Faculty of Electrical and Electronic Engineering Technology

SMART CHILD TRACKER USING IOT

MUHAMMAD SYAFIQ BIN JAMALUDIN

Bachelor of Electronics Engineering Technology with Honors

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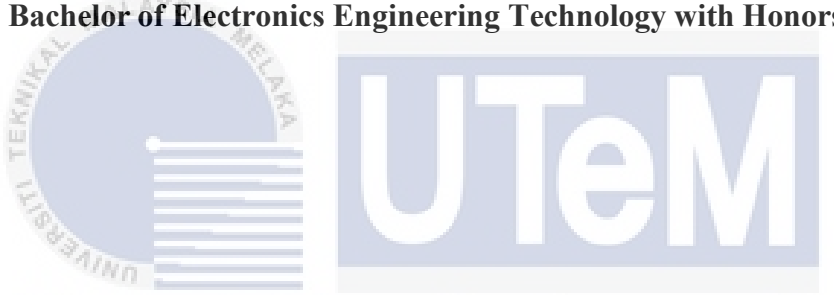
A project report submitted
in partial fulfillment of the requirements for the degree of
Bachelor of Electronics Engineering Technology with Honors



Faculty of Electrical and Electronic Engineering Technology

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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DECLARATION

I declare that this project report entitled “SMART CHILD TRACKER USING IOT“ is the result of my own research except as cited in the references. The project report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature : 

Student Name : MUHAMMAD SYAFIQ BIN JAMALUDIN

Date : 7 Februari 2022

APPROVAL

I hereby declare that I have checked this project report and in my opinion, this project report is adequate in terms of scope and quality for the award of the degree of Bachelor of Electronics Engineering Technology with Honours.

Signature : 

Supervisor Name : IZADORA BINTI MUSTAFFA

Date : 7 FEBRUARI 2022

Signature :

Co-Supervisor :

Name (if any)

Date :

DEDICATION

To my beloved mother, Zalina Binti Samsudin, my dearest father, Jamaludin Binti Ahmad Razali, my supportive supervisor Madam Izadora Binti Mustaffa, my brother Muhammad Naqib Bin Jamaludin and also my friends Aiman Hakeem Bin Shoksi and Saiful Sophian Bin Latif.

ABSTRACT

In 2021 a total 4,471 cases of missing children were reported. In an effort to counter this problem the Malaysian government created a Missing Children Portal. A preventive method would complement the government's effort. This thesis described a device that actively tracks the whereabouts of the wearer, i.e. child. The device consists of microcontroller, GPS and GSM Module, Heartbeat Sensor and DHT11 sensor. Children who wear an activity tracker bracelet with IoT and GSM technology are monitored 24 hours a day. As a result, the prototype proposes a way to address the IoT-related dispute among children. This idea proposes a wearable "Activity Tracker Wristband" that is preloaded with all the necessary data, including human responses such as rage, anxiety, uneasiness, and terror. When the victim is confronted with these scenarios, the various sensors generate an emergency signal, which is sent to the smartphone. The technology successfully monitors the presence of the children in the predicted zone. When a person enters the monitoring zone, GSM sends a help request to the parents and individuals in the immediate vicinity using the IOT Monitoring system. This technology would be extremely sensitive and simple to operate. Its rapid response time would provide better assistance to each individual user.

ABSTRAK

Pada 2021 sejumlah 4,471 kes kehilangan kanak-kanak telah dilaporkan. Dalam usaha menangani masalah ini, kerajaan Malaysia mewujudkan Portal Kanak-Kanak Hilang. Kaedah pencegahan akan melengkapkan usaha kerajaan. Tesis ini menerangkan peranti yang secara aktif menjejaki keberadaan si pemakai, iaitu kanak-kanak. Peranti ini terdiri daripada mikropengawal, GPS dan Modul GSM, sensor degupan jantung dan sensor DHT11. Kanak-kanak yang memakai gelang penjejak aktiviti dengan teknologi IoT dan GSM dipantau 24 jam sehari. Akibatnya, prototaip mencadangkan cara untuk menangani pertikaian berkaitan IoT di kalangan kanak-kanak. Idea ini mencadangkan "Gelang Penjejak Aktiviti" boleh pakai yang diperbuat dengan semua data yang diperlukan, termasuk tindak balas manusia seperti kemarahan, kebimbangan, kegelisahan dan ketakutan. Apabila mangsa berhadapan dengan senario ini, pelbagai sensor menjana isyarat kecemasan, yang dihantar ke telefon pintar. Teknologi ini berjaya memantau kehadiran kanak-kanak di zon yang diramalkan. Apabila seseorang memasuki zon pemantauan, GSM menghantar permintaan bantuan kepada ibu bapa dan individu di kawasan berhampiran menggunakan sistem Pemantauan IOT. Teknologi ini akan menjadi sangat sensitif dan mudah untuk dikendalikan. Masa tindak balas yang pantas akan memberikan bantuan yang lebih baik kepada setiap pengguna individu.

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My gratitude is extended to my parents, family members, and friends for their love and prayers during my studies.

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V	-	Voltage
RM	-	Ringgit Malaysia
A	-	Current
BPM	-	Beat Per Minute
C	-	Celsius
F	-	Fahrenheit
%	-	Percentage
H	-	Humidity

LIST OF ABBREVIATIONS

V	-	Voltage
IoT	-	Internet of Things
GPS	-	Global Positioning System
SMS	-	Short Message System
C	-	Celsius
F	-	Fahrenheit
BPM	-	Beat Per Minute

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

The project history, identity, objective, scopes, and relevance are all covered in this chapter. This section will explain why we need this project and the problem we're seeking to solve. This project will explain how the idea came to be, what the project's goal is, what obstacles might arise during the project, and what benefits it could provide to society and community.

1.1 Background

The Internet of Things (IOT) is a system that includes a variety of physical devices such as automobiles, electrical parts, programming, sensors, actuators, and more. Its primary goal is to allow these devices to efficiently and intelligently connect these objects in order to acquire data and trade it for a specific purpose.

The Internet of Things (IOT) allows devices to be detected and connected remotely to monitor a network that already exists. Because of the convergence of many technologies, such as ubiquitous wireless communication, real-time analytics, sensors, embedded systems, and so on, the important vision of IOT has evolved. The Internet of Things (IOT) is a technology that allows products to be detected and operated remotely over existing system foundations that include a variety of devices.

These gadgets leverage a variety of existing technologies to acquire important data, which they then autonomously transfer to other devices [5]. In today's situation, over

80% of the whole population is accustomed to the new advancements, especially the youth, who use mobile phones, smart gadgets, laptops, and other brilliant technologies.

This project's main concept is based on advanced technology that provides a "Activity Tracker Wristband" that protects youngsters. Assaults on children, women, and the elderly have increased dramatically in recent years, and the number of unfortunate victims who are unable to contact the police or relatives due to a lack of a cell phone has significantly increased [4].

This proposed solution will outperform other existing techniques or gadgets on the market today in terms of assisting victims. Children wearing Activity Tracker Wristbands with access to IoT and GSM technology are monitored 24 hours a day, 7 days a week, in real time. The system includes sensors that are connected to the processor and continuously monitor important data such as heart rate, temperature, and so on. When potentially dangerous situations emerge, parents may be alerted.

1.2 Problem Statement

This model is proposing a framework which is helpful for ladies, kids, pets and furthermore for elderly. Yet in this undertaking we are even more concentrating on kids' wellbeing which is to follow the kids' actions and their condition while they are not in the perspective of their parents. Child tracking system is a device that can track and monitor their child's location and condition such as body temperature of the children and the heart beat rate of the children.

Child supervision is usually a challenge for parents who have to work all hours of the day and night. It will be difficult for the parent to know where their child is going or

Leaving during their working hours. When a parent is in the workplace, however, the child tracking system allows them to track and monitor their child's position with only one click on the program. It is critical for a parent to obtain information on their children when they are missing in order to prevent any bad events from occurring and to protect them 24 hours a day.

Following the death of Nurlin Jazlin in 2007, the topic of missing children has sparked widespread concern around the world. However, missing children instances are still common in Malaysia, particularly in Johor, Selangor, and Kedah, which have the greatest number of missing children cases [2].

In 2014, a total of 15 children were reported missing, with 1782 cases reported as of 2015 and 140 cases reported in early January 2016 [3]. Those data demonstrate the urgency of missing person's instances in Malaysia, necessitating parental concern. It's difficult to keep an eye on their child without using technology, especially when they're outside.

Even if a parent tries, he or she will not be able to avoid the mistakes that we will make in the future. We may deduce from our observations that today's parents are preoccupied with their cell phones, which may cause them to disregard their children for a few seconds or even a few minutes, putting their children at risk of going missing in just a few seconds out of sight.

There is a need for a solution that allows parents to track their child's location when they are not with them and receive alerts when their youngster arrives or departs from a specific place. Aside from that, Malaysian parents have a restricted number of system options to choose from.

Some devices are only functional in a specific country, and the required highlight may not fulfil Malaysia's parent's requirements. Even if they are available, most of the equipment must be imported, and the prices are in US dollars or Euros, which are rather expensive in Malaysian ringgit. However, while guardians are preoccupied with their jobs, they do not have enough time to monitor their children's well-being, thus this device comes in handy. The framework features a sensor interface with the processor that continues to detect important flags like heartbeat rate and temperature.

Furthermore, if a person crosses a zone (for example, a school zone) due to harassment, the system instantly transmits information to the parents and the local police station, notifying them of the problem's status. This method is known as geo fence, and it allows parents to choose the zone they desire for their children.

1.3 Project Objective

This project's major goal is to protect children when they are away from their parents or guardians, such as when they are out playing with their friends or returning from school. The following are the specific objectives:

a) To develop a prototype project that can help to assist users in detecting the children's status such as temperature, heartbeat and location in the form of latitude and longitude.

b) To develop applications for remote monitoring and alerting systems for parents regarding the condition of the children.

