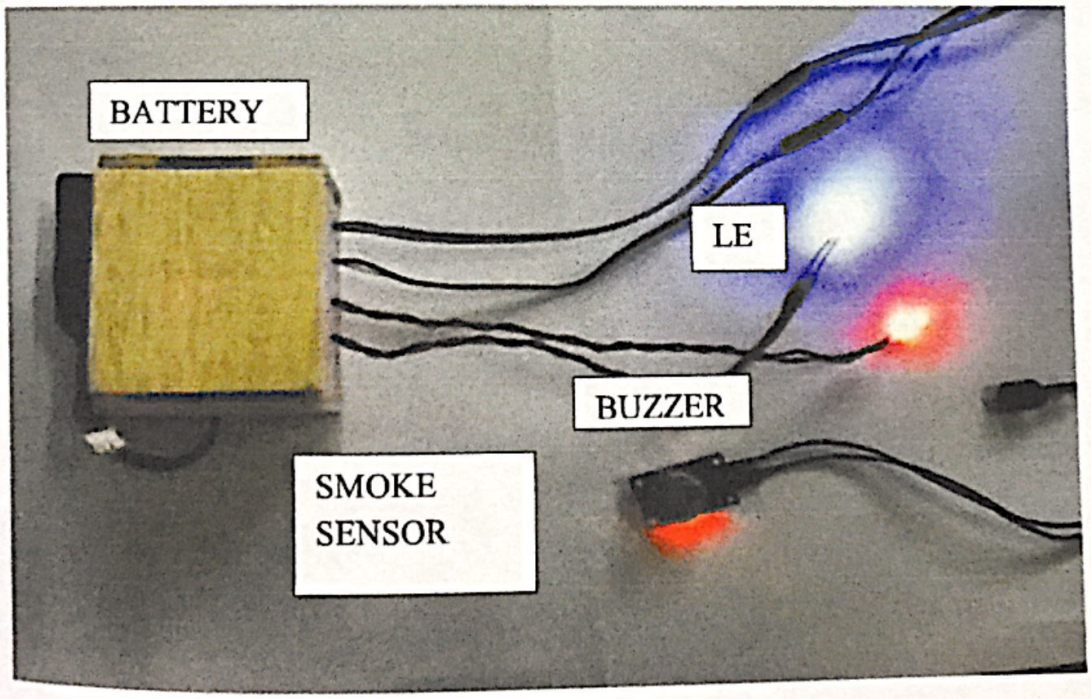


Figure 3.8: Top Part Close

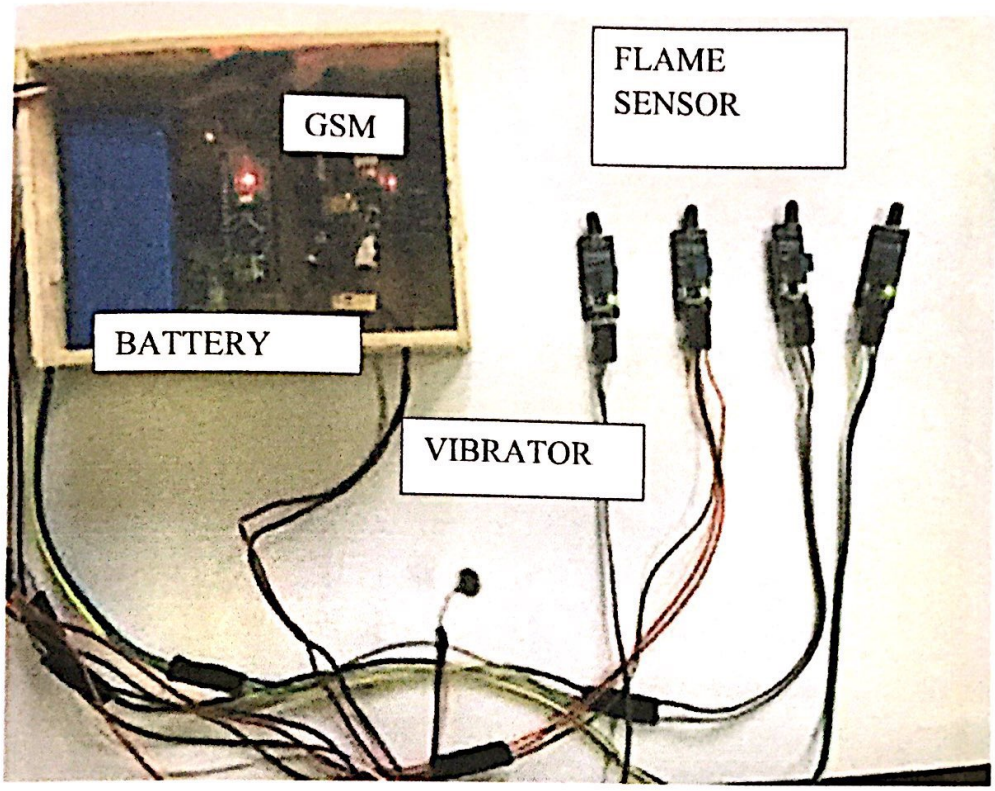


Figure 3.9: Body Part

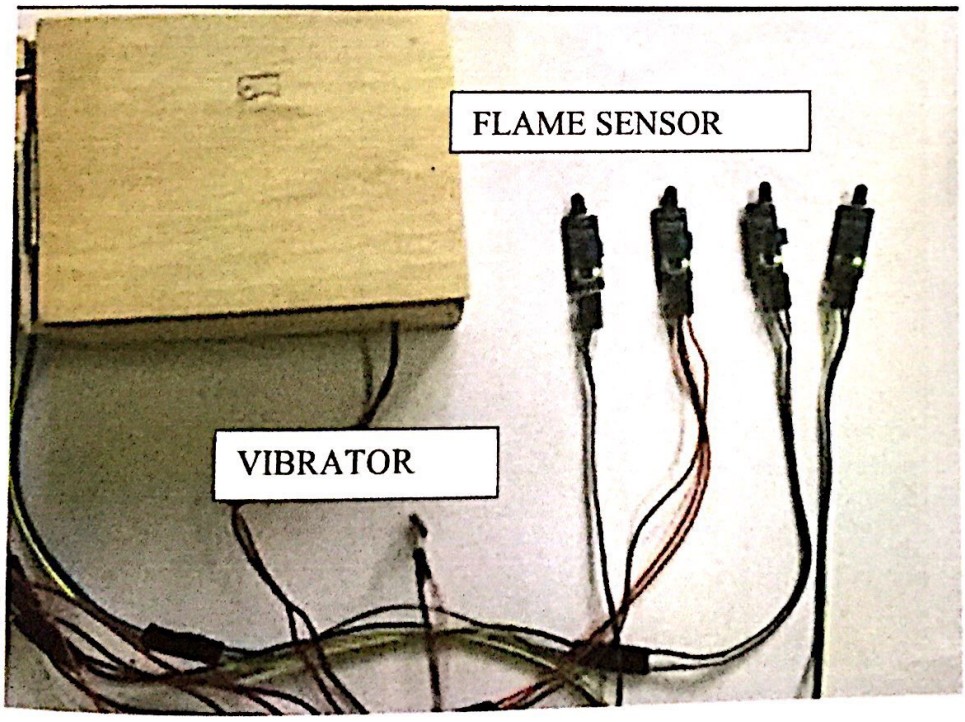


Figure 3.10: Body Part Close

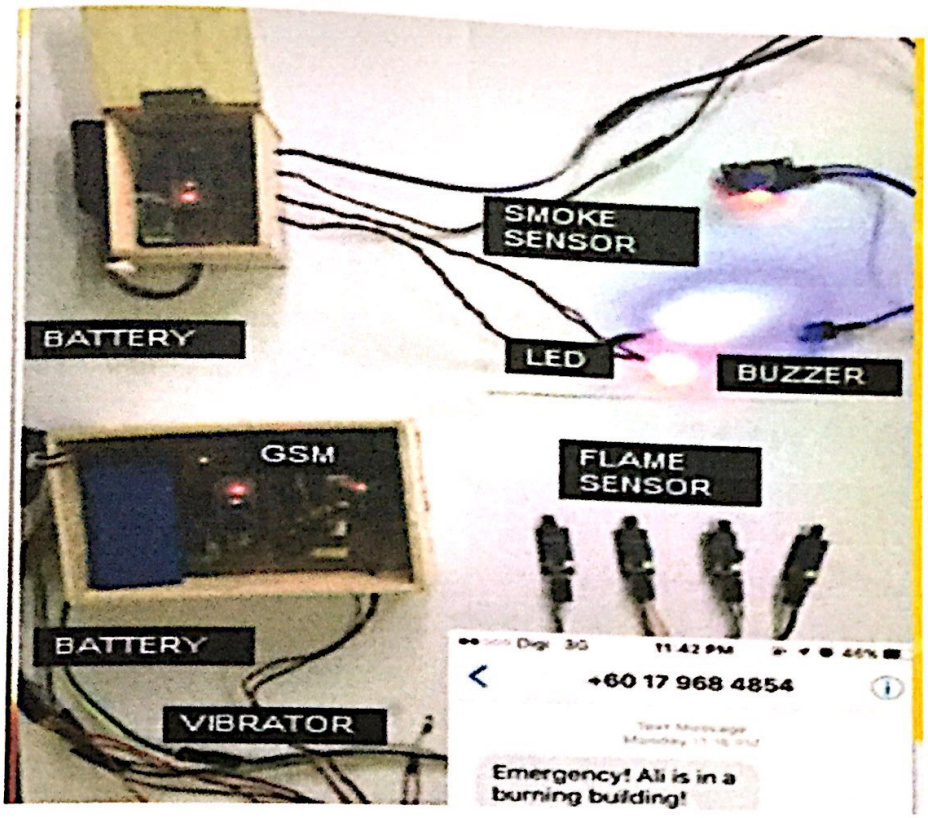


Figure 3.11: Device

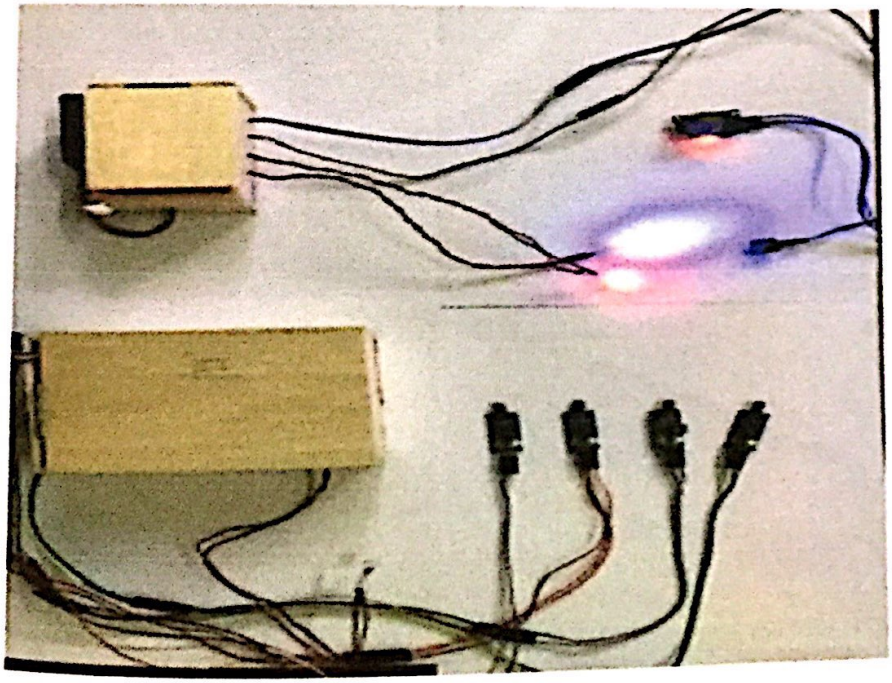


Figure 3.12: Device Close

3.4 SMOKE SENSOR

The MQ-2 smoke sensor is sensitive to smoke and to the following flammable gases, LPG, Butane, Propane, Methane, Alcohol, Hydrogen. The resistance of the sensor is different depending on the type of the gas. The smoke sensor has a built-in potentiometer that allows you to adjust the sensor sensitivity according to how accurate you want to detect gas.

