Faculty of Electrical and Electronic Engineering Technology

DEVELOPMENT OF A SMART WALKING STICK FOR BLIND PEOPLE

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Bachelor of Electronics Engineering Technology with Honours

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DEDICATION

My special dedication is directed to my parents, siblings and friends who have always supported me and who have always encouraged me to help me complete my final year project successfully. Meanwhile, I am dedicating this thesis to my beloved supervisor, TS. DR. Norhashimah Binti Mohd Saad who has given me a lot of guidance and guidance on how to achieve success for my final year project. Thank you very much. I appreciate it. I am grateful for their inevitable sacrifice, tolerance, and consideration in making this effort feasible. I cannot provide the appropriate words that can accurately describe my appreciation for their loyalty, support, and belief in my ability to achieve my dreams

ABSTRACT

If an individual's central visual acuity in the better eye is 20/200 or less with the use of a correcting lens, he is considered blind for the purposes of this title. For the purposes of the first sentence of this subsection, an eye with a limitation in the fields of vision such that the widest diameter of the visual field subtends an angle of no greater than 20 degrees is considered to have a central visual acuity of 20/200 or less. The innovative Smart Blind Walking Stick system can operate in a user-friendly manner so that the blind person can walk independently without getting help from others. This system assists the blind to navigate on their own. The stick with sensors can detect the obstacles in front using ultrasonic sensors and it will produce buzzer sounds and a vibrator. The buzzer would alert the user. Furthermore, the sensor on the stick can also detect the water on the ground and informed the user by the buzzer and vibrator. The buzzer and vibrator generate different sounds according to different detection. Finally, this project can identify to track the user's location using GPS and send the location to guardians using GSM. It also focuses on aspects that provide cost-effective and efficient navigational help.

ABSTRAK

Jika ketajaman penglihatan pusat individu pada mata yang lebih baik adalah 20/200 atau kurang dengan penggunaan kanta pembetulan, dia dianggap buta untuk tujuan tajuk ini. Untuk tujuan ayat pertama subseksyen ini, mata yang mempunyai had dalam bidang penglihatan sedemikian rupa sehingga diameter terluas medan penglihatan yang mencakar sudut tidak lebih daripada 20 darjah dianggap mempunyai ketajaman penglihatan pusat 20/ 200 atau kurang. Sistem Smart Blind Walking Stick yang inovatif boleh beroperasi dengan cara yang mesra pengguna supaya orang buta boleh berjalan secara bebas tanpa mendapat bantuan daripada orang lain. Sistem ini membantu orang buta untuk mengemudi sendiri. Kayu dengan sensor boleh mengesan halangan di hadapan menggunakan sensor ultrasonik dan ia akan menghasilkan bunyi buzzer dan vibrator. Buzzer akan memberi amaran kepada pengguna. Tambahan pula, sensor pada kayu juga boleh mengesan air di atas tanah dan memaklumkan pengguna melalui buzzer dan vibrator. Buzzer dan vibrator menghasilkan bunyi yang berbeza mengikut pengesanan yang berbeza. Akhir sekali, projek ini boleh mengenal pasti untuk mengesan lokasi pengguna menggunakan GPS dan menghantar lokasi kepada penjaga menggunakan GSM. Ia juga menumpukan pada aspek yang menyediakan bantuan navigasi yang kos efektif dan cekap.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF SYMBOLS

M	-	Mega
cm	-	Centimeter
Hz	-	Hertz
%	-	Persent
Rx	-	Reciever
Tx	-	Transmeter
GND	-	Ground
°	-	Degree
mm	-	milimeter
mAh	-	milliampere hour
F	-	Farad
in	-	inches

LIST OF ABBREVIATIONS

D	-	Distance
GPS	-	Global Positioning System
GSM	-	Global System for Mobile
V	-	Voltage
ETC	-	Electronic travel aids
USB	-	Universal Serial Bus
IDE	-	Integrated Development Environment
PCB	-	Printed Circuit Board
RFID	-	Radio Frequency Identification
DC	-	Direct Current
I/O	-	Input Output
SMS	-	Short Message Service
APP	-	Application
yr	-	Year

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.1 Background

Visually impaired people now have severe vision impairments that prevent them from travelling independently. As a result, they must rely on a variety of techniques and tools to help them move. Blind or visually impaired people can use their other senses to navigate safely and comfortably with the help of an orientation and mobility specialist. Signal is used in a variety of technologies. Blind people's mobility has recently improved thanks to advances in processing and sensor technology. Sonar feedback (infrared or ultrasonic signals) is divided into two categories in the documentation. The radar system detects obstacles as stationary and moving objects using an ultrasonic system. These devices function in the same way as a radar system. The wave moves and determines how far the human is from the obstacles. All existing systems, alert the blind person to the presence of an object in front of or next to them at a certain distance. Object data can help to improve space manifestations and blind memory by providing additional information.

To overcome these limitations, the work provides a simple, efficient, and adaptable electronic guide to the blind with visually impaired mobility, regardless of whether they are outside or inside. Obstacles can be coded using a microcontroller and a system with simple ultrasonic sensors that collect and combine all reflected data. The project will include a buzzer and vibrator to ensure that the blind receive an ultrasonic signal. The user is notified and could avoid obstacles.

Even with assistance, such as traditional sticks, it can be difficult to guide a visually impaired person on their way without making mistakes, which can be inconvenient and inaccurate, causing obstacles to be encountered. As a result, this project will develop a user system to prevent unwanted incidents. When an obstacle, such as a hanging object, an object in the path, or a drain, appears using ultrasonic waves, an ultrasonic sensor operates on a stick. The sensor sends information to the microcontroller after identifying the obstacles. The microcontroller sends a signal to the buzzer and vibrator if the obstacle is close enough to it. The Smart blind stick also has GPS and GSM capabilities, allowing the guardian to reach the user's exact location.