1.4 Scope of Project

The following is the project's scope:

a) Parents and guardians that want to secure their children's location information.

b) Parents and guardians who are concerned regarding the status of their children such as temperature, heartbeat and location.

c) Teachers and tutors who are responsible for the children during the school session.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter examines the completed project in order to gain a deeper understanding of the project's design, conceptualization, specification, and any other relevant information. There are some reviews of the Children Tracking System that has been offered to complete this project in the later stages of this chapter. Each piece of literature will be evaluated in terms of connectivity for conveying messages or data, data readability, and marketability for Malaysians. These are the three primary characteristics that will be discussed in the literature that follows. Additional features will be identified and examined later, based on past literature, research, and project findings.

2.2 Review of Current Situation

The tracking system has been used in the market for both corporate and personal purposes all around the world. According to consumer research [14], there is an increasing trend for retailers to use the following technology to track their customers' purchasing habits in order to improve their service and encourage them to shop more frequently and spend more [14].

Furthermore, Waze, the world's largest community-based traffic and navigation software, revealed in 2014 that it had achieved 50 million users worldwide, with Malaysia

and Indonesia ranking among the top ten countries. These figures suggest that the tracking system has piqued the interest of the global market [11]. A personal GPS tracker was recently introduced to the market to deal with missing instances involving children, pets, and even older folks.

A personal GPS tracker assisted a mother in locating her autistic kid who had gone away after only two minutes of distraction. Furthermore, the GPS device has assisted a mother in receiving notification of her daughter's sexual assault. Despite the fact that there have been numerous cases of the personal GPS tracker being beneficial to people, a recent survey of 1130 parents in the UK found that 43 percent of respondents had decided against using location tracking, while 39 percent of respondents had never heard of location tracking, 16 percent of respondents were in favor of location tracking, and only about 1.7 percent were opposed.

According to the survey's findings, many people in the United Kingdom are still unaware of location monitoring, if they are aware of it at all. Furthermore, as noted in one of the articles, there will be differences in the characteristics of the technology based on the social environment, even with the same pricing levels and technological capabilities for the same child location monitoring device.

There have been numerous investigations of the tracking system in various fields [8]. However, because the focus of this study is on the child tracking system, these will not be thoroughly examined and will only be mentioned when necessary. The focus of the review will be on the technology and features that will serve as a guide for developing the best method for tracking children in Malaysia.

This present system relies on a wireless mechanism for sending notifications and communicating via a secure network. The technique is centered on smartphones, which will be extremely helpful in assisting sufferers. It is not only alerting about attacks, but also in providing the exact location of the injured individual to the nearest police station so that required action can be taken.

Children will be given a smart phone with access to a GPS tracking device that will track their whereabouts and display the results on an LCD. The alert messages are also sent to the local police station and family members.

2.2.1 Design and Implementation of a Multipurpose Child Tracking System

This project proposes a tracking system capable of recognising numerous threats while multiple children are present, as well as attempting to overcome the limitations of current systems. There are two modules in the intended system: a parent module and a child module.

When a violation of child safety is detected, an explicit sensor in the tyke module will raise a flag. This flag will be delivered from these sensors to the controller, which will then send it to the parent module, which will make the appropriate decision and commence the infringement plan.

The parent can choose whether the system should work indoors or outdoors, and the parent module can then determine the distance between each child and their parent at any given time. The Global Positioning System (GPS) is utilized to calculate external distances while changing the RF amplitude. Signal is used to calculate indoor distance.

In addition, the parent can set a safety distance for each child, and if that distance is exceeded, the system will alert both the parent and the child. This design's proposed hardware and software are simple and inexpensive to build on a single chip microcontroller [1].

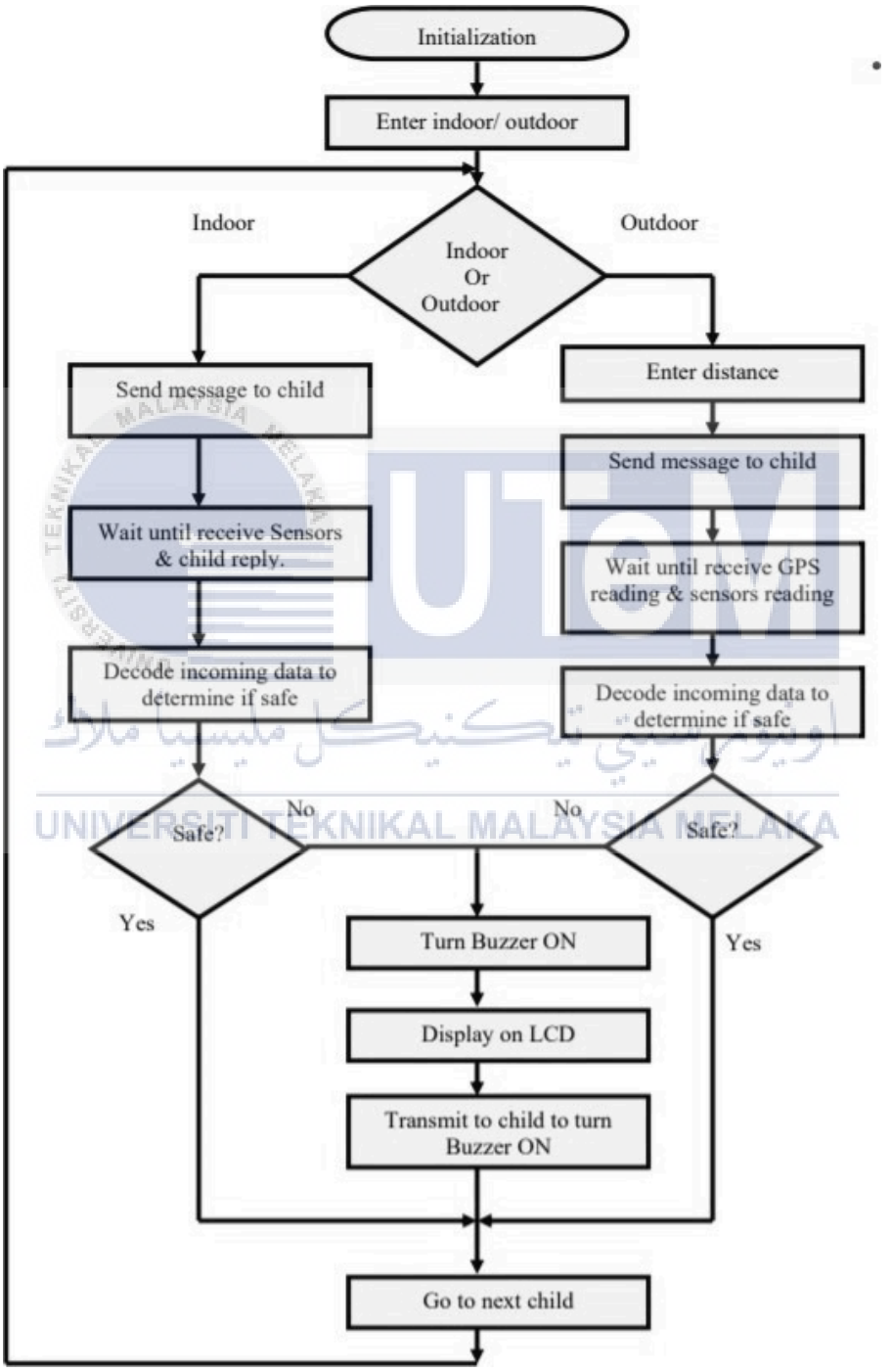

Figure 2.1: Diagram of a Parent Module Flow Chart

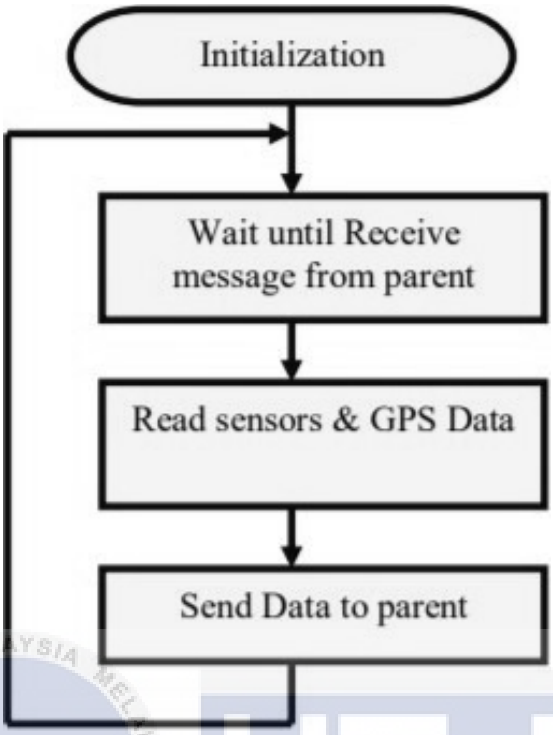

Figure 2.2: Diagram of a Child Module Flow Chart

2.2.2 Design and Implementation of a Children Tracking System on an Android Mobile Terminal Using the ARM7 Architecture

Recently, crime against children has increased at an alarming pace around the world, and it is past time to provide a safety support system for children attending school. The goal of this project is to develop a child tracking system for every child that attends school. However, existing systems are insufficient to prevent crime against children because they provide information about a group of children rather than a single child, leaving parents with a low level of assurance about their child's safety. They also do not focus on sensing a child's cry and informing its parents.

A kid module and two receiver modules are included in the proposed system for receiving information about the missing child on a regular basis. The child module

contains an ARM7 microcontroller (lpc 2378), a global positioning system (GPS), a global system for mobile communication (GSM), and a voice playback circuit, while the receiver Module contains an Android mobile device held by the parent and a monitoring database inthe school's control room [7].

2.2.3 GSM-based child tracking system

Many incidents of missing minors aged 14 to 17 years have recently been reported, with a higher likelihood of kidnappers. Our goal is to concentrate on kidnapping cases involving children. A geo fence campus, a kid module, and a parent module are all part of this project. The purpose of the geo fence campus is to locate the child and follow his or her travels. When the child leaves the campus, the child module sends a message to the parent module, alerting the receiver.

A sensor has also been included to detect the child's emotions. And, in particular, when the kid cries [10]. With a Global system for mobile communication and a Global positioning system module, a microcontroller ATMEGA 162 is used. This aids in the hacking and tracking of children's movements. By employing both the GPS satellites system and the A-GPS through a cellular network to get the location, the combination of GPS and A-GPS would improve the accuracy of the position. To achieve adequate location accuracy, the system should include both technologies.