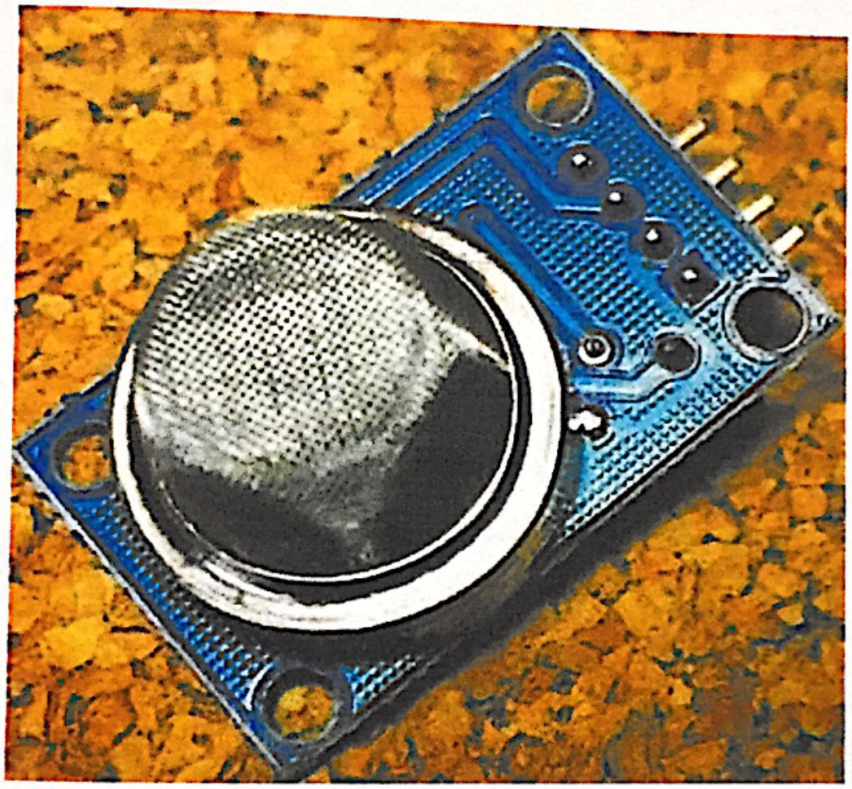


Figure 3.13: MQ2 Sensor

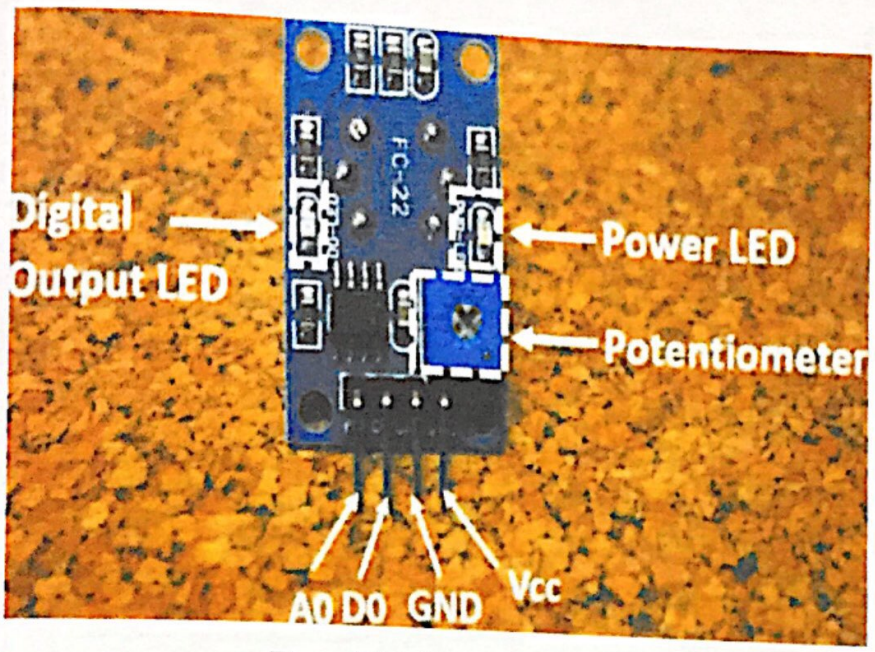


Figure 3.14: Sensor Back View

Table 3.1: Type of Gas Sensor

Semiconductor sensor for Flammable gas, Plastic or Metal cover	
Model	**Target Gas**
MQ-2	General combustible gas
MQ-3	Alcohol
MQ-4	Natural gas, Methane
MQ-5	LPG, Natural gas, Coal gas
MQ-6	LPG, Propane
MQ-7	Carbon Monoxide (CO)
MQ-8	Hydrogen
MQ-9	CO and Combustible gas
MQ216	Natural gas\Coal gas
MQ306A	LPG, Propane
MQ309A	Carbon Monoxide (CO), Flammable Gas
MQ303A	Alcohol
MQ131	Ozone O3
MQ135	Air Quality Control (NH3,Benzene,Alcohol,smoke)
Semiconductor sensor for Toxic gas	
MQ136	Sulfureted Hydrogen (H2S)
MQ137	Ammonia (NH3)
MQ138	VOC (Mellow, Benzene, Aldehyde, Ketone, Ester)

Table 3.2: Technical Data of MQ2 Gas Sensor

Technical Data

Model No.			MQ-2
Sensor Type			Semiconductor
Standard Encapsulation			Bakelite (Black Bakelite)
Detection Gas			Combustible gas and smoke
Concentration			300-10000ppm (Combustible gas)
Circuit	Loop Voltage	V_C	≤24V DC
	Heater Voltage	V_H	5.0V±0.2V ACorDC
	Load Resistance	R_L	Adjustable
Character	Heater Resistance	R_H	31Ω±3ΩRoom Tem.
	Heater consumption	P_H	≤900mW
	Sensing Resistance	R_S	2KΩ-20KΩ(in 2000ppm C_3H_8)
	Sensitivity	S	Rs(in air)/Rs(1000ppm isobutane)≥5
	Slope	α	≤0.6($R_{5000ppm}/R_{3000ppm}$ CH4)
Condition	Tem. Humidity		20±2℃65%±5%RH
	Standard test circuit		Vc:5.0V±0.1V V_H: 5.0V±0.1V
	Preheat time		Over 48 hours

Sensitive material of MQ-2 gas sensor is SnO2, which with lower conductivity in clean air. When the target combustible gas exist, The sensor's conductivity is more higher along with the gas concentration rising. Please use simple electrocircuit, Convert change of conductivity to correspond output signal of gas concentration. MQ-2 gas sensor has high sensitity to LPG, Propane and Hydrogen, also could be used to Methane and other combustible steam, it is with low cost and suitable for different application.

3.5 FLAME SENSOR

Flame detectors respond to the production of one or a combination of ultra-violet or infrared spectrums of electromagnetic radiation. These detectors are often used in situations where there is a potential for the rapid development of fire such as flammable liquids. These detectors comprise an electronic circuit with an electromagnetic radiation receiver. Flame detectors are actuated when they receive

electromagnetic radiation from one or more defined wave lengths are received according to their design in the ultra-violet or infrared spectrum.

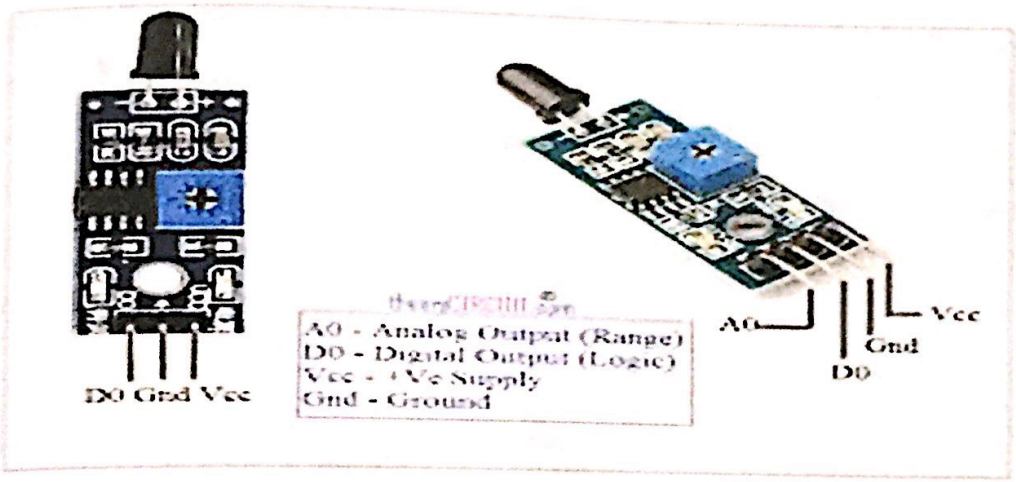


Figure 3.15: Flame Sensor

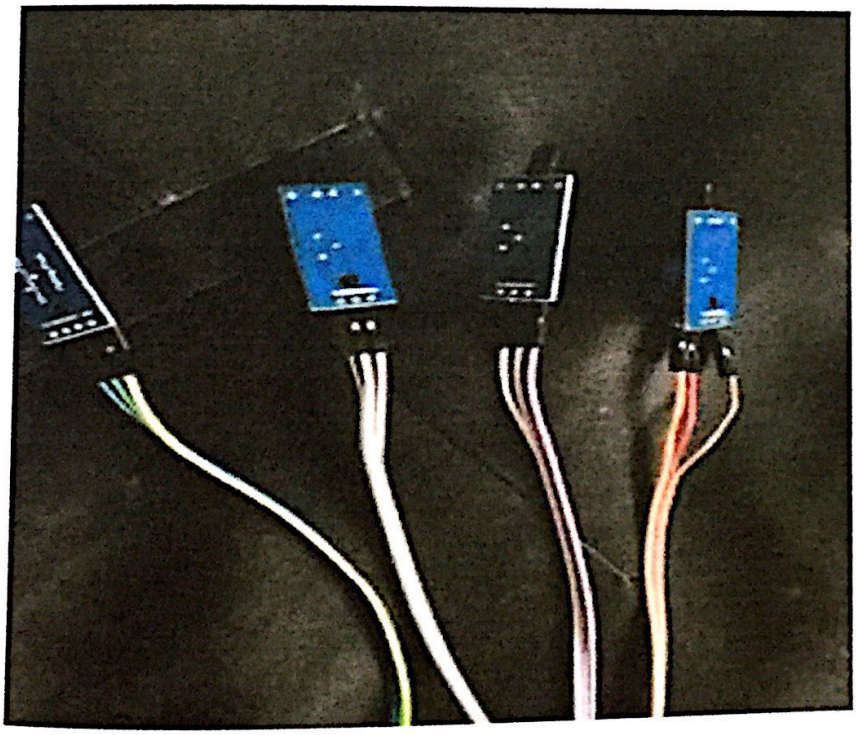


Figure 3.16: Flame Sensor on Jacket

3.6 GSM

GSM (Global System for Mobile communication) is a digital mobile telephony system that is widely used in Europe and other parts of the world. GSM uses a variation of time division multiple access (TDMA) and is the most widely used of the three digital wireless telephony technologies (TDMA, GSM, and CDMA). GSM digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot. It operates at either the 900 MHz or 1800 MHz frequency band.

