UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Smart Visually Impaired Aid

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Computer Engineering Technology (Computer System) with Honours.

By

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DECLARATION

I declared this report entitled "Smart Visually Impaired Aids" is the results of my own research except as cited in references.

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APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfilment of the requirements for the degree of Bachelor of Computer Technology (Computer System) with Honours. The member of the supervisory is as follow:

………………………….

(Ahmad Fairuz Bin Muhammad Amin)

ABSTRAK

Projek "Smart Visually Impaired Aids" adalah teknologi baru untuk orang buta yang mempunyai masalah dalam mengesan objek semasa berjalan di kawasan kecil dan luas. Sistem ini menggunakan Raspberry Pi sebagai alat utama untuk mengaktifkan peranti dan mendapatkan maklumat peranti lanjutan. Peranti ini adalah sensor ultrasonik untuk mengesan objek dihadapan dan memberikan amaran awal melalui alat pendegar telinga atau pembesar suara apabila pengguna berada dekat dengan objek untuk mengelakkan berlaku kemalangan yang tidak diingini. Selain itu, peranti kedua adalah modul GPS untuk mendapatkan maklumat tentang lokasi spesifik dan masa secara terperinci. Kemudian, menghantar koordinat ke pangkalan data dalam Raspberry Pi dan mengemas kini setiap minit dipangkalan data awan iaitu Firebase. Bahagian perisian akan memantau lokasi pengguna menggunakan aplikasi android yang menghubungkan ke pangkalan data dengan sambungan wi-fi. Objektif utama projek ini adalah untuk membantu orang buta untuk berjalan di jalan raya atau Kawasan yang luas dan pengguna boleh mencapai destinasi tanpa kebimbangan ahli keluarga kerana mereka boleh memantau dari aplikasi android, jadi orang buta lebih yakin untuk berjalan di mana-mana.

ABSTRACT

The Smart Visually Impaired Aid is a new technology for blind people that have problem in detecting obstacle object during walking in small and large area. The system using Raspberry Pi as microcontroller to active the device and get information the extended device. The device is ultrasonic sensor to detect obstacle object and give a warning message speech via earphone or speaker when user at near to the object to avoid accident happen. Other than that, the second device is GPS module to get information about real time specific location in detail. Then, the coordinate sends to database in Raspberry Pi and update everyone minute. the software part is to be monitoring the location of user using android application that link into database with wi-fi connection. The main objective of this project is to assist the people who are blind walk the street or wide area and user can reach destination without family member worry because they can monitor from android application, so blind people have more confident to walk everywhere.

DEDICATION

To my beloved parents (Hj Ibrahim Bin Mahmood and Hajah Zahidatul Hikma Bin Ahyat) and family (Ahmad Yasir Arafat, Ahmad Fadlil Khalid, Nurbaiti , Nurkhuzaimah, Nurhanim and Nurain).

ACKNOWLEDGEMENT

I would like to thank God for the fulfillment of the Final Year Project (FYP) without any complicated problems and distractions. I would like to take this opportunity to thank all of those who have generously helped and supported me in completing the FYP study, which is mandatory for all students of Universiti Teknikal Malaysia Melaka (UTeM) to complete our degree.

First, I would like to give many thanks to my supervisor Ahmad Fairuz Bin Muhammad Amin from the Electrical Engineering Department from Faculty of Technology Engineering, Universiti Teknikal Malaysia Melaka (UTeM) for his support to this project to giving advice, suggestion, helping to plan project and guide from start to the complete

Secondly, I would like to express my sincere thanks and my gratitude to the entire Faculty of Technology Engineering (FTK) lecturer who, during my studies at UTeM, passed on their expertise and guided me. In addition, I would like to express my sincere thanks and gratitude to my beloved family and my parents for giving me full support, encouragement and idea to start the project until the project is finished.

 Lastly. I would like to thank everyone who helping to complete my project direct or indirect. Finally, thanks to all my friend and to all those who help me for making my time at UTeM a memorable one.

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LIST OF ABBREVIATIONS

USB   Universal Serial Bus

GPS   Global Positioning System

mAh   milliamp Hour

APPS   Applications

Wi-Fi   Wireless Fidelity

IDE   Integrated Development Environment

CHAPTER 1

INTRODUCTION

1.1 Project Background

Eyes are among the sense organs that is very beneficial to humans because they serve to record the scenarios or situations that are around them so that people could find things they have seen. If they have normal eyesight, they can do a lot of activities easier. Not everybody was perfect and born with normal eyes, however, there's also an eyesight disorder since birth, blindness is a common eye deficiency among societies around the world. The eyesight is important for people to detect the environment such as weather and obstacle object for a long-distance range, but if people lose the advantage either born blind or blindness due to accident, they don't have abilities that will be the problem for visually impaired people sense.