2.3 Review of a Similar Product

In much of the country, various types of child tracking systems have been implemented. The purpose of the study was to examine the various business models offered by various systems. The table depicts the many characteristics offered by the four Main GPS trackers, as well as the concept given for my project. Each of them has a distinct business plan.

Nonetheless, there are some commonalities in the characteristics offered by the four systems. First and foremost, both trackers may give real-time location information for the child. This functionality is necessary to ensure that a parent can see their child's whereabouts in real time whenever they need to. Second, some of the devices have the ability to build geo-fences.

The geo-fence is a set of barriers that a parent can build on the app in a specific area so that they can be notified when their child leaves or enters the boundary. Finally, some of the gadgets can track the tracker's history. Their history allows parents to know where their child has been, how many warnings have been activated, and so on. Finally, the majority of them have an emergency button.

The emergency button is a type of button that is installed on the tracker for the child to press in the event of an emergency. Depending on the tracker utilized, different actions will be triggered. In the sections below, we'll go through their distinctions in greater detail.

2.3.1 Angel Sense

The Angel Sense is a GPS tracker that works in conjunction with the voice-monitoring system. It's made for kids who have special needs [15]. First and foremost, the tracker includes a clever search function that was used to locate the child. With the mode turned on, the parent may track their child's whereabouts on a map,complete with a child exit alarm and a live 10-second update interval.

Aside from that, the tracker has a listen-in feature. This function allows parents to validate their child's status by just listening in on their child's location and determining whether they are safe or not depending on the sound.

Furthermore, the tracker's first responder group alarm feature can assist parents in locating a misplaced child. A live view of the lost child's location and directions to the missing child can be provided to a predefined trusted group of people through SMS with only one click. Additionally, the tracker includes a dashboard for the child's school. It's an interface that school workers will use to make sure the youngster is safe throughout school hours.

Finally, Angel Sense's customer service department, which is staffed by parents of special needs children who work from home, is one of the tracker's most unique features. The parent who contacts customer support for assistance will be assisted by experienced users who are familiar with the circumstances of the parent who calls because the staff member is also a parent of a special needs child. The AngelSense tracker is only available in the United States and costs RM 600.00 plus RM 160.00 a month for service.

Finally, the AngelSense GPS tracker is ideal for parents who need to provide extra care for their children as well as for their customer service. The special features assist the

parent in keeping track of their child's location and situation, as well as sending the lost child's location to a trusted group of people with just one click, as well as contacting customer service, whose representatives are always aware of the situation and ready to assist the parent.

2.3.2 GPS Smart Soles

GPS smart soles are GPS trackers that are embedded in the shoes' insoles. The tracker is intended for adults with cognitive memory disabilities who require particular attention from a family member [13]. It is created with the basic notion of tracking without the need to carry an external gadget.

The tracker's ability to monitor discreetly distinguishes it from competitors. The discreet monitoring system works in the following ways: it provides tracking by simply hiding the tracker inside the insoles, eliminating the need to wear or carry any equipment to begin tracking.

Furthermore, the GPS smart soles provide customized alerts that send notifications to the owner whenever the tracker enters or exits geo zones. The owner can even share the tracker with multiple caregivers to allow it to be tracked by other trusted people.

The tracker costs RM 1200.00, with a monthly service fee of RM 60.00. It is supported in a few countries, with the exception of Malaysia. In short, the GPS smart soles are ideal for parents who only require basic capability to keep track of their eldest child and who like itsinsole-integrated design.

2.3.3 Trax Play

TraxPlay is a GPS tracker that may be used for both dogs and children. The tracker uses GPS and GLONASS to improve the precision of location retrieval, as well as a GSM/GPRS quad-band to relay the location to the smartphone.

The TraxPlay GPS tracker is distinguished by the fact that it includes an augmented reality feature. Augmented reality is a locating function that uses a built-in camera to display the image of the tracker as well as the distance in a directed direction. This function allows parents to view their child's whereabouts more clearly and precisely. Furthermore, the tracker's unique element is its scheduling capacity. The scheduling tool allows parents to configure a geo-fence with a precise schedule, allowing them to watch specific regions on specific days and hours. When the set schedule is reached, the geo-fence zone will automatically activate [12].

A proximity fence feature is also available on the tracker. The owner can use this function to create a fence that surrounds him or her. The fence will move with the owner whenever he or she moves. This feature is fantastic since it will alert the owner if their child or pet has wandered too far away from them or has crossed the border.

In addition, the parent can control the tracker's speed. This is the tracker'sone-of-a-kind capability: it will notify the parents if the tracker exceeds the set speed restriction.

Finally, the tracker provides the functionality of multiple devices and sharing, which allows the parent to track numerous trackers and share a tracker to multiple accounts. Parents can track several children with only one app and share the tracker account with a trusted group of people to assist in keeping track of their children while the

parent is unavailable.

The gadget will cost $99, with service costs varying depending on the plans selected, which include either $4.99 per month for two years of service or $8.99 per month for one year of service. Malaysia is one of 33 nations where the tracker can be used.

To summarize, the TraxPlay GPS tracker is ideal for parents who need to keep track of both their children and their pets, as well as for the unique capabilities mentioned earlier. The tracker could now indicate the youngster or pet the direction more precisely and clearly thanks to augmented reality. The proximity fence and schedule geo-fence provide an effective way to monitor the child's whereabouts, and the numerous devices and sharing features are best suited for families who have many children to watch, and the tracker can even be shared with other persons to assist keep track of.

2.3.4 Children's Activity Tracker Wristband with IoT Monitoring (KIDS-PIE)

Unlike other trackers, my product, known as the children activity tracker or (KIDS-PIE) wristband using IOT, is a GPS and activity tracker that may also be regarded as a health tracker, and it is made in Malaysia to meet the demands of Malaysian parents. It will offer a lower pricing than competing products on the market.

The SOS button will be included with this product in case of an emergency. When the SOS button is touched, the MIT inventor 2 will alert and send a notification to the parents on their smartphone, informing them of their children's position.

In addition, this tracking system product gives information about the children's health. It enables parents to maintain tabs on their children's health. It will keep track of the

children's heart rates and body temperatures. Furthermore, the use of GPS technology allows parents to locate their children with the most accurate position information, both indoors and out, and it can guide parents to their children's whereabouts if there are any missing cases. It also provides a real-time location.

Furthermore, the bracelet is equipped with an alarm that will sound if the watch is misplaced or removed from the youngster.

To summarize, the children's activity tracker wristband is a locally manufactured wristband with an SOS button for emergencies, health tracking to monitor the child's health, an alarm to be triggered if it is misplaced or detached from the child, and, of course, GPS tracking and monitoring to track and monitor the location.

2.4 Summary

The most that can be said about this system is that it is largely done in the United States, based on all of the devices and study that has been done previously. The device's server and company are largely from the United States. As a result, the proposed system will bring the device to Malaysia and raise public awareness about the issue of child trafficking in Malaysia.

Child trafficking is a significant problem that needs to be taken seriously by society. We will be able to monitor the youngster's condition and position in real time thanks to the child tracker device. Furthermore, youngsters will be able to send an SOS message if or when they feel unsafe or threatened by the environment or someone. This would ensure that the youngsters are safe anytime their guardians or parents are not present in the area.

Product	Positioning Technique	Unique Capability	Price in RM	Support in Malaysia
Angel Sense	GPS	Smart search, listening capability and first responder group alarm.	800.00	No
GPS Smart Soles	GPS	Discrete monitoring and customized alert.	1,400.00	No
Trax Play	AGPs, GPS, GLONASS	Augmented reality, proximity fence and speed alert.	440.00	Yes
Children Activity Tracker Wristband	GPS	Child location, health tracking, SOS button and real time monitoring.	TBC	Yes

Table 2.1: A comparison of four different children's device trackers.

CHAPTER 3

METHODOLOGY

3.1 Introduction

The project approach, project planning, project schedule, and project software will all be covered in this chapter. This project moves from one section to the next. The specifics of the component used in the project will also be discussed. This chapter will go over the block diagram, the project's flow chart, the suggested hardware and software, the project's simulation, and the project's final design. This chapter will focus on the proposed design and system for constructing it. Also included is a proposed result that can be acquired from the system after it is completed.

3.2 Methodology

The system development life cycle technique was employed in this project (SDLC). To ensure that high-quality software is produced, every project must adhere to a framework known as the software development lifecycle (SDLC). This is because the SDLC defines the tasks to be completed at each stage of the software development process, ensuring that our work is planned, structured, and completed on time. Figure 3.1 depicts the stages of the SDLC.

Figure 3.1: Software Development Life Cycle (SDLC).

3.2.1 Phase 1: Planning

The firm plan to develop the system is determined during the planning phase. Because the project's tasks are pre-planned and scheduled, as well as planning for the project's implementation strategies, planning is critical to the project's success.

3.2.2 Phase 2: Analysis

The project's requirements, including software and hardware requirements, as well as development tools, are identified during the analysis phase.

3.2.3 Phase 3: Design

The conceptual design of the mechanism is considered during this phase of project development, as are the mechanism specifications and requirements. After the conceptual design validates the project's goal and scope, TinkerCAD is used to create the physical design this can be observed on the 3D design in the Appendix D. TinkerCAD's physical design makes it simple to handle product data, automate procedures, and create mechanisms in real time. Following the completion of the conceptual and physical design phases, the project will focus on circuit diagram modelling using the Proteus programme.

3.2.4 Phase 4: Implementation

The project will be developed in iterations, with each iteration involving the production of a new module with distinct functionality assigned to separate modules. During development, the most significant module that is critical to the system, as well as the module that has the highest demand from the parents, will be produced first, such as detecting the user's present location and creating geo-fence. After the module has been fully constructed, the final increment will be used to combine the modules to build a complete system.

3.2.5 Phase 5: Maintenance

Each iteration's testing phase includes unit testing and user interface testing, with unit testing being the testing of a single module's functionality and user interface testing involving the testing for the presence of a flaw in the system's user interface. The user acceptance test is also performed on the final iteration, when all of the modules have been unified and thoroughly evaluated, to guarantee that the system can satisfy the client and meet the specifications.