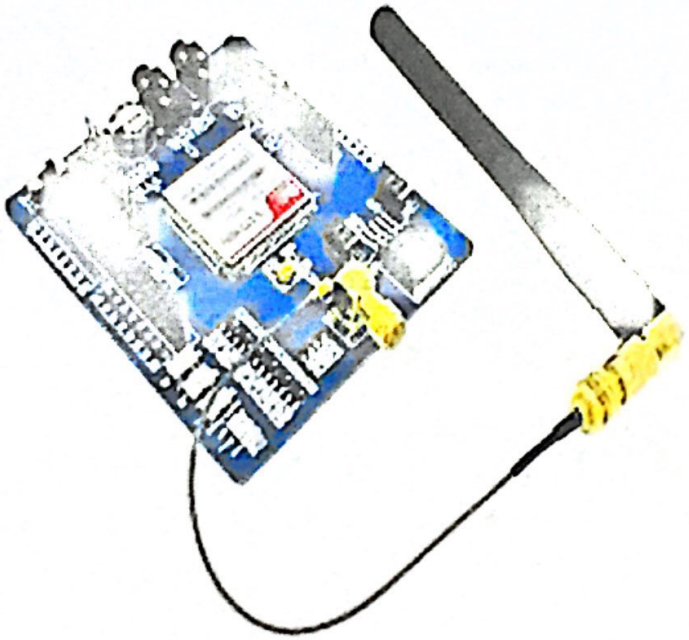


Figure 3.17: GSM

3.7 ARDUINO

The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328 (Arduino Nano 3.x) or ATmega168 (Arduino Nano). It has more or less the same functionality of the Arduino Duemilanove, but in a different package. It lacks only a DC power jack, and works with a Mini-B USB cable instead of a standard one. The Nano was designed and is being produced by Gravitech.

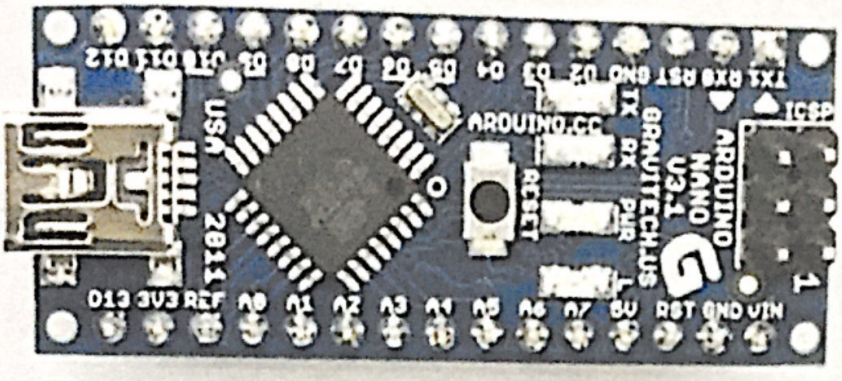


Figure 3.18: Front View of Arduino

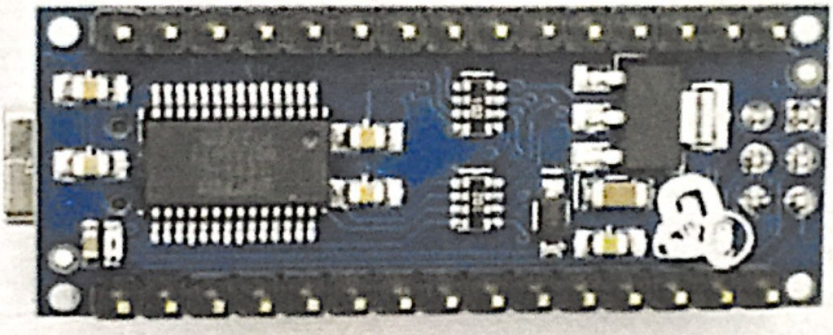
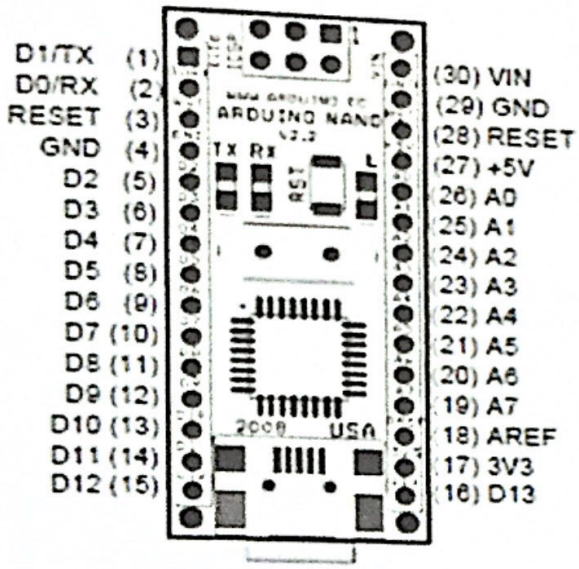


Figure 3.19: Back View of Arduino

Arduino Nano Pin Layout



Pin No.	Name	Type	Description
1-2, 5-16	D0-D13	I/O	Digital input output port 0 to 13
3, 28	RESET	Input	Reset (active low)
4, 29	GND	PWR	Supply ground
17	3V3	Output	+3.3V output (from FTDI)
18	AREF	Input	ADC reference
19-26	A7-A0	Input	Analog input channel 0 to 7
27	+5V	Output or Input	+5V output (from on-board regulator) or +5V (input from external power supply)
30	VIN	PWR	Supply voltage

Figure 3.20: Arduino Pin Layout

3.8 MINI VIBRATION MOTOR

Vibration motor which is able to produce vibration according to the voltage supplied. It has two terminals which are voltage supply and ground terminal. The operating voltage is 5V and needs enough current to operate properly.

Figure 3.21: Mini Vibration Motor

3.9 BUZZER

Buzzer is component that produces a beeping sound based on the voltage supply and ground terminal. The operating voltage range is 6v.

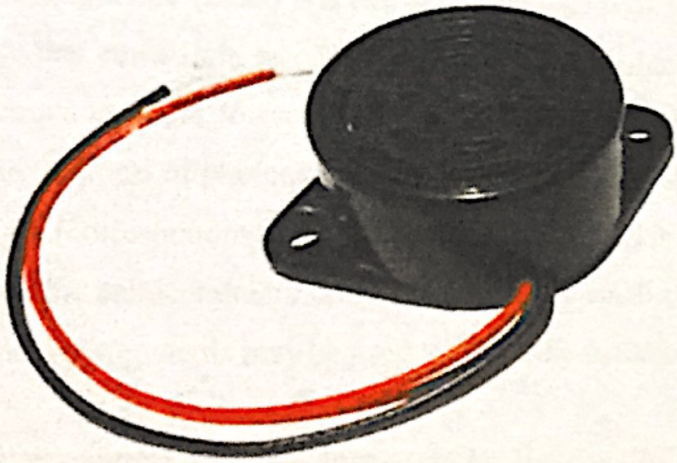


Figure 3.22: Buzzer

3.10 RECHARGEABLE LIPO BATTERY

Rechargeable Lipo batteries are an excellent way to reduce impact on the environment while saving money in the long-term. The entire system is powered up by a battery which is able to supply 7V. The power supply is high enough to power up

all components. Otherwise, the system will not be able to operate well. Figure below shows type of rechargeable Lipo batteries used.

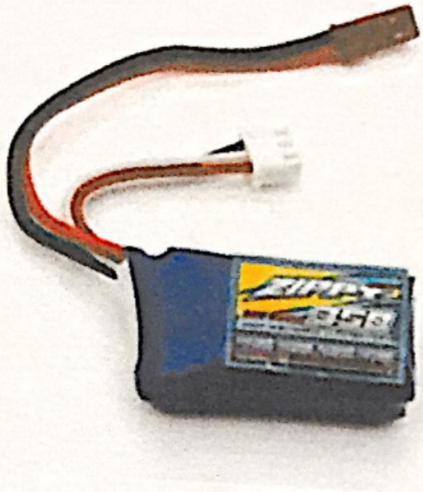


Figure 3.23: Rechargeable Lipo Battery

3.11 SUPERBRIGHT LED

A light-emitting diode (LED) is a two-lead semiconductor light source. It is a p–n junction diode that emits light when activated. When a suitable voltage is applied to the leads, electrons are able to recombine with electron holes within the device, releasing energy in the form of photons. This effect is called electroluminescence, and the color of the light (corresponding to the energy of the photon) is determined by the energy band gap of the semiconductor. LEDs are typically small (less than 1 mm2) and integrated optical components may be used to shape the radiation pattern.