The new era of 2nd century, with the new technology that can help to solve the people with visually impaired problem encounter. The smart blind aid is the one of the solutions for blind people to walk without worried. They also give warning respond to the user when object obstacle is very near to the user, this help user to acknowledgment the warning if any object in front before crush. however, they only can detect object only on front of user.

Other than that, this study aims to develop smart blind aid for the blind to cope with their problems, use raspberry pi 3 B+ as microcontroller and ultrasonic to detect the obstacle object range, speaker or headphone to facilitate it's the user and feedback for user if sensor detect obstacle object, GPS module neo-6m to get location and save to database then, using android application to monitor the location.
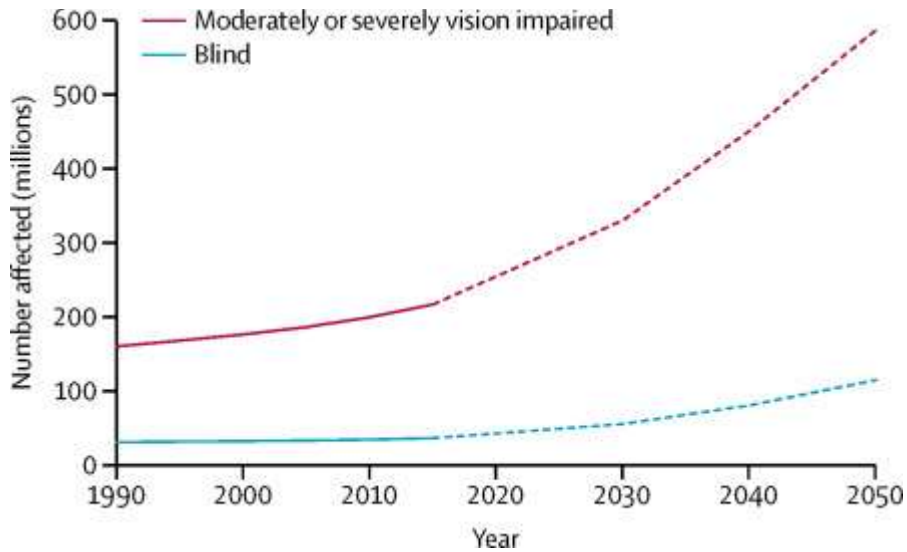
Figure 2.1.1 Number Affected
source : https://www.sciencedirect.com/science/article/pii/S2214109X17302930

Base on website (ABourneMD, 2017) show an estimated 38·5 million people (80 percent UI 13·2–70·9; 0·50 percent, 80 percent UI 0·17–0·92) would be blind in 2020 (7·75 billion overall population) and 114·6 million people (23·39–229·0; 1·18 percent, 0·24–2·36) would be blind in 2050 (9·69 billion overall population). The estimates were 237·1 million people (101·5–399·0; 3·06%; 1·31–5·15) in 2020 and 587·6 million people (155·9–1093·8; 6·06%; 1·61–11·29) in 2050, for moderate and severe impairment of vision. Global predictions of the amount of people with blind or moderate or severe visual impairment for each decade between 2020 and 2050.

1.2 Problem Statement

Problems frequently encountered by the blind are mobility limitations. People with visually impaired problems need equipment to detect obstacles in order to walk anywhere without worrying about crashing into objects. So, they usually facilitate their mobility by using a normal cane that have only plastic stick or wood stick that work when blind user tap the object then they sense the object obstacle and avoid the object but they do not know if object bigger than user think when walk around the city that all know the large area that have many possible accident even for normal

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people to reach the destination ,the new technology aid impaired system can help blind to detect front of object and response to the user . Their family may don't know if the user (blind people) have reach the destination safely or lost then the aid impaired system can detect blind user from family member using android application.

They have several obstructions for blind people for example bump into hazardous branches, signboard, vehicles park and accident when cross the road. this problem needs to be avoided because that will cause serious injuries, with the smart visually impaired the blind user can avoid a possibility to accident or injuries, when user can detect hazardous 5 second before bumping it.