3.2.6 Parameters

Temperature, humidity, and heartbeat of the child will be the major parameters of this project, which will be measured in a specific portion of the body called the wrist, because the device will be worn as a bracelet to allow for easy movement and portability.

3.2.7 Hardware

An Android smartphone, to install the application, the system requires a smartphone that runs on the Android platform. To effectively perform the functional need indicated above, the application requires the smartphone to keep the location and network connection open at all times.

Figure 3.2: Android Smartphone.

Wristband with Velcro, the method requires a wristband for the youngsters to wear. This is for youngsters who are experiencing an emergency or are in a dangerous circumstance. The bracelet will contain a sos or emergency button that will send a signal to the parents' phone or any of the contacts listed in the contact address to alert them that their children are in danger. The bracelet can also detect the children's heartbeat range as well as their body temperature.

Figure 3.3: Velcro Wrist Strap.

3.3 Development Methodology

The purpose of this research is to make it easier to finalize the system design for both hardware and software development for the Children Activity Tracker Wristband using IOT. Hardware development is concerned with selecting the appropriate components and tools to suit the project's requirements. The design of the mechanism is built during the conceptual design phase of software development.

Furthermore, in order to achieve the project's goal, the software development focuses on coding using the Blynk application, C++ language, and simulation using Proteus, while for application development in Android devices, Blynk is used. The circuit design is created using Proteus to acquire a simulation prior to implementing the mechanism, while the Arduino IDE allows the appropriate coding for the project to be written.

3.3.1 Software and Hardware Requirement

Mobile Application – BLYNK is a mobile application for Android and iOS that may be used to monitor and display the settings that have been specified on the kid tracker device.

Arduino IDE – Arduino IDE is essential software for coding and uploading code to the ESP8266 microcontroller in order to analyse and read the sensor's input. The hardware will be able to achieve the project's goal by using the C++ language and particular syntax accessible from the Arduino IDE.

Proteus – Arduino IDE is essential software for coding and uploading code to the ESP8266 microcontroller in order to analyze and read the sensor's input. The hardware will be able to achieve the project's goal by using the C++ language and particular syntax accessible from the Arduino IDE.

GSM Module – SIM900A Modem is based on SIMCOM's Dual Band GSM/GPRS SIM900A modem. It operates over the 900/ 1800 MHz band. SIM900A can automatically search these two bands. AT Commands can also be used to change the frequency bands. The baud rate can be changed from 1200-115200 using the AT command. The inbuilt TCP/IP stack in the GSM/GPRS Modem allows you to connect to the internet through GPRS.

GPS Module – The NEO-6 module series is a collection of stand-alone GPS receivers that use the u-blox 6 positioning engine. These versatile and cost-effective receivers come in a small 16 x 12.2 x 2.4 mm box with a variety of connecting choices. NEO-6 modules are suited for battery-operated mobile devices with severe cost and space constraints due to their compact architecture and power and memory options. The u-blox 6 positioning engine, which has 50 channels, has a Time-To-First-Fix (TTFF) of less than 1 second.

Heartbeat Sensor – Pulse Sensor Amped is a heart-rate sensor that works with Arduino and Arduino compatible boards. Students, artists, athletes, makers, and game and smartphone developers who wish to incorporate live heart-rate data into their work can use it. Pulse Sensor enhances the hardware with amplification and noise suppression circuitry. Getting accurate pulse measurements is much faster and easier. A 3V or 5V Arduino can be used with Heartbeat Sensor.

Temperature Sensor – A temperature sensor is a gadget that is specifically designed to measure an object's temperature. The DHT11 series of precision integrated circuit temperature sensors are employed in our project, and its output voltage is linearly proportional to the Celsius (centigrade) temperature. A thermistor whose output value is proportional to the temperature (in °C) can be used to measure the temperature more precisely.

Wi-Fi Module – The ESP8266 Arduino compatible module is a low-cost Wi-Fi chip with full TCP/IP capability, and the best part is that it also has an MCU (Micro Controller Unit) that allows you to control I/O digital pins using a simple, pseudo-code-like programming language. Expressive Systems, a Shanghai-based Chinese firm, makes this device.

3.4 Block Diagram

The suggested system is based on modern technology that primarily protects youngsters by providing a "Activity Tracker Wristband" based on specific zones in which they must be present. In terms of assisting victims, this proposed methodology will be far more effective than current methods. Children who wear an Activity Tracker Wristband with IoT and GSM technologies are monitored 24 hours a day, 7 days a week. The system includes sensors that are connected to the processor and continuously monitor vital signs like heart rate, temperature, and so on. As a result, parents will be alerted anytime potentially dangerous situations emerge. In addition, if a person violates a zone (for example, a school zone) due to harassment, the system automatically sends information to

the parents, informing them of the situation. In addition, if a person crosses a zone (such as a school zone) due to harassment, the system instantly sends information to the parents, notifying them of the problem's status.

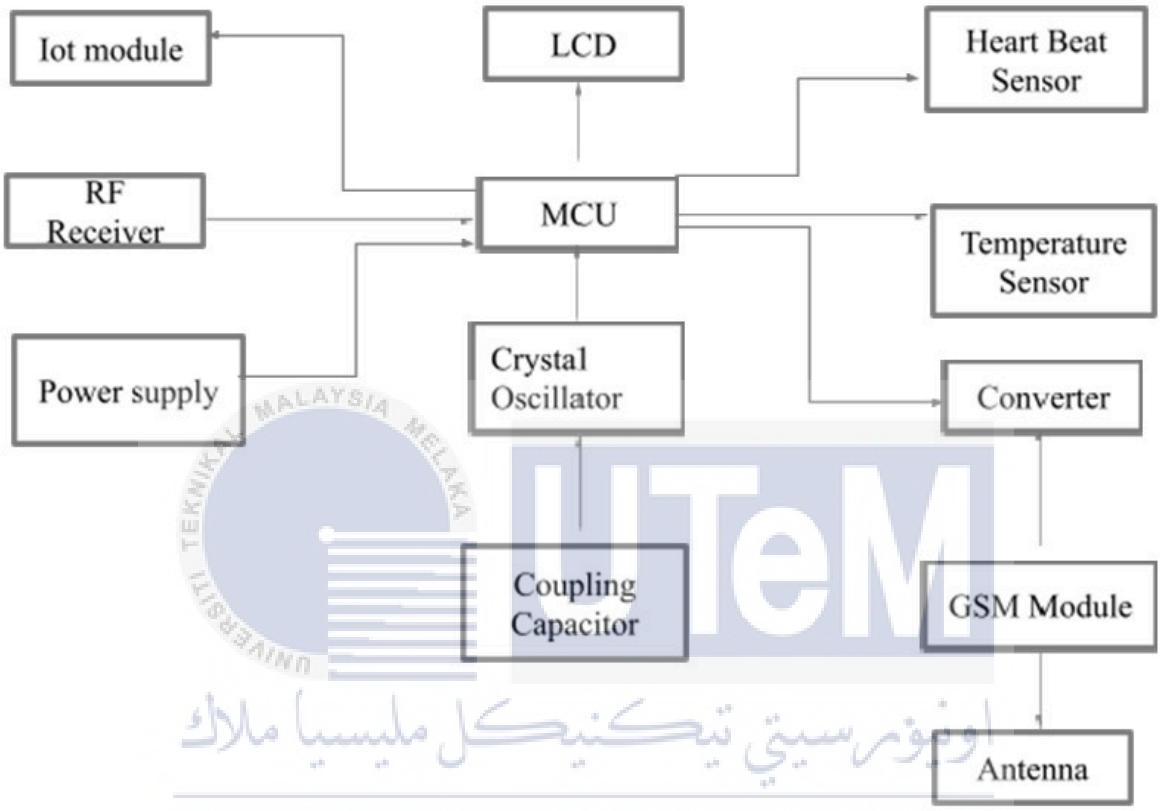

Figure 3.4: The Proposed Child Tracker Device is depicted as a block diagram.

The system accomplishes the following functions by employing an Arduino Uno with an Atmega328P processor as the system's control mechanism. It is divided into two sections:

- Wrist band section
- Remote monitoring section.

The wristband portion contains the tracker band that is worn on the child's hand for monitoring purposes. The GSM module and ESP8266 will be the medium transfer to send a text message and notification from the children's device to the parent's mobile device if any perilous situation occurs, while the heart rate sensor will sense the children's heart rate and will also send the detail to the parents via the Blynk application.