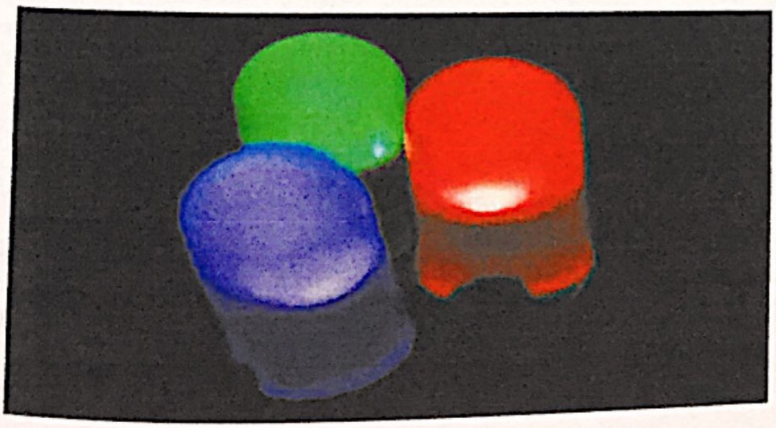


Figure 3.24: Superbright LED

3.12 SOFTWARE

3.12.1 Arduino Software

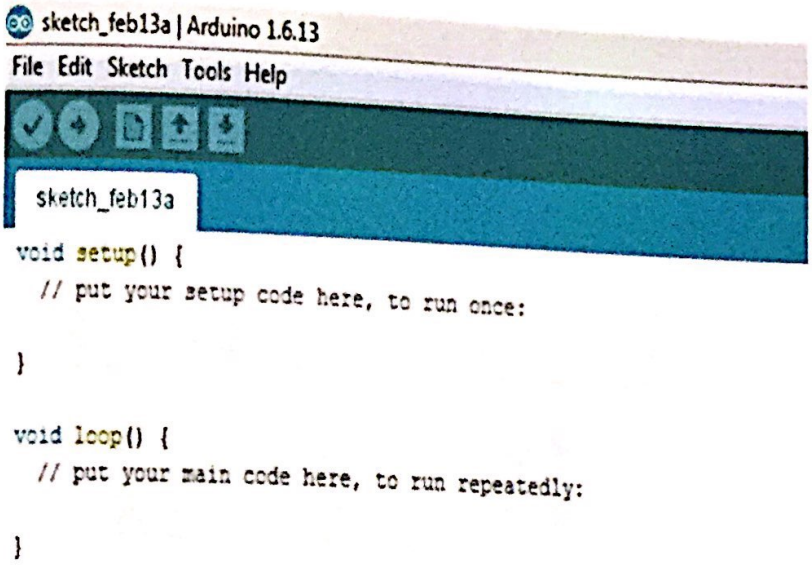


Figure 3.25: Software

3.12.2 Microsoft Excel

Microsoft Excel is used to interpret my questionnaire or early survey in analysis my devices among hospital's staff and public. By using Microsoft Excel, graph is the suitable method to analyze and differentiate between each questions of my survey.

3.12.3 Proteus 8 professional

Proteus 8 is a electronics circuit board design, PCB prototyping software that can also be used to for real time simulation of microcontroller such as 8051, design of schematics of electronics and external electrical circuits and PCB(printed circuit board) design.