1.3 Objective of the study

The aims are as follows:

1. To understand the GPS module and raspberry pi to give current location for user.
2. To design an tools aid to help blind people using aid technology system.
3. To encounter the limitation of activity and mobility.

1.4 Scope of the study

This project's about aiding tools for visually impaired people who have lost their physical integrity or different with normal people. The focus of this project is to prevent further damage if any accidents happens. Furthermore, it will also helping visually impaired consumers navigate safely between obstacles and other potential risks. Raspberry pi is used for controlling sensors, GPS, and send through android application. This project uses both software and hardware. For the software part, using python language to code the raspberry pi to connection all sensor and GPS, then the information store to database in raspberry and view in the android application to detect location, the android application also use a java code to make an interface and link to the database monitoring .

For the hardware part, using GPS neo-6m module that function to locate the user's real-time location and to push the location longitude and latitude to the android application for monitoring, then using an ultrasonic sensor to identify an obstacle object and a speaker to warn the user.

1.5 The limitation of the project

- This project will be using ultrasonic sensor and it takes at least a second to send a signal to a user when an obstacle has been detected.
- This project is focus aid for visually impaired with equipment that turned on for long hours of time. the battery if 10000mah normal power bank can stand last for 14 hours and the source charger for power bank is the car or normal plug at home.
- The GPS module always on and delay to relocate the real time location for blind people to get the information instant or immediately.

1.6 Organization

Chapter 1: Introduction

Introduction has been provided in this chapter that contain background project for understanding the project summary. It explains the introduction project, which includes the introduction, problem statement, objectives, study scope of work and project limitation.

Chapter 2: Literature Review

In this chapter 2, the chapter explains in deeper about the review of theories, project works and previous finding project that related to the current project. It also is known as a summary that needs to study the research project or journal and summarized it. Also, discuss the hardware involved.

Chapter 3: Methodology

In chapter 3, methodology and strategy to achieve the objectives is explained in more detail. This chapter contains designs procedures of the system of visually impaired aid and the process of GPS system. It also including the process flow and the flowchart for the whole project.

Chapter 4: Result, Analysis, and Discussion

Chapter 4 presents the study results and findings, the result from the experiments that are shown in tables, figures, diagrams and graphs are discussed in the chapter. From findings, the other observations are projected.

Chapter 5: Conclusion and Recommendation

In chapter 5, the summarize overall outcomes of the experiment and the objectives of the project that needed to achieve and the recommendations addition as a purpose to further develop and enhance the project function. This recommendation is provided for the future people that need to research deeper about related project and improve for future research.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This chapter reviews the literature of previous research and project analysis that has been done by other specialist that relate to the visual impaired aid technology system. Other than that, the past project and research will be discussed. The literature that was explored is usability the microcontroller system implements and analysed the function in every aspect regarding to their weakness, strength and future technology use with respect to their quality of system. then, the method and result of past research will be contracted and will be great example for better result in this project.

2.1 Project Device

2.1.1 Using Microcontroller Raspberry pi 3

Basically, Raspberry pi is a computer but is small factor size with all the same functions as a computer connecting to a computer monitor using HDMI or mini HDMI as a connector and use a standard mouse and keyboard connecting with Universal Serial Bus (USB) version 2.0. Its small capable device allows people of different ages to learn computing and programming in languages like Python. The operation of the system uses a Raspbian because it is the Best All-Around Operating System. Raspbian is Raspberry Pi's "official" operating system and Raspbian is a Linux version specifically designed for Raspberry Pi. The Raspberry pi spec uses ARM Cortex A53 (ARMv8 Instruction Set) quad-core CPU 1.2 GHZ, GPU Broadcom Video Core IV @ 400 MHz, memory 1 gigabyte, then, include with Bluetooth and wireless build in board. Use like