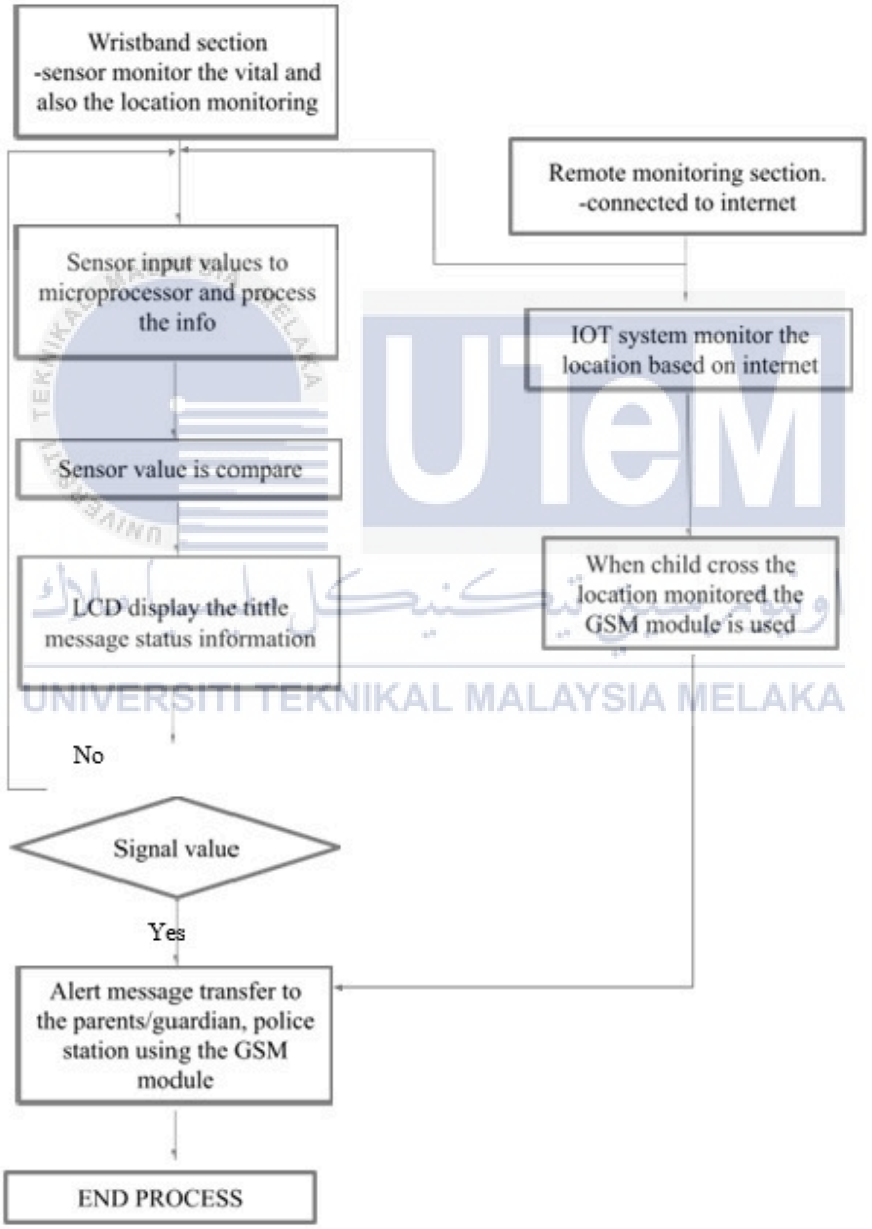

Figure 3.5: The Monitoring System Flow Chart

The main mechanism for temperature monitoring will be similar to that of heart rate monitoring; it will detect children's body temperature and send the data via the Blynk application. When the child touches the SOS Button in an emergency, an SMS will be sent to the parents' cell number informing them of the child's condition and position in terms of latitude and longitude.

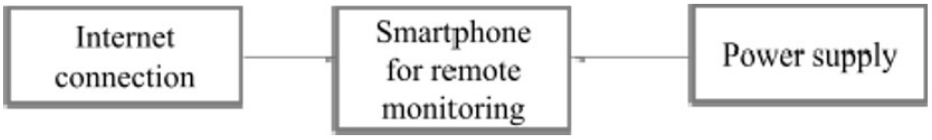

Figure 3.6: Remote Monitoring System

3.5 The proposed methodology has some limitations.

Limitations will be imposed on two components of the planned project: the GPS module and the wrist strap's design. Due to a limited budget, obtaining a precise location based on GPS Module and without any signal interference that is not limited by geography whether inside a tunnel or a locked room in an apartment required more than RM 1000.00.

For the design itself, the term machine refers to a machine that creates accurate designs and conducts research with a select set of people, in this case, primary school children or any youngsters under the age of ten. To develop and build a gadget that can be worn by the user in a group study that is both portable and comfortable.

3.6 Summary

The proposed methodology is presented in this chapter in order to build a more effective and feasible means of tracking youngsters without endangering their health.

CHAPTER 4

RESULTS AND DISCUSSIONS

4.1 Introduction

For this chapter, what is truly needed in this is to study the relationship between the parameters where the Smart Child Tracker measured. From this parameter we could further extrapolate the result and identify what it means when a child is in distress and duress. The parameters which will be specified are heartbeat, temperature and humidity. These 3 parameters will be further split into 4 which temperature value will be observed in Fahrenheit [F] and Celsius [C].

In order to study the relationship a table will be tabulated for the result recorded during the testing of the actual product. Below is the attached picture of the actual Smart Child Tracker prototype.

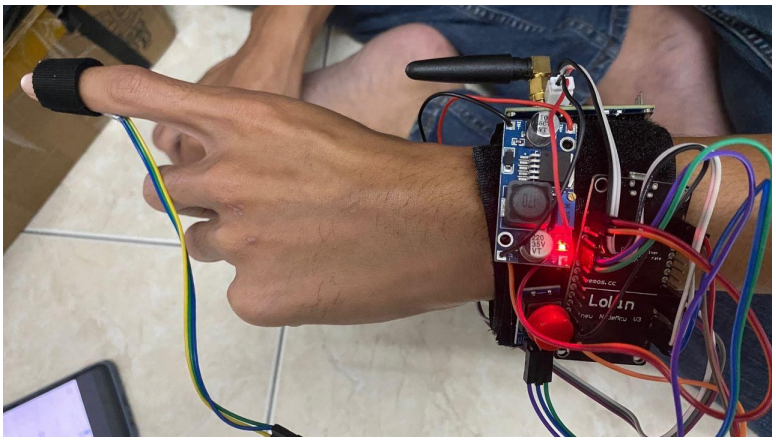

Figure 4.1 - Smart Child Tracker Prototype in actual testing phase.

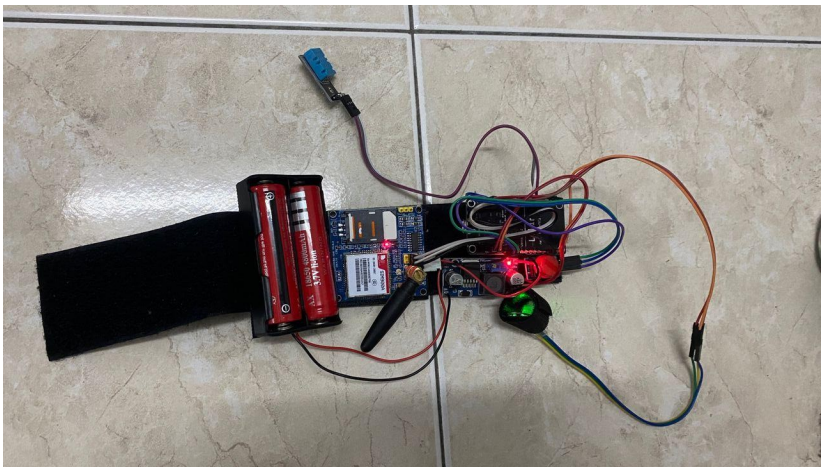

Figure 4.2 - Smart Child Tracker Prototype with velcro strap.

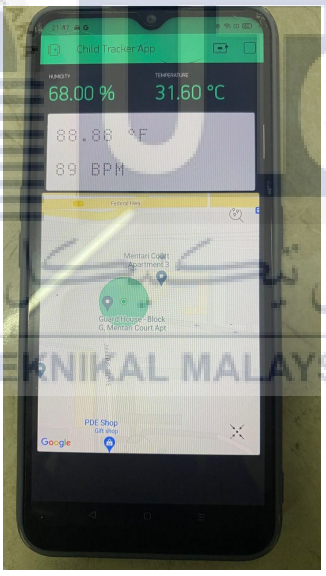

Figure 4.3 - Blynk App display on smartphone with parameters display.

The tabulated data, chart and graph will be further explained in subchapter Result and Analysis. Including all the analysis of the tabulated and pictorial graph of the result.

4.2 Results and Analysis

We first will proceed with the tabulated result of the parameter which is specifically the heartbeat in beats per minute [BPM] unit, temperature in both celsius [C] and Fahrenheit [F] and finally for humidity in percentage [%]. Below is the tabulated table.

HEARTBEAT [BPM]	TEMPERATURE [C]	TEMPERATURE [F]	HUMIDITY [%]
80	30.1	80.1	80
81	30.3	80.3	80.5
82	30.5	80.5	81
83	30.7	80.7	81.5
84	30.9	80.9	82
85	31.1	81.1	82.5
86	31.3	81.3	83
87	31.5	81.5	83.5
88	31.7	81.7	84
89	31.9	81.9	84.5
90	32.1	82.1	85
91	32.3	82.3	85.5
92	32.5	82.5	86
93	32.7	82.7	86.5
94	32.9	82.9	87
95	33.1	83.1	87.5
96	33.3	83.3	88
97	33.5	83.5	88.5
98	33.7	83.7	89
99	33.9	83.9	89.5
100	34.1	84.1	90
101	34.3	84.3	90.5

HEARTBEAT [BPM]	TEMPERATURE [C]	TEMPERATURE [F]	HUMIDITY [%]
102	34.5	84.5	91
103	34.7	84.7	91.5
104	34.9	84.9	92
105	35.1	85.1	92.5

Table 4.1 - Parameters tabulated for Smart Child Tracker value.

Further analysis could be obtained by interpreting in terms of graphs and charts. Further analysis will be done after the graph below has been in the form of graph and chart . Below is the interpretation in the form of a graph and chart.

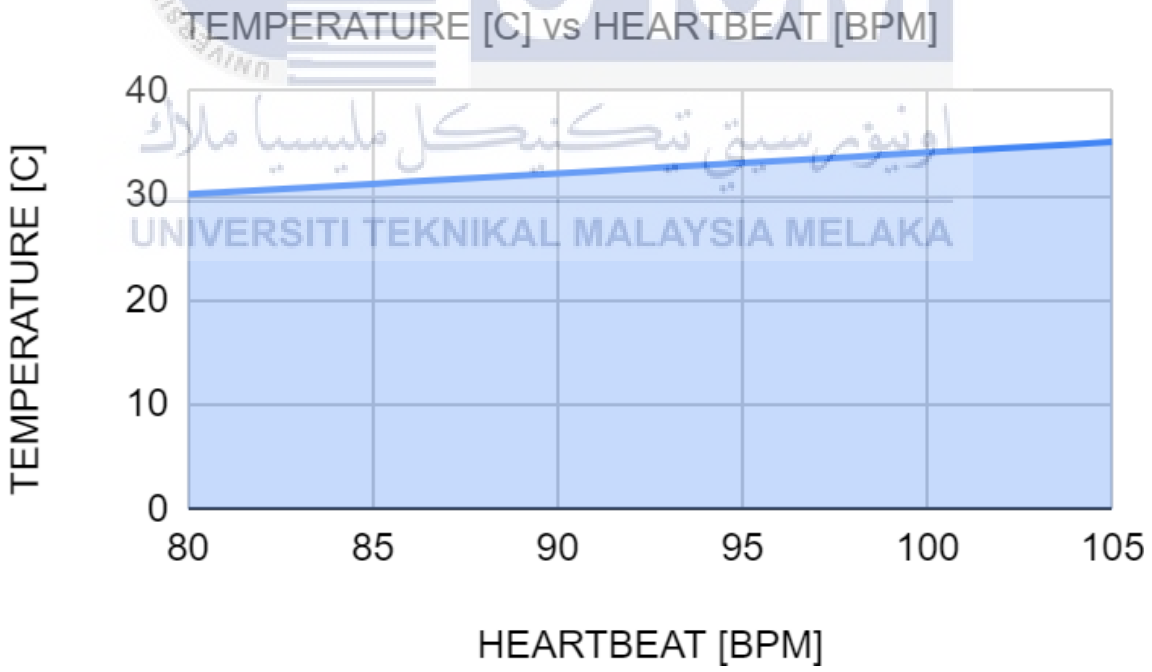

Figure 4.4 - Heartbeat over Temperature in line graph.