3.13 PROCESS OF METHODOLOGY

3.13.1 Flow Chart General of Project

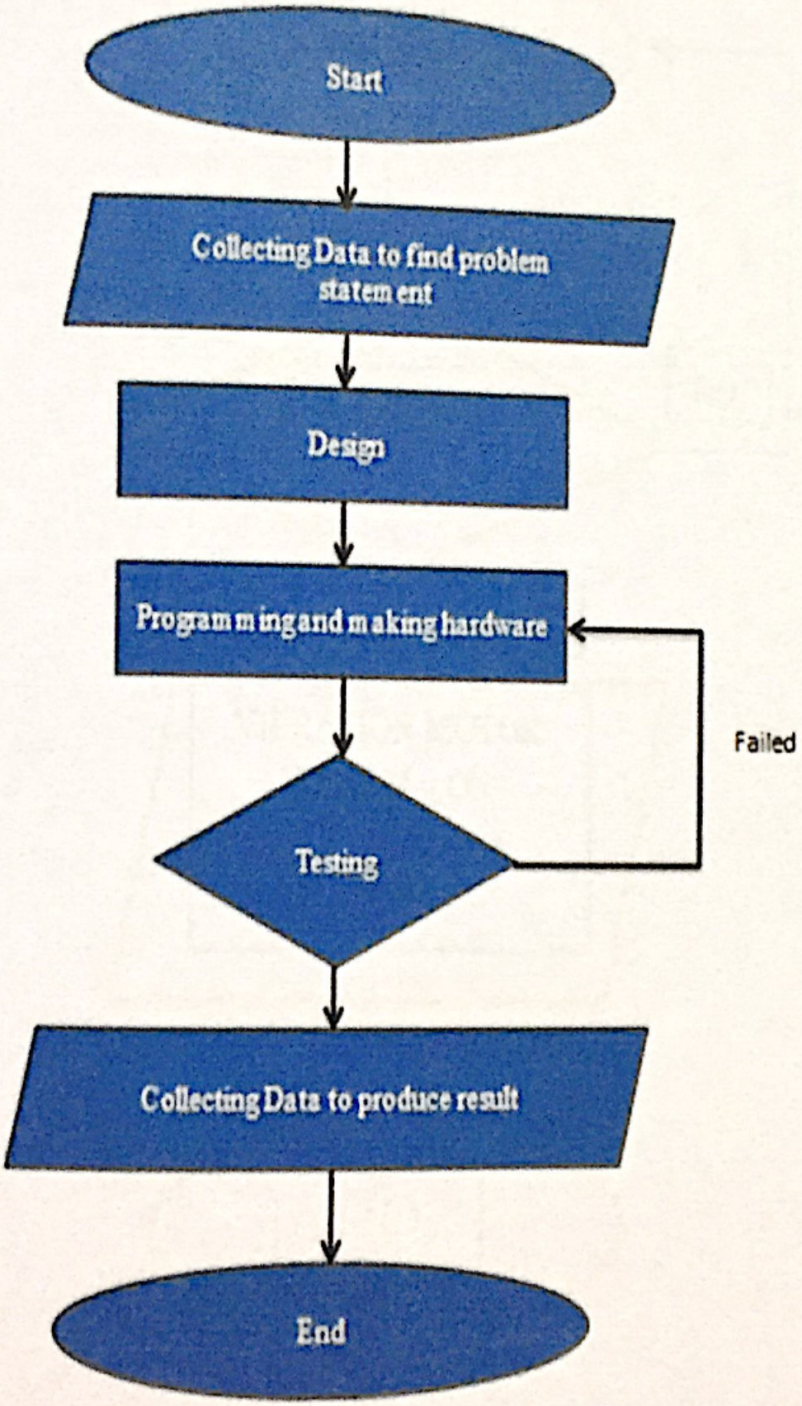


Figure 3.26: Flow Chart General

3.13.2 Flow Chart of Project

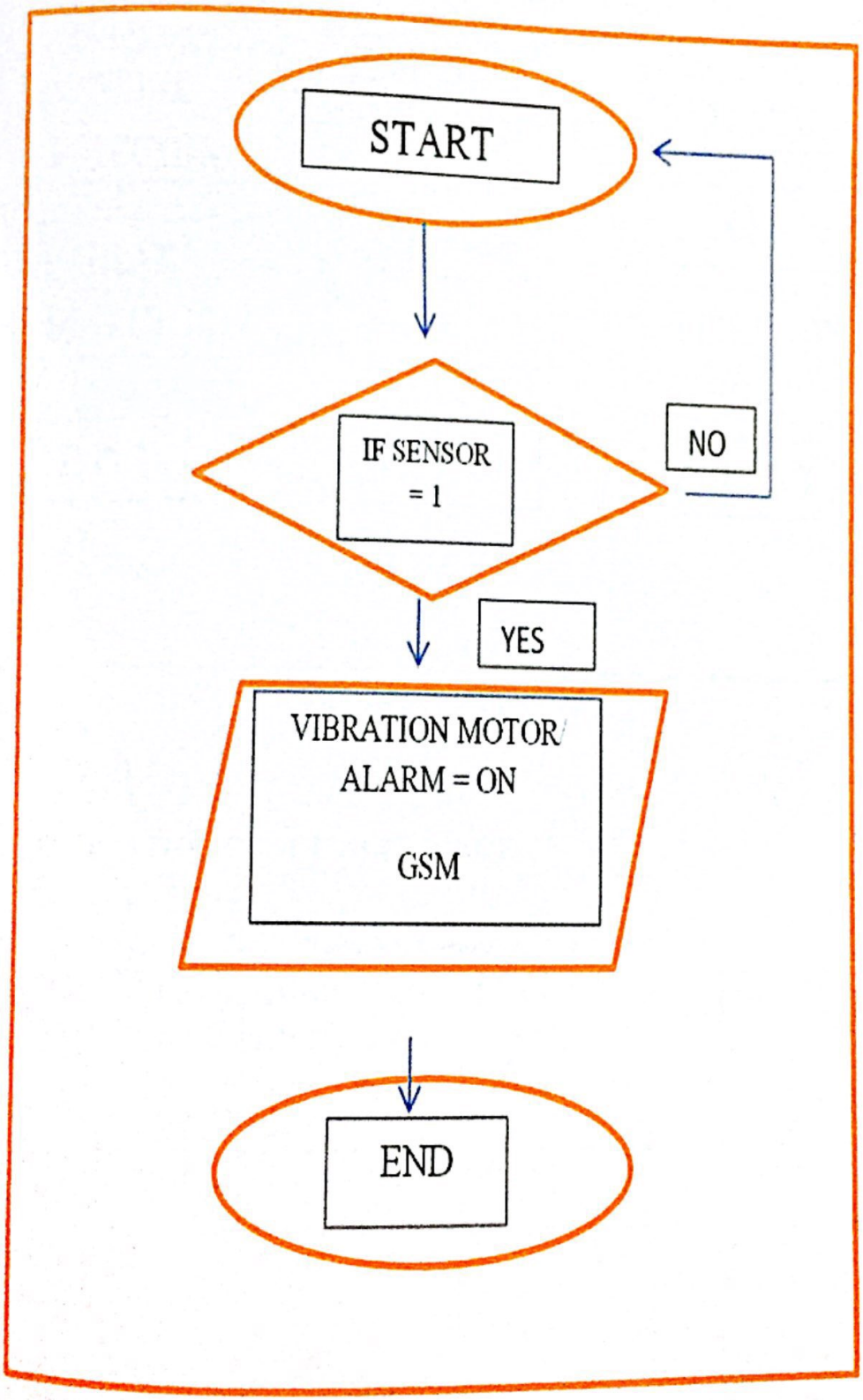


Figure 3.27: Flow Chart Smoke Alert Device for the Blind

3.13.3 Block Diagram of Project

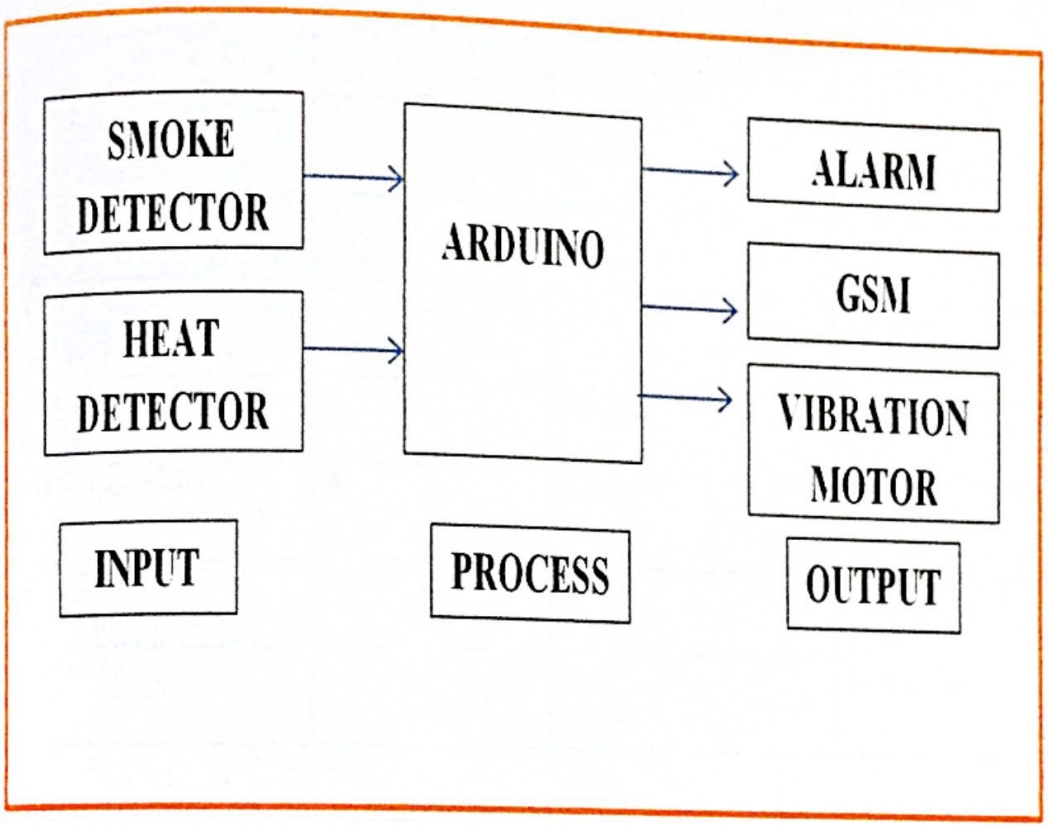


Figure 3.28: Block Diagram

3.14 ESTIMATION COST FOR PROJECT

Table 3.3: Estimation Cost

COMPONENTS	QUANTITY (UNIT)	PRICE (UNIT)	PRICE (RM)
ARDUINO NANO	2	50.00	100.00
RECHARGABLE BATTERY	2	45.00	90.00

MINI VIBRATION MOTOR	1	4.00	4.00
LED	2	5.00	10.00
BUZZER	1	3.00	3.00
GSM	1	120.00	120.00
SMOKE SENSOR	1	30.00	30.00
HEAT SENSOR	4	15.00	60.00
OTHERS	DEPENDS	-	100.00
TOTAL			RM517.00

3.15 ELECTRICAL DESIGN

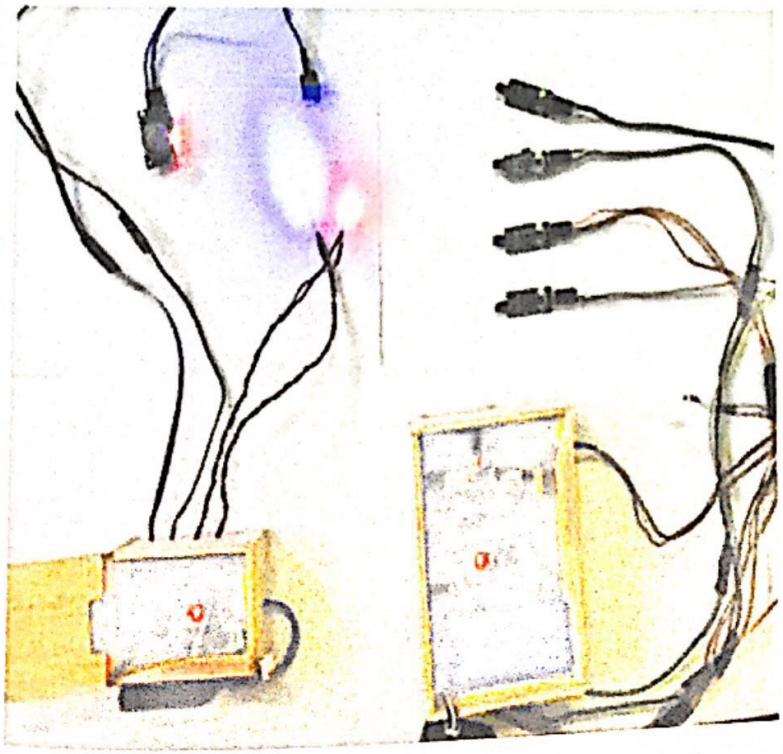


Figure 3.29: Electrical Device

3.16 HC-05 BLUETOOTH MODULE

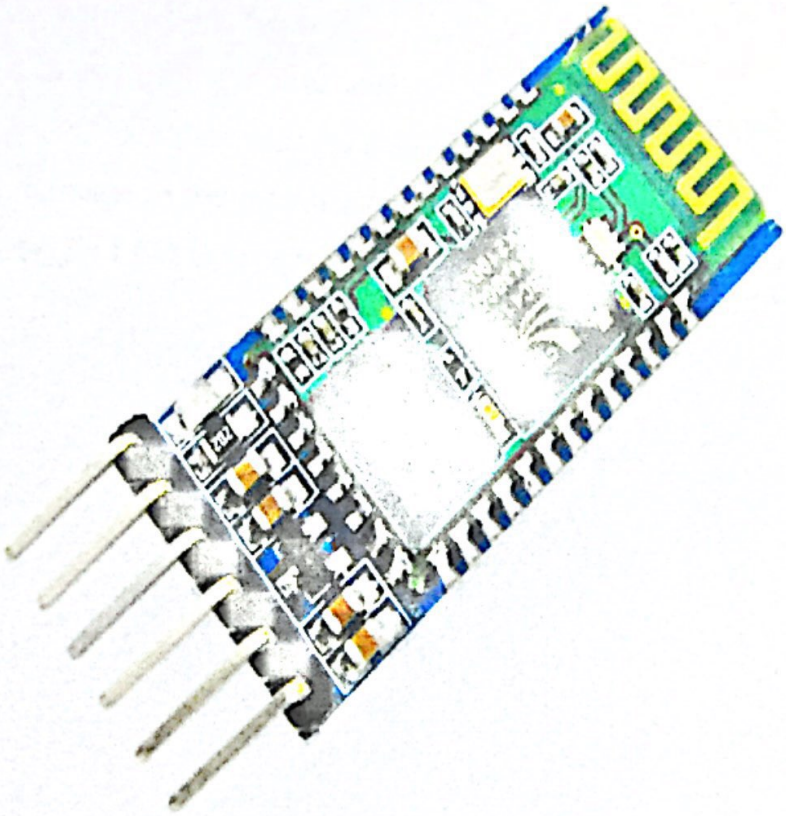


Figure 3.30: HC-05 Bluetooth Module

Figure 3.16.1 shows HC-05 Bluetooth module. Comparing it to the HC-06 module, which can only be set as a Slave, the HC-05 can be set as Master as well which enables making a communication between two separate Arduino Boards. There are several different versions of this this module but I recommend the one that comes on a breakout board because in that way it's much easier to be connected. The HC-05 module is a Bluetooth SPP (Serial Port Protocol) module, which means it communicates with the Arduino via the Serial Communication.

3.17 SUMMARIZE

Overall, methodology part implements the hardware, software and data analysis (Research). For hardware part, all the components will complete this scope such as Smoke Sensor, Heat Sensor, Buzzer and GSM. A part from that, Arduino NANO is used to coding the microcontroller and to control the possible output. The outputs of this device are they well get alert with alarm and at the same time will have GSM to send massage to the guardian. If the patient are faint, in the time of rescue, they will have bright LED to give notice to another person to help them.

CHAPTER 4

RESULT AND DISCUSSION

4.1 INTRODUCTION

In this chapter it will discuss about the results and findings of the analysis conducted on this project. After the development of smoke alert device for the blind were complete, this device was tested. This device were tested for the effectiveness, comfortableness, attraction of the device and also the design. Each of the categories consist of 5 type of different room size for the smoke sensor. Also, this device was tested by 4 different distance for flame sensor. The testing was conducted as see how many second this device will give alert. The test can be used as prove, that this device are working very fast in giving alert.

4.2 ANALYSIS OF QUESTIONNAIRE

Through this part, the questionnaire is conducted among 30 blind people and their guardian. A part from that, all the data in the survey form is tabulated in graph bar below. As overall, through the data collected from this questionnaire showed positive feedback in Smoke Alert Device for the Blind.

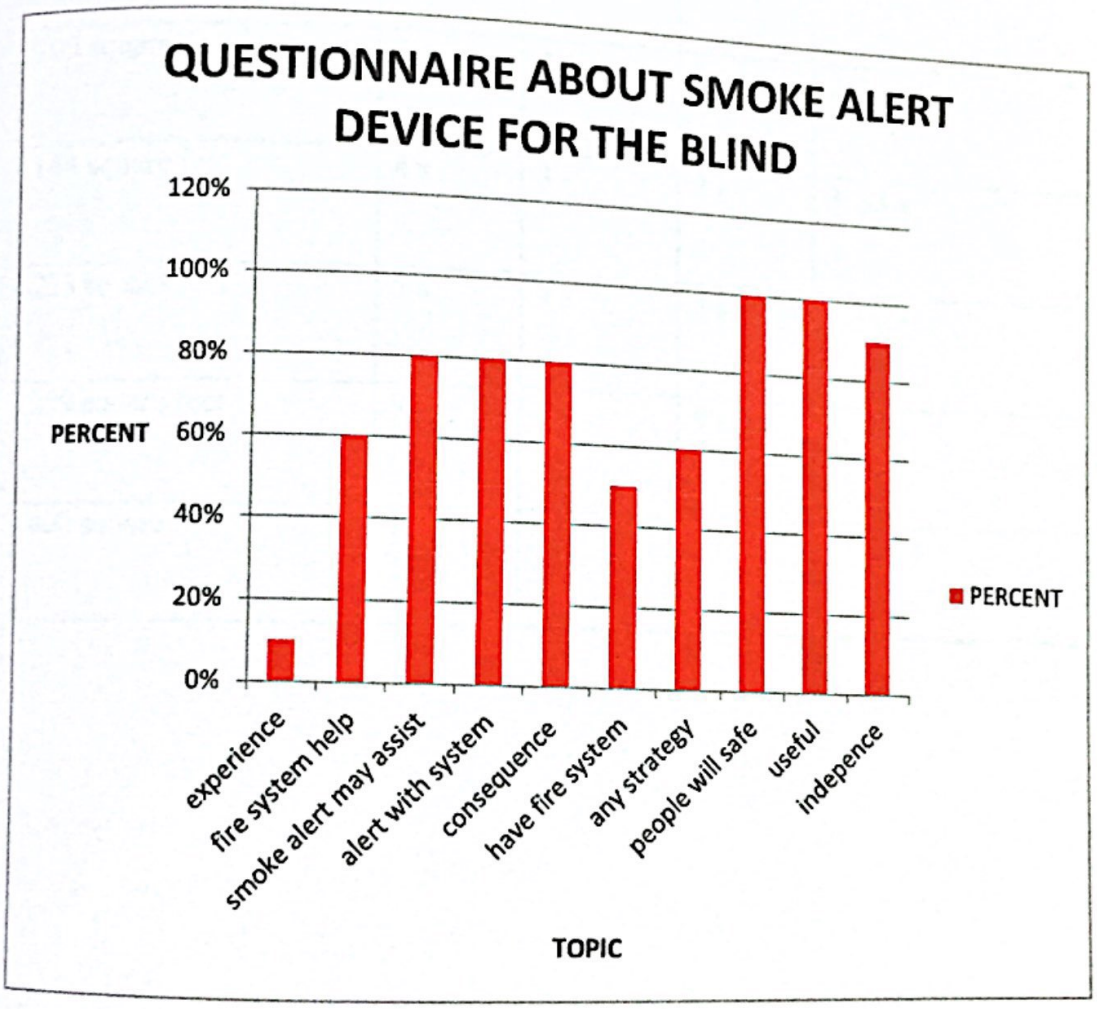


Figure 4.1: Questionnaire Smoke Alert Device for the Blind

4.3 PERFORMANCE ANALYSIS OF SMOKE SENSOR

For the performance of smoke sensor, this smoke sensor can detect the smoke concentration in the range of 300 – 10000 parts per mole (ppm). With the testing device, there are 5 different type of room filled with different concentration of the

smoke. The table below show the performance analysis of smoke sensor in the room with different size, and how many seconds that this device will give alert.