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computer, from web browsing and playing at the highest-definition video, word processing, spreadsheet creating and playing games. Raspberry Pi can connect to the outside world and has been used in a broad range of digital manufacturer projects, from music tools and parent sensors to climate monitoring and walking robot synchronization with cameras and new technology systems such as smart blind cane for community support.
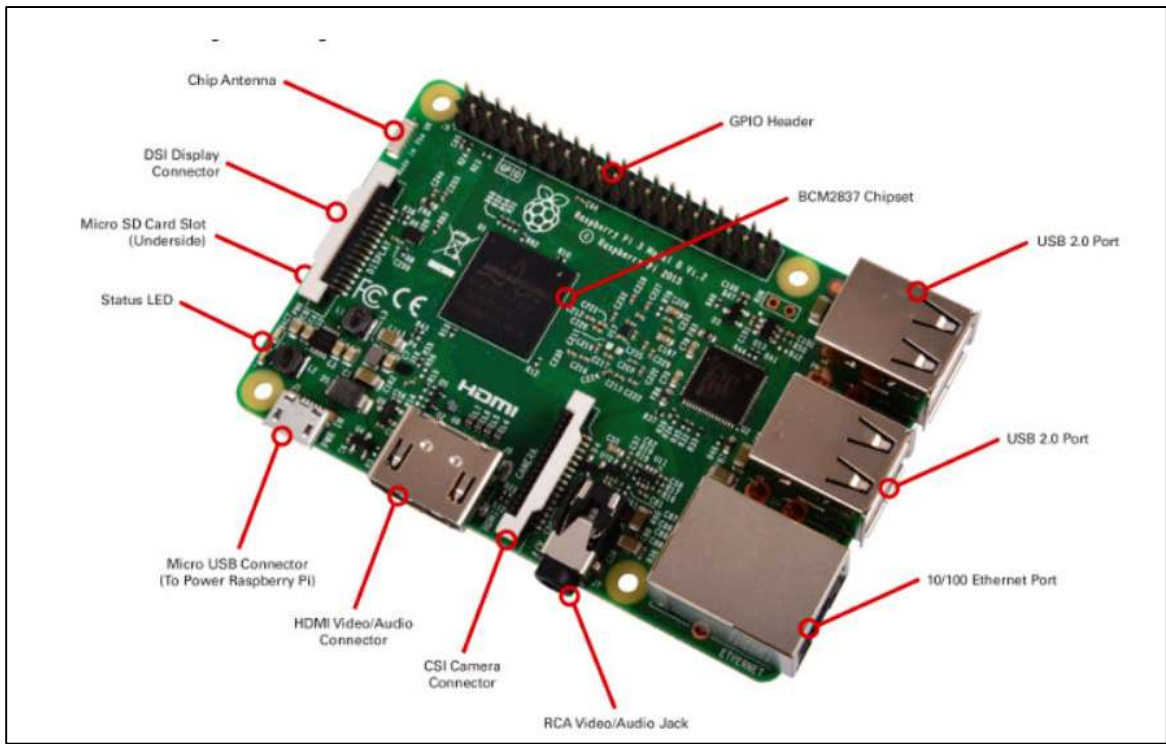

Figure 3.1.1.1 Raspberry Pi 3 B+ microcontroller
Source : *https://www.theengineeringprojects.com/2018/07/introduction-to-raspberry-pi-3-b-plus.html*
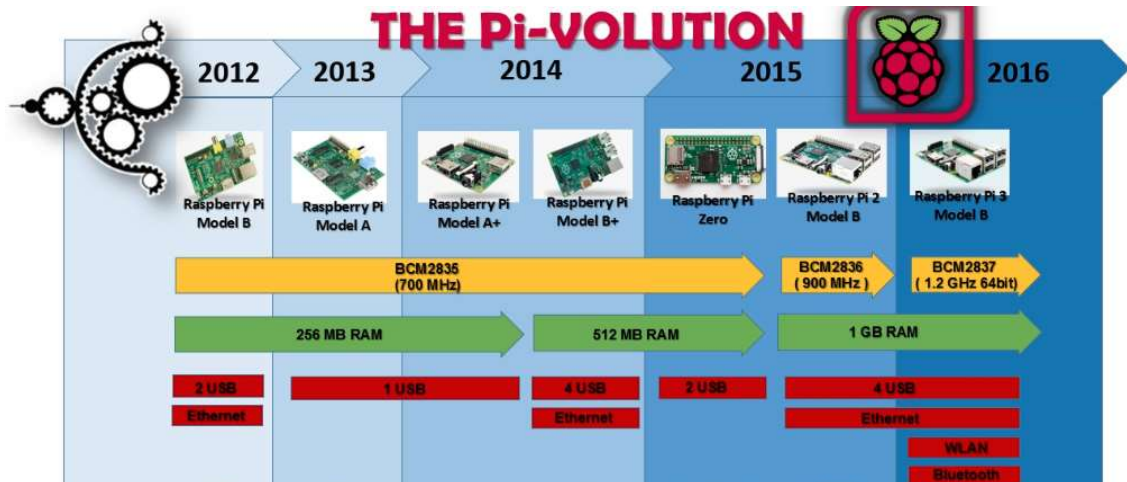
Figure 2.1.1.2 Raspberry Pi microcontroller evolution