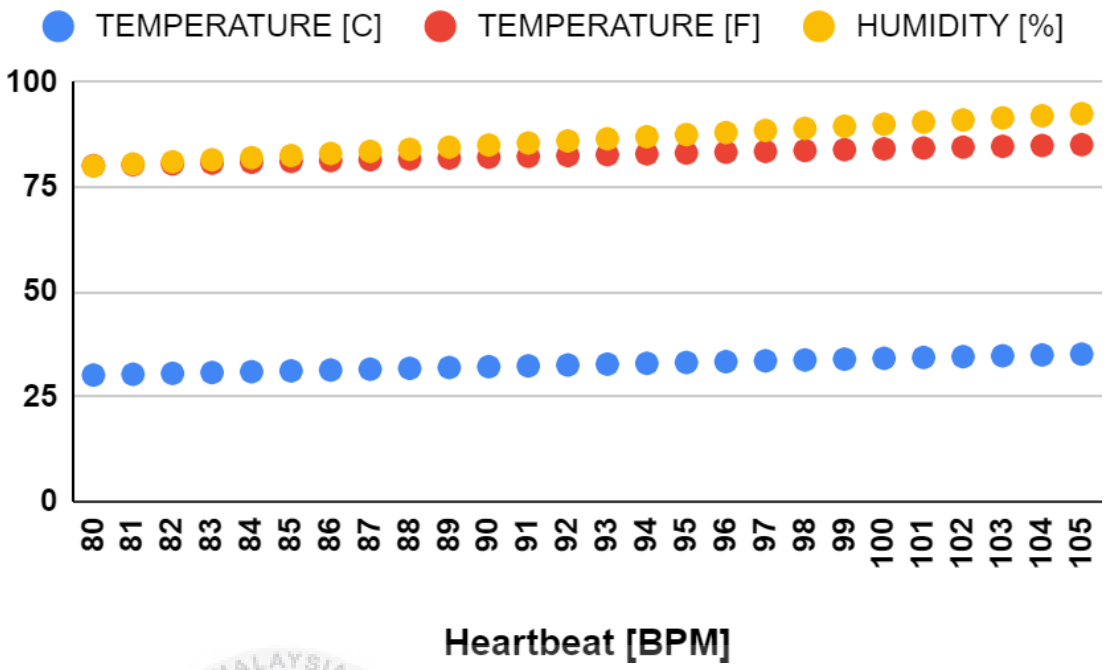

Figure 4.5 - Scatter Point Chart Temperature and Humidity over Heartbeat.

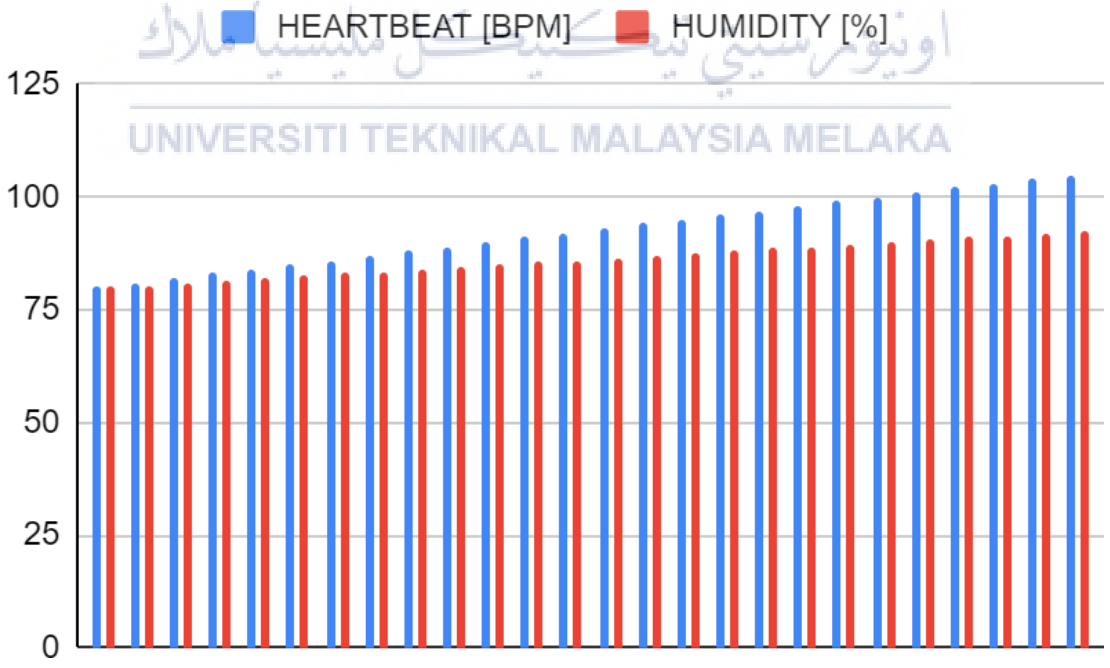

Figure 4.6 - Heartbeat and Humidity in stacked bar graph representation.

From this we could understand and observe that whenever the heartbeat of a child is increasing thus the temperature and humidity will also increase but the increase is not exponential. It just slowly gradually increased. This could be observed from Figure 4.3 until Figure 4.5 where the heartbeat increases from 80 BPM until 105 BPM which is the difference of 25 BPM. But the increase in temperature is within the range of 5 values, from starting value until max value.

4.3 Summary

In summary, we can conclude that the information that we analyze is in synchronized with what actually happens in any human in distress, which is the heartbeat is increased to a high beat per minute and the temperature of the human will also increases, thus the humidity will also increase due to sweat.

The increase in temperature is due to hormonal change which increases body temperature and pouring sweat. Usually when in distress either being bullied which the children will be in shambles and shaking or when being chased by others for bad intention. Therefore, from the parameters the result could be analyzed when increased in these 3 parameters which is temperature, heartbeat and humidity to determine whether the child is in distress or not. If the child is in distress the child can push the SOS button for SMS notification.

Finally, from this the conclusion could be derived that the smart child tracker is a novelty and functions greatly. This conclusion will be further increased in Chapter 5.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

For summary, The Smart Child Tracker is able to track and function perfectly without problem as long as there is power supply which in this case is the lipo battery which produces up to 7.4 V of power supply. The sensor and module for the electronic component is very fragile therefore need to handle with care for the prototype but for the final commercialized product the idea is the component will be in micro size and will be inside a package like a smart watch.

The idea is to make a Smart Child Tracker much more portable and much smaller than the current prototype, but this could only be realized using a factorized equipment and custom made component. In order for this commercialized product to be successful the prototype component needed to work without problem. This has been proven by my video of the prototype demonstration in the presentation video.

The prototype is still limited in terms of aesthetic value since the commercialized value will be further improved and deliberated in future works. Regarding the explanation will be further explained in subchapter future works.

5.2 Future Works

For future improvements, the prototype is able to be improved in more important aspects in the future. Below is the aspect will be further improve and explain further:

i) Aesthetic value, the gadget outlook and interface.

ii) The size of the actual gadget.

iii) Sim-card signal and Wi-Fi connection.

These factors will be further reiterated in each paragraph below.

Aesthetic value, the look of the gadget will be further improved to be in terms of the sensor and module will be put inside one box which is sleek and nice looking value. The velcro strap will be inside the same wrist strap to ensure the young kids will be able to use the wristband easily and not easily lose the wristband.

While the size of the gadget will try to make at least half of the actual prototype so it will be easier to use for the young kids. This will be one of the more marketable and sale points for the target market. Also needed to be in bright and popping color for the said wrist band, the actual market product of Smart child Tracker.

Lastly, the connection will be in the form of the antenna slot for the Wi-Fi and Sim-Card slot for the SMS notification and also the mobile Wi-Fi connection for the display parameters of the young kids wearing the wristband of Smart Child Tracker. In conclusion, these 3 features will be the main focus for the Smart child Tracker in terms of Smart Child Tracker before commercialization into mass production.