Table 4.1: Performance Analysis of Smoke Sensor

ROOM SIZE (square feet)	1st	2nd	3rd	"average" (s)
100 square feet	3 s	4 s	3 s	3. 33 s
144 square feet	4 s	3 s	3 s	3. 33 s
225 square feet	5 s	4 s	3 s	4. 00 s
289 square feet	9 s	8 s	9 s	8. 67 s
400 square feet	11 s	13 s	10 s	11. 33 s

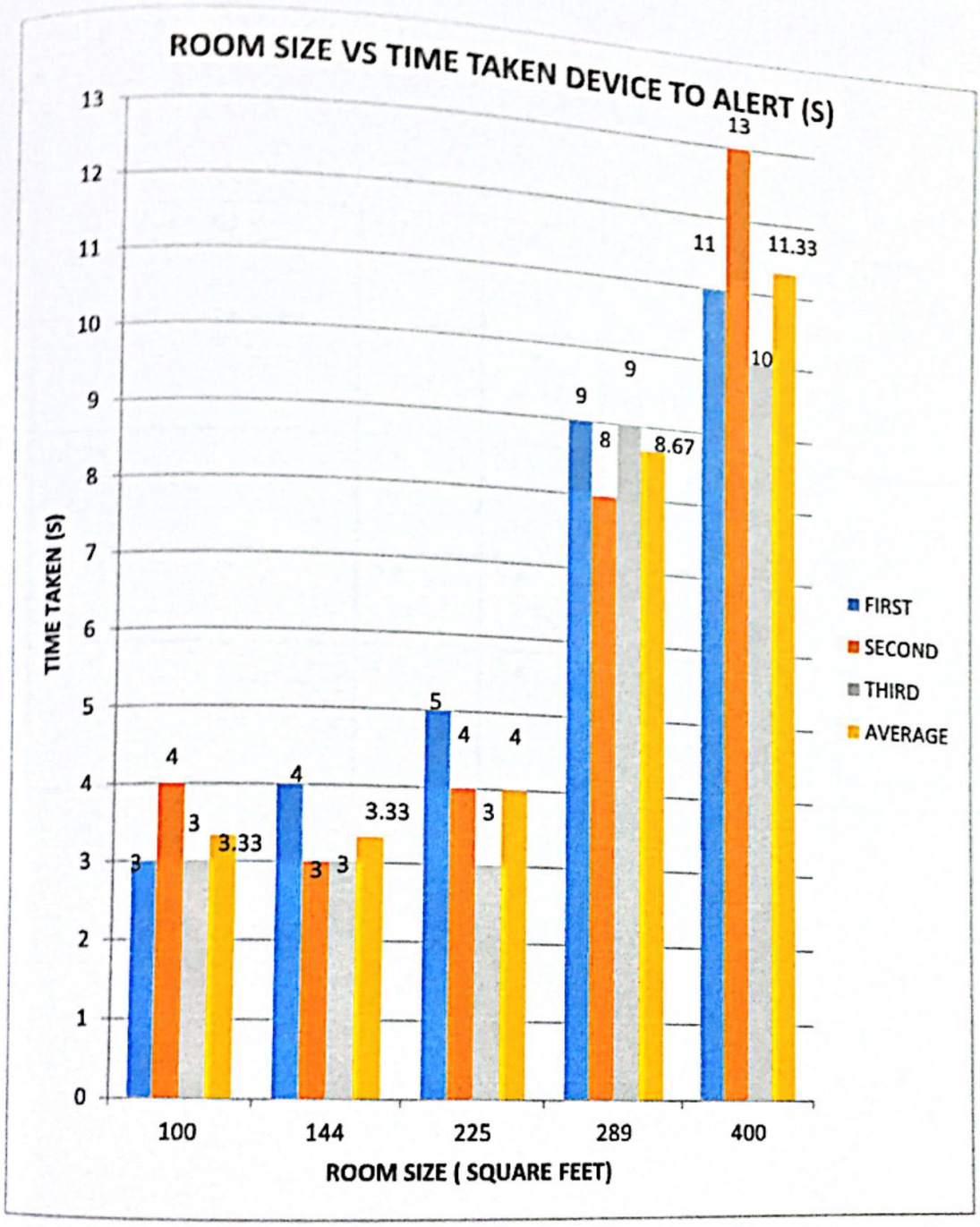


Figure 4.2: Performance Analysis of Smoke Sensor

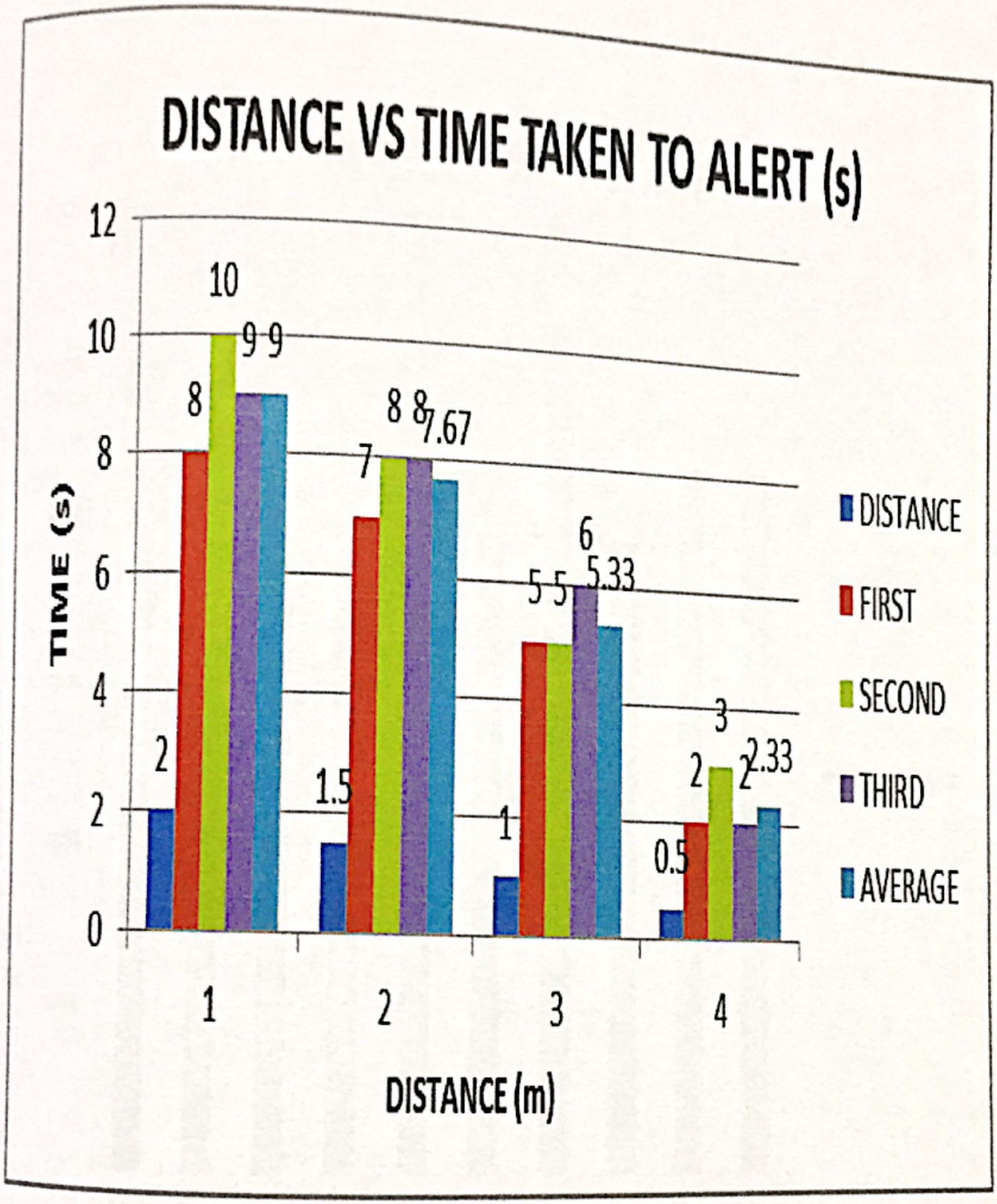
4.4 PERFORMANCE ANALYSIS OF FLAME SENSOR

For the performance of heat sensor, this heat sensor can detect the flame in the range of 1-2 meters. With the testing device, there are 4 different distance from the device to the flame source. The table below show the performance analysis of flame

sensor in the room with different distance, and how many seconds that this device will give alert.