Figure 2.1.1.2 Raspberry Pi microcontroller evolution
Source : https://www.meccanismocomplesso.org/en/raspberry-pi-3-the-evolution-goes-on/

2.1.2 Using GPS module

Global Positioning System (GPS) is a satellite-based radio tracking system to assess the surface position of an object. GPS works when a satellite transmits a message that includes the current location, orbit and precise time satellite, the GPS receiver then combines multi-satellite broadcasts to compute its exact position using a triangulation process because it uses three satellites to locate the GPS receiver but four connection satellites are more accurate in the event of poor signal circumstances like in urban areas, satellite signals may display multi-path propagation where signals bounce off structures or weaken meteorological conditions. The GPS system also functions to acquire location and time information throughout all weather conditions, everywhere on Earth. GPS satellites transmit information signals over radio frequency in range 1.1 to 1.5 GHz to the receiver to obtain information, a base station or GPS module can calculate its position and time in live time.
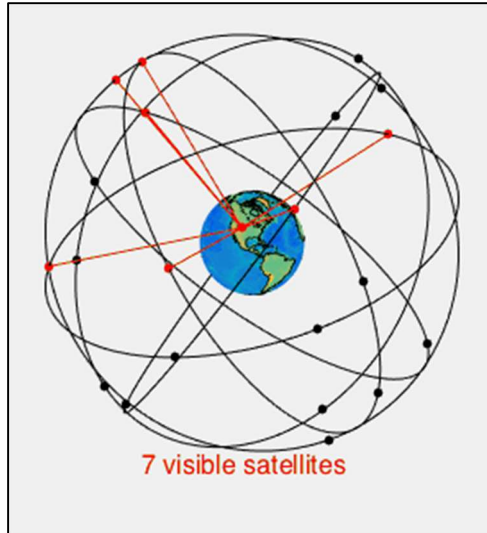
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Figure 2.1.2.1 Visible Satellites in earth
Source : https://johnedevans.wordpress.com/interesting-things/the-physics-of-gps/

2.1.3 Using Ultrasonic sensor

Ultrasonic sensor is an optical sensor with a transmitter and receiver that uses a single ultrasonic element for transmitting and receiving. Alternatively, the single oscillator transmits and generates ultrasonic waves that can miniaturize the sensor head.
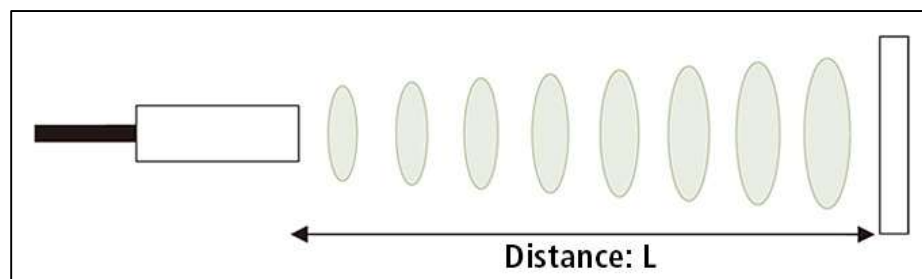

Figure 2.1.3.1 Ultrasonic sensor transmit

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2.2 Related work

2.2.1 Smart Stick for Blind using Raspberry Pi

Based on this project purpose by Akhila. S et.al which is about Smart stick system to provide blind people with a smart electronic aid that has trouble to detecting obstacles while walking in large areas. In addition, the system is designed to include artificial vision and object recognition, real-time GPS guidance using the Raspberry Pi microcontroller. The system of this project is ultrasonic sensors, GPS unit and speech feedback, earphone warning messages, and provides navigation through GPS to a specific location, and voice output works through TTS (text to speech). The goal of this project is to provide lower cost and effective blind navigation and obstacle detection assistance that creates a sense of artificial vision by giving information about environmental obstacle object all over them so that they can walk independently.

Visually impaired people are suffering in their routine and social lives. The visually impaired is a disorder that affects most people around the world that results to the loss of the valuable sense of vision for the environment. In this world, there have many of people who are visually impaired, where many of them are blind. The need future technology for assistive and will be continuous. There is a wide range of navigation systems for blind people since they really require an object to be identified.