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APPENDICES

Appendix A Coding for ESP32 in Arduino IDE Software

```
#define BLYNK_PRINT Serial
#include <ESP8266WiFi.h>
#include <SoftwareSerial.h>
#include <BlynkSimpleEsp8266.h>
#define USE_ARDUINO_INTERRUPTS false
#include <PulseSensorPlayground.h>
#include "DHT.h"
#define DHTPIN 2
#define DHTTYPE DHT11
SoftwareSerial SIM900A(4,5);

const int OUTPUT_TYPE = SERIAL_PLOTTER;

const int PULSE_INPUT = A0;
const int PULSE_BLINK = 13;    // Pin 13 is the on-board LED
const int PULSE_FADE = 5;
const int THRESHOLD = 550;  // Adjust this number to avoid noise when idle

char auth[] = "2yjSNqS7WOUYUPdu_I1sFb3nce4oqb1A"; // ni auth token kt Blynk app
tu, ad kt setting
char ssid[] = "Jamal62-2.4G@unifi";              // double check kt 62, klau ad spacing edit.
n xleh msuk 5G punya wifi
char pass[] = "malaysiaboleh";                   // password wifi

byte samplesUntilReport;
const byte SAMPLES_PER_SERIAL_SAMPLE = 10;

float hum, temp_C, temp_F;
float lats = 3.021592;
float longs = 101.707560;
int a, myBPM, Signal, heart;

PulseSensorPlayground pulseSensor;
BlynkTimer timer;
DHT dht(DHTPIN, DHTTYPE);

WidgetMap myMap(V4);
String GPSLabel = "CHILD TRACKER"; //Labeling location on MAP

void setup() {
```

```
  Serial.begin(115200);
  SIM900A.begin(9600);
  pinMode(16, INPUT);

  // Configure the PulseSensor manager.
  pulseSensor.analogInput(PULSE_INPUT);
  pulseSensor.blinkOnPulse(PULSE_BLINK);
  pulseSensor.fadeOnPulse(PULSE_FADE);

  pulseSensor.setSerial(Serial);
  pulseSensor.setOutputType(OUTPUT_TYPE);
  pulseSensor.setThreshold(THRESHOLD);

  // Skip the first SAMPLES_PER_SERIAL_SAMPLE in the loop().
  samplesUntilReport = SAMPLES_PER_SERIAL_SAMPLE;

  dht.begin();
  Blynk.begin(auth, ssid, pass);
  timer.setInterval(100L, pulse);
  timer.setInterval(1L, dht11);
  timer.setInterval(1000L, maps);
}

void pulse(){
  if (pulseSensor.sawNewSample()) {
       if (--samplesUntilReport == (byte) 0) {
         myBPM = pulseSensor.getBeatsPerMinute();
         Signal = analogRead(PULSE_INPUT);
         heart = Signal - 450;
         samplesUntilReport = SAMPLES_PER_SERIAL_SAMPLE;
         pulseSensor.outputSample();
         Serial.println(Signal);
         Blynk.virtualWrite(V0, heart);
    }
  }
}

void dht11(){
  hum = dht.readHumidity();
  temp_C = dht.readTemperature();
  temp_F = dht.readTemperature(true);
  Blynk.virtualWrite(V1, String(hum, 2));
  Blynk.virtualWrite(V2, String(temp_C, 2));
  Blynk.virtualWrite(V3, String(temp_F, 2));
}
```

```
void maps(){
   myMap.location(2, lats, longs, GPSLabel);
}

void SendMessage()
{
  Serial.println ("Sending Message");
  SIM900A.println("AT+CMGF=1");    //Sets the GSM Module in Text Mode
  delay(1000);
  Serial.println ("Set SMS Number");
SIM900A.println("AT+CMGS=\"+60136368141\"\r"); //Mobile phone number to send
message
  delay(1000);
  Serial.println ("Set SMS Content");
  SIM900A.println((String)"SOS Button pushed, your child temperature "+hum+"C, and
heartbeat "+heart+" BPM. Location at latitude "+String(lats,6)+" and longitude
"+String(longs,6));// Messsage content
  delay(1000);
  Serial.println ("Finish");
  SIM900A.println((char)26);// ASCII code of CTRL+Z
  delay(1000);
  Serial.println ("Message has been sent ->SMS Selesai dikirim");
}

void loop() {
  Blynk.run();
  timer.run();
  a = digitalRead(16);
  if(a==1)
  SendMessage();
}
```

Appendix B Blynk Application and SMS Message Notification

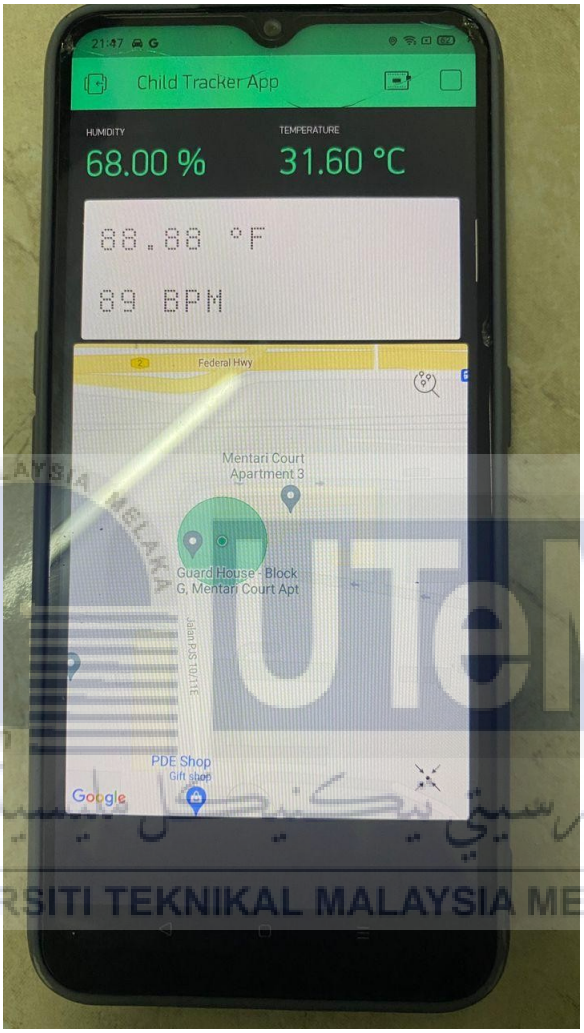

Figure B.1 - Blynk Application Display.

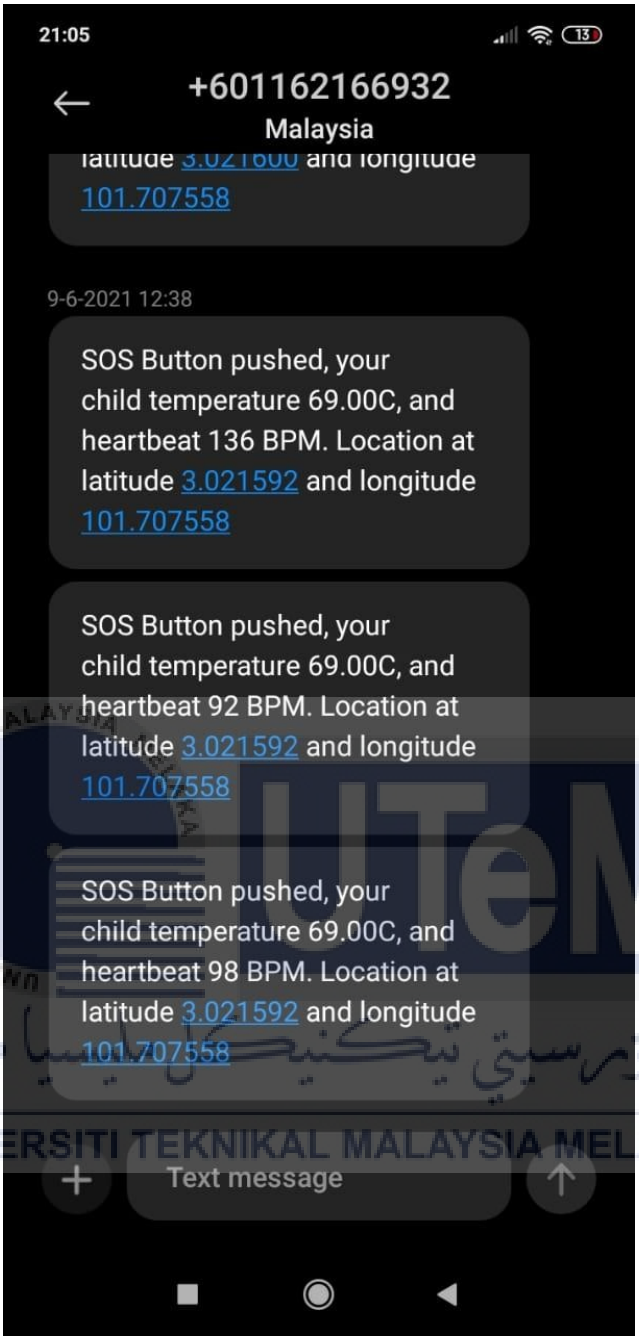

Figure B.2 - SMS Notification Display from circuit module to phone.

Appendix C Circuit Smart Child Tracker Prototype

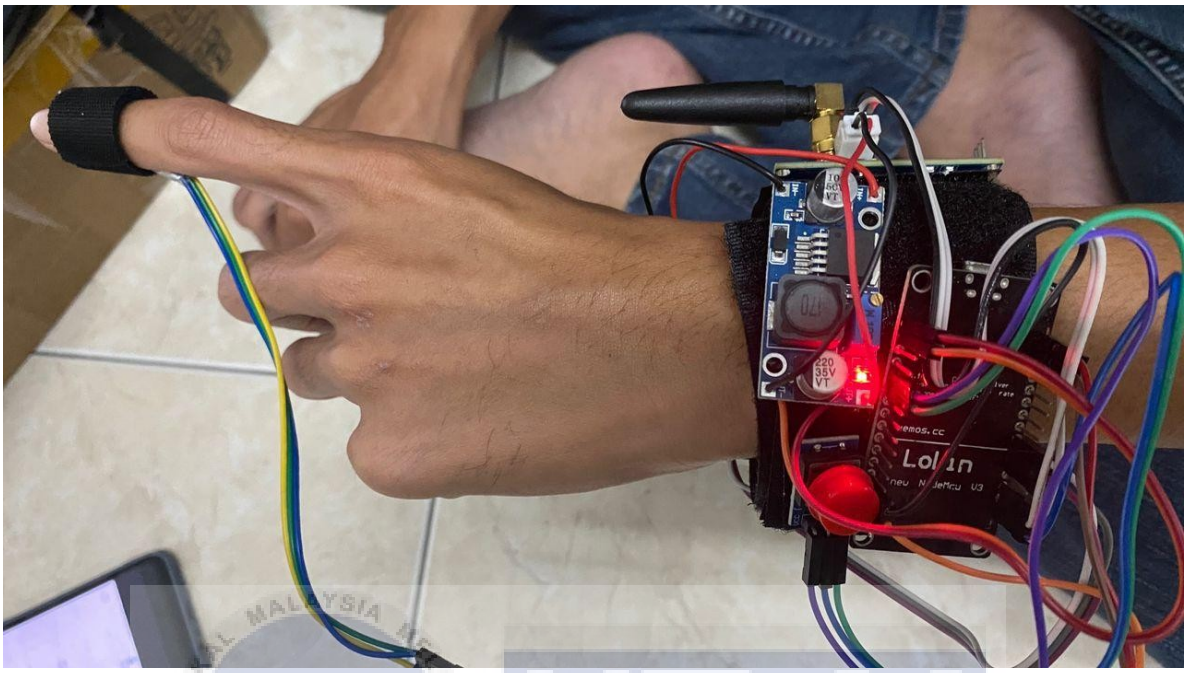

Figure C.1 - Smart Child Tracker on hand for parameter display on the Blynk App.