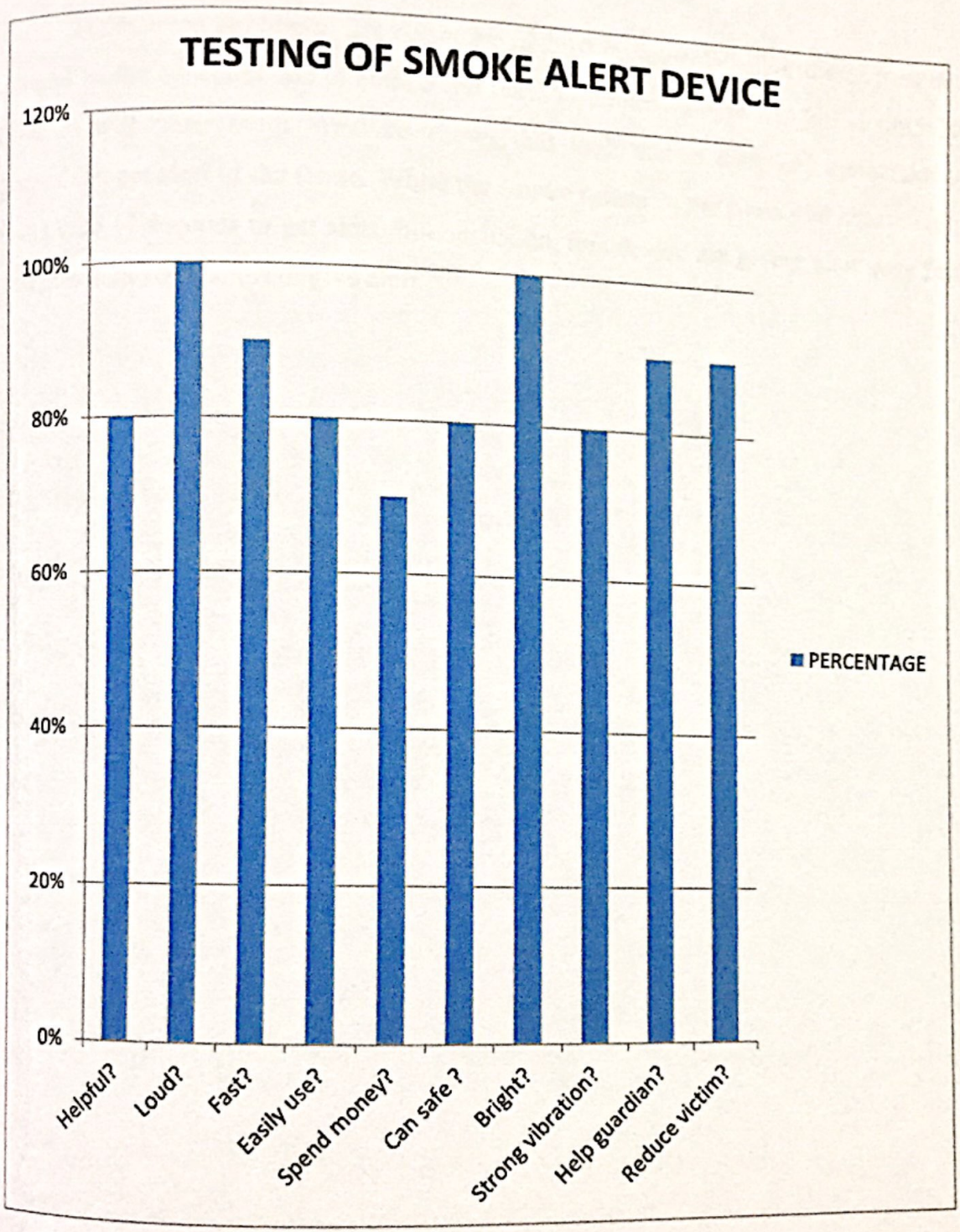
Table 4.2: Performance Analysis of Flame Sensor

DISTANCE (m)	1st	2nd	3rd	"average" (s)
2.0 M	8 s	10 s	9 s	9.00 s
1.5 M	7 s	8s	8 s	7.67 s
1.0 M	5 s	5 s	6 s	5.33 s
0.5 M	2 s	3 s	2 s	2.33 s



Graph 4.3: Performance analysis of smoke sensor

4.5 POST SURVEY



Graph 4.4 : Testing Smoke Alert Device

4.6 CONCLUSION

Human can only be in fire or smoke in 2-10 minutes. Whether die or pass out depend on the concentration of smoke and fire.15 minutes straight will kill victim5-10 minutes will cause brain .Analysis shows that in 2 meters distance, users take 9 seconds to get alert of the flame. While the smoke sensor in the room 400 square feet, users take 11 seconds to get alert. In conclusion, this device are giving alert very fast and less then 10 seconds to give alert.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 CONCLUSION

This is the last chapter in this writing. This section can lead to a conclusion, summarization and recommendation about The Development of Smoke Alert Device for the Blind. Based on the previous chapter, there is a lot of knowledge and the information and there is also data collection in order to prove the accuracy, correlation and learning process in designing The Smoke Alert Device for the Blind.

The development of this product is to see whether it can help blind people to use this while there are fire happened when they were alone home and with this device, they can be independence. This device also portable and easy to carry everywhere. With this product, if the patient are in the fire, with the flame sensor, they can get alert if they were become closer to the fire to make sure they were far away from fire and danger. Smoke sensor are use is very suitable to detect smoke in combustible. The flame sensor also have their range and can be work with the accurancy.

Human can only be in fire or smoke in 2-10 minutes. Whether die or pass out depend on the concentration of smoke and fire.15 minutes straight will kill victim5-10 minutes will cause brain .Analysis shows that in 2 meters distance, users take 9 seconds to get alert of the flame. While the smoke sensor in the room 400 square feet, users take 11 seconds to get alert. So, we can say this device are very fast in giving alert to the users for the further action.

5.2 RECOMMENDATION

After doing survey, there are several recommendation has been listed. Which are:

1. To innovate and change the bag to the belt and that will easy to carry.
2. The setting number to the guardian are not in the programming but can set by using keypad.
3. Make the device become smaller and compact.

REFERENCES

[1] Rohde D., (2016). The association between smoke alarm presence and injury and death rates : Asystematic review and meta-analysis. School of Geography, Planning and Environmental Management, University of Queensland, Australia.

[2] R. Velázquez, Wearable Assistive Devices for the Blind. Chapter 17 in A. Lay-Ekuakille & S.C. Mukhopadhyay (Eds.), Wearable and Autonomous Biomedical Devices and Systems for Smart Environment: Issues and Characterization, LNEE 75, Springer, pp 331-349, 2010.

[3] Kandel E and Jessell T (1991) Touch. In: Kandel E, Schwartz J, and Jessell T (Eds.), Principles of neural science, 3rd ed., Oxford University Press, pp 349-414.

[4] Liu F., (9 January2 016). Application of Aspirating Smoke Detectors at the Fire Earliest Stage. As chool of Engineering, Sun Yat-sen University, Guangzhou 510006, China.

[5] Chaudhry M., Kamran M., Afzal S., (2008). Speaking monuments — design and implementation of an RFID based blind friendly environment.

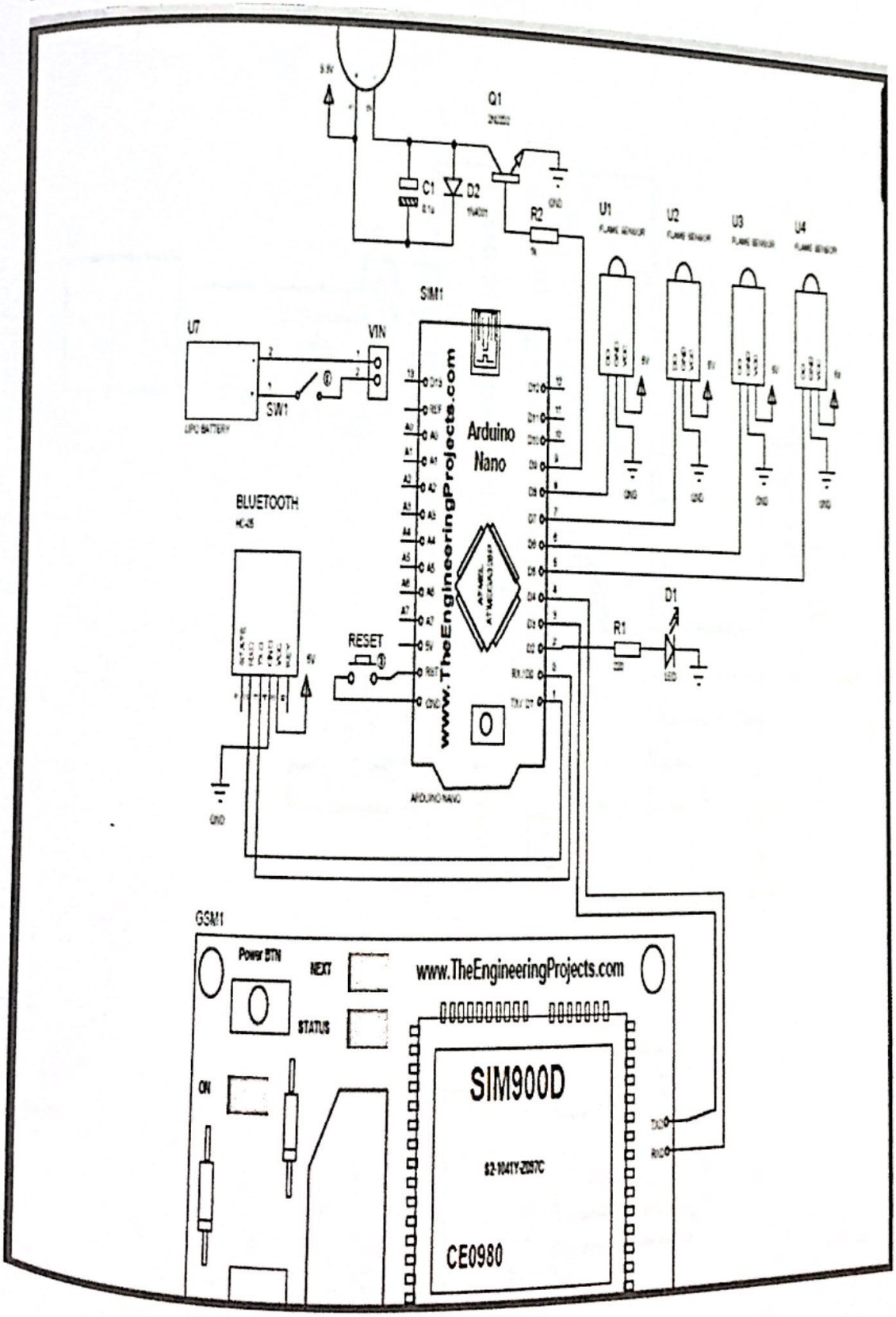
[6] Abdel I. N. A., (2013) Automated Mobility and Orientation System for Blind or Partially sighted People. Department of Electrical Engineering Tafila Technical University, Tafila 66110, Jordan.

[7] Ganz A, (August 30 - September 3, 2011). Indoor navigator for the blind. (RFID). 33rd Annual International Conference of the IEEE EMBS Boston, Massachusetts USA.

[8] Oke A.O, Falohun A.S and Adetunji A.B, (July 1 - 3, 2015), Development of A GSM - Based Fire Detector System. Department of Computer Science and Engineering, Ladoke Akintola University of Technology, Ogbomoso, Nigeria.