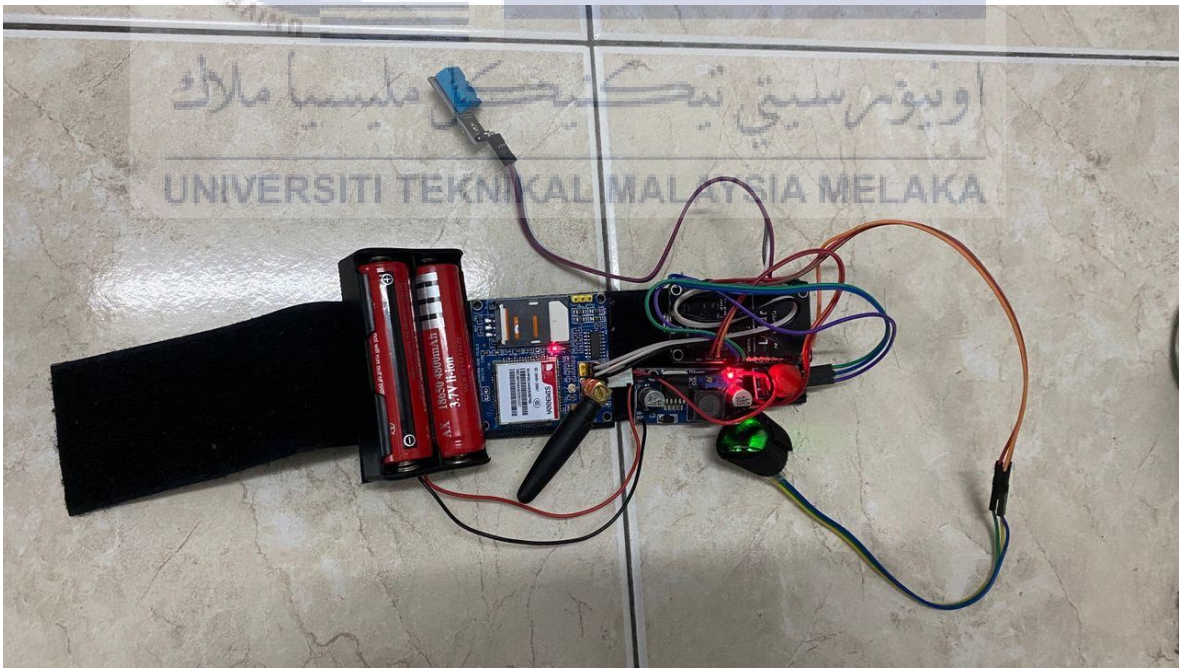

Figure C.2 - Smart Child Tracker without putting on hand.

Appendix D **3D Design for Smart Child Tracker Prototype**

Figure D.1 - Front View 3D Design of Smart Child Tracker Prototype.

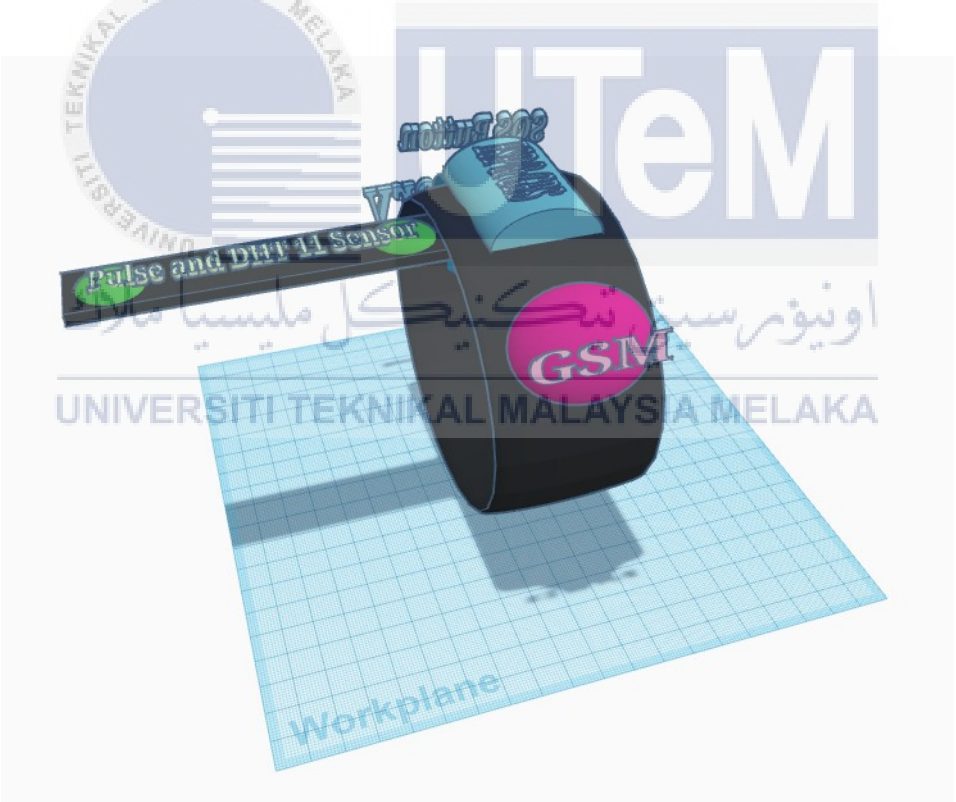

Figure D.2 - Left View 3D Design of Smart Child Tracker Prototype.

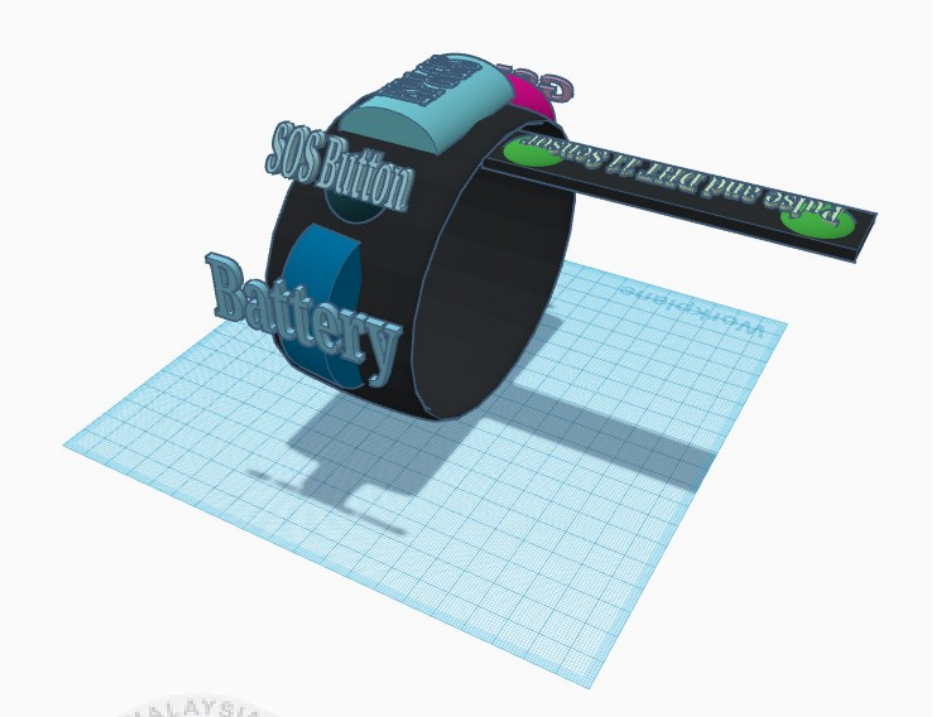

Figure D.3 - Right View 3D Design of Smart Child Tracker Prototype.

Figure D.4 - Side View 3D Design of Smart Child Tracker Prototype.

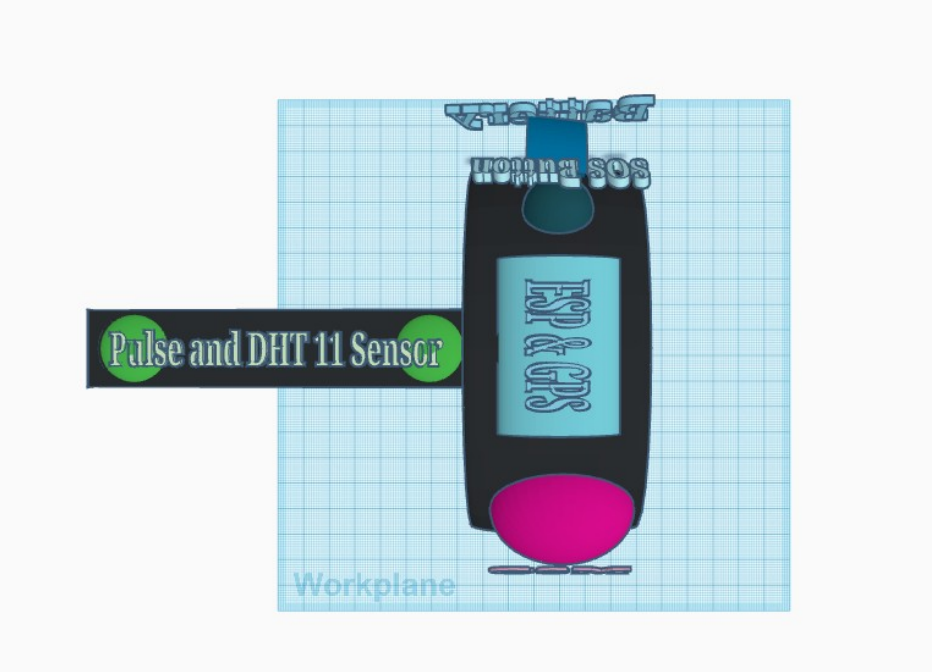

Figure D.5 - Top View 3D Design of Smart Child Tracker Prototype.