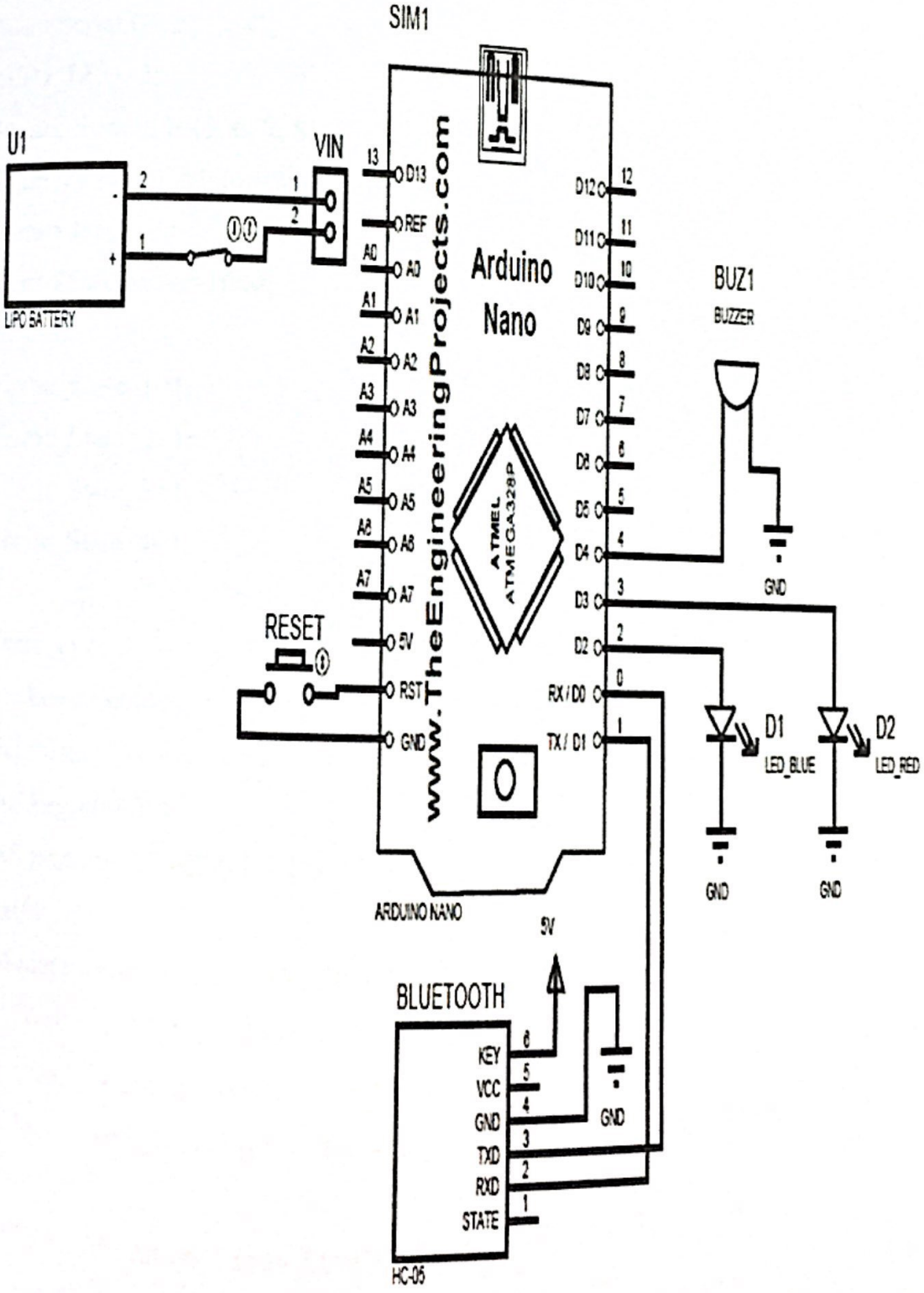
APPENDIX A

SCHEMATIC DIAGRAM MASTER



APPENDIX B

SCHEMATIC DIAGRAM SLAVE



APPENDIX C

MASTER CODING

```
#include <SoftwareSerial.h>
SoftwareSerial GPRS(3, 4);
int GSM_LED=2;
int Flame_Sensor[]={5, 6, 7, 8};
const int Vibration_Motor=9;
int count=4;
int start=2500, pause=1000;
int state=0;
int Flame_State_1=1;
int Flame_State_2=1;
int Flame_State_3=1;
int Flame_State_4=1;

void setup() {
 Serial.begin(38400);
 Serial.flush();
 GPRS.begin(9600);
 GPRS.println("AT+CMGF=1");
 delay(500);
 pinMode(Vibration_Motor,OUTPUT);
 digitalWrite(GSM_LED, LOW);
 for (int num=0; num<count;num++) {
  pinMode(Flame_Sensor[num],INPUT);
 }
 digitalWrite(Vibration_Motor,LOW);
 gsmPowerUp();
}
```

```
void loop() {


  Flame_State_1 = digitalRead(Flame_Sensor[0]);
  Flame_State_2 = digitalRead(Flame_Sensor[1]);
  Flame_State_3 = digitalRead(Flame_Sensor[2]);
  Flame_State_4 = digitalRead(Flame_Sensor[3]);

// Serial.print("Flame Sensor 1 : ");
// Serial.println(Flame_State_1);
// Serial.print("Flame Sensor 2 : ");
// Serial.println(Flame_State_2);
// Serial.print("Flame Sensor 3 : ");
// Serial.println(Flame_State_3);
// Serial.print("Flame Sensor 4 : ");
// Serial.println(Flame_State_4);
// Serial.println();
// delay(1);

  if(Serial.available()>0){
  state = Serial.read();}

  while(GPRS.available()) {
  Serial.write(GPRS.read());}

  if(Flame_Sensor_1()==1   ||   Flame_Sensor_2()==1   ||   Flame_Sensor_3()==1   ||
Flame_Sensor_4()==1 || state=='B'){
  Serial.write('A');
  Serial.println();
  sendSMS();
  for(int i=0;i<10;i++){
  digitalWrite(Vibration_Motor,HIGH);
  delay(start);
```

```
  digitalWrite(Vibration_Motor,LOW);
  delay(pause);}
  state=0;
  Serial.flush();
   }

 else{
  Flame_State_1=1;
  Flame_State_2=1;
  Flame_State_3=1;
  Flame_State_4=1;
  digitalWrite(Vibration_Motor,LOW);
  state=0;
  }
}

int Flame_Sensor_1() {
 if(Flame_State_1==0){
  return 1;}
 else {
  return 0;}
}

int Flame_Sensor_2() {
 if(Flame_State_2==0){
  return 1;}
 else {
  return 0;}
}

int Flame_Sensor_3() {
 if(Flame_State_3==0){
  return 1;}
```

```
 else {
  return 0;}
}

int Flame_Sensor_4() {
 if(Flame_State_4==0){
  return 1;}
 else {
  return 0;}
}

void sendSMS() {
 GPRS.println("AT+CMGS=\"+60108026706\"");
 delay(500);
 GPRS.print("Emergency! Ali is in a burning building!");
 GPRS.write(0x1a); // ctrl+Z character
 delay(500);
}

void gsmPowerUp() {
for (int i = 0; i < 30; i ++){
 digitalWrite(GSM_LED, HIGH);
 delay(100);
 digitalWrite(GSM_LED, LOW);
 delay(100);
}
 digitalWrite(GSM_LED, HIGH);
 delay(1000);
 digitalWrite(GSM_LED, LOW);
 delay(1000);
 digitalWrite(GSM_LED, HIGH);
}
```

SLAVE CODING

```
#define LED_Blue 2
#define LED_Red 3
#define Buzzer 4
int state=0, Gas_Value=0, Gas_Pin=0;
int Gas_SetPoint=350; //edit value kat sini
int i = 0;
int val = LOW;
int pre_val = LOW;

void setup() {
Serial.begin(38400);
Serial.flush();
pinMode(LED_Blue,OUTPUT);
pinMode(LED_Red,OUTPUT);
pinMode(Buzzer,OUTPUT);
digitalWrite(LED_Blue,LOW);
digitalWrite(LED_Red,LOW);
}

void loop() {

if(Serial.available()>0){
state = Serial.read();}

if(Gas_Sensor()==1 || state=='A'){
Serial.write('B');
Serial.println();
  for(int repeat=0;repeat<1;repeat++){
```

```
    for(i = 0; i < 255; i = i + 2)
    {
      analogWrite(LED_Blue, i);
      analogWrite(LED_Red, i);
      analogWrite(Buzzer, i);
      delay(10);
    }
    for(i = 255; i > 1; i = i - 2)
    {
      analogWrite(LED_Blue, i);
      analogWrite(LED_Red, i);
      analogWrite(Buzzer, i);
      delay(5);
    }
    for(i = 1; i <= 10; i++)
    {
      analogWrite(LED_Blue, 255);
      analogWrite(LED_Red, 255);
      analogWrite(Buzzer, 200);
      delay(100);
      analogWrite(LED_Blue, 0);
      analogWrite(LED_Red, 0);
      analogWrite(Buzzer, 25);
      delay(100);
    }
    state=0;
    Serial.flush();
  }}

else
  {
    analogWrite(LED_Blue, 0);
    analogWrite(LED_Red, 0);
```

```
        analogWrite(Buzzer, 0);
        state=0;
        Serial.flush();
    }
    pre_val = val;
  }

  int Gas_Sensor() {
  Gas_Value = analogRead(Gas_Pin);
  Serial.println(Gas_Value);
  delay(1);

  if(Gas_Value>Gas_SetPoint){
   return 1;}
  else {
   return 0;}
}
```

APPENDIX E

PRE SURVEY QUESTIONNAIRE

A SURVEY OF FINAL YEAR PROJECT "DEVELOPMENT OF SMOKE ALERT DEVICE FOR THE BLIND"

Age:

Gender: ☐ male ☐ female

Race:

☐ PUBLIC ☐ STUDENT ☐ HOSPITAL STAFFS

1. Do you have experience trap in fire?

   ☐ yes ☐ no

2. Does the fire system in the building help you in the fire ?

   ☐ yes ☐ no

3. Do you believe that the smoke alert device may assist you when you trap in fire?

   ☐ yes ☐ no

4. Do you alert with the fire system?

   ☐ yes ☐ no

5. Do you know the consequence when you are breath with hot gases?

   ☐ yes ☐ no

6. Do you have fire system in your house?

   ☐ Yes ☐ no

7. Do you have any strategy to get out when you are trap in fire?

   ☐ yes ☐ no

8. Do you think smoke alert device will help blind people to safe in fire?

   ☐ yes ☐ no

9. Do you think smoke alert device is useful to blind?

   ☐ yes ☐ no

10. Do you think this product can enhance blind people to be independence?

    ☐ yes ☐ no

If there is any comment, do state it below :

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APPENDIX F

POST SURVEY QUESTIONNAIRE

A TEST SURVEY OF FINAL YEAR PROJECT "DEVELOPMENT OF SMOKE ALERT DEVICE FOR THE BLIND"

1. This device really helpful to blind people?

   ☐ YES ☐ NO

2. Did this device give alert loud?

   ☐ YES ☐ NO

3. Do you think this alert are very fast?

   ☐ YES ☐ NO

4. Is it this device are portable and easily carry anywhere?

   ☐ YES ☐ NO

5. Would you spend your money to buy this device?

   ☐ YES ☐ NO

6. Do you think this device can safe blind people in fire?

   ☐ YES ☐ NO

7. Did the LED are very bright in the smoke for rescuer?

   ☐ YES ☐ NO

8. Do you think the vibrator are strong enough to wake up from sleep?

   ☐ YES ☐ NO

9. Did the massage to the guardian are very helpful?

   ☐ YES ☐ NO

10. Do you agree if I said this product can reduce blind people as victim in fire?

    ☐ YES ☐ NO