1.2 Problem Statement

The normal and healthy can at least get to the destination somehow but for some unfortunate people like blind people finding the location becomes a very tedious process. They will need constant help and companionship until they reach their desired destination. Blind people have trouble detecting obstacles in front of them such as walls. This affects blind people so much, it will result in hitting an obstacle or falling into a drain.

In addition, most blind people not only have vision problems but also hearing problems, so this project design with buzzers and vibrators to notify users. Furthermore, when blind people walk alone, they run the risk of becoming lost or not being noticed by their guardians. Hence, this project can help to track their where abouts.

1.3 Project Objective

Visually impaired people have trouble recognizing minor details even when their eyes are healthy. The main aim of this project is to propose a systematic and effective methodology to create aids in blind people living daily life like normal people. The objectives of this project:

a) To design an assistive device for the visually impaired that can identify impediments and give other alternative routes for the blind.

b) To make the blind person more convenient to move independently with a water sensor which helps in identifying moisture content to avoid slippery paths.

c) To evaluate the performance of Ultrasonic sensors by looking at the buzzer response when getting a signal.

1.4 Scope of Project

The scope of work will be focused on implementing a common blind stick to a Smart Blind stick with a combination of two sensors, the HC-SR04 Ultrasonic Sensor and the Water Sensor. Ultrasonic sensors at a distance of less than 50cm from the obstacle are calculated using the time delay between the sound beam and the arrival of the echo.

The water sensor module identifies whether the sensor is dry, wet, or fully submerged in water by measuring conductivity. On the sensor trace, there is a 1M pull-up resistor in use. Until a drop of water shortens the sensor trace to a grounded line, the resistor will pull the value of the sensor trace high.

Then, the ultrasonic sends a signal to the microcontroller and directs the buzzer and vibrator to work. When it can detect an obstacle, the buzzer will beep 4 times, while when it detects water it will beep 2 times continuesly.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter will go over previous research that has led to the development of the blind stick. Various researchers are working on a large number of research projects in order to develop an effective navigation aid for blind people.

After that, many blind people relied on a white cane and a trained dog to guide them, but they had limitations. Despite being inexpensive, the white cane cannot accurately detect obstacles and must rely on touch instead, giving the user less time to react to situations, which is extremely dangerous. A well-trained dog is costly, and it is possible that it will injure itself because it is an animal.

2.2 Microcontroller

An integrated circuit known as a microcontroller may regularly carry out a certain duty without the need for another boom since it is located inside each component needed to carry out the necessary activities. An analog-to-digital conversion (ADC), pulse width modulation (PWM), multiple control and communication modules, memory units, and input/output interfaces are all incorporated [1].

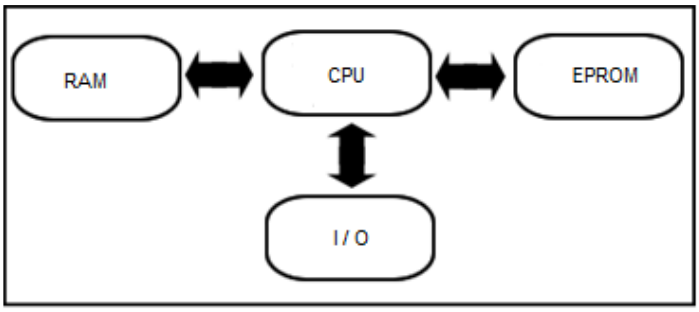

Figure 2.1 : General block diagram of the microcontrollers

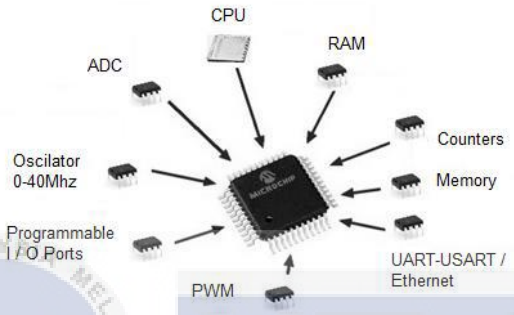

Figure 2.2 : Internal components of the microcontrollers

2.2.1 Microcontroller Types

Microcontrollers are classified based on their architecture, word processing length, processor clock operating frequency, and other processor characteristics. Microcomputer applications such as signal processing and embedded systems use CISC architectures, whereas electronic applications such as control and automation use RISC architectures. The following are some of the key characteristics that set microcontrollers apart. [1].

Table 2.1 : Characteristics that set microcontrollers part **[2]**

Processor Architecture	The application and command set that were used.
Processor word length	length and type of data to be processed.
Processor clock frequency	The processing speed of the codes to be executed.
RAM and ROM capacities	The area covered by the program and program data.
Input / Output units	Data exchange and communication with external media.
Built-in enhancements	Special enhancements required.
Form factor	Physical structure and working environment.
Operating conditions	Supply voltage, electromagnetic compatibility,compatibility with other circuits

2.2.1.1 Arduino UNO Rev3

The ATmega328P is the core of the Arduino Uno microcontroller board (datasheet). It contains a USB connector, a power jack, an ICSP header, a reset button, a 16 MHz ceramic resonator (CSTCE16M0V53-R0), 6 analogue inputs, 14 digital input/output pins, and 6 of these may be used as PWM outputs. Everything required to support the microcontroller is included; all that is required to get going is the insertion of a USB cable, an AC-to-DC converter, or a battery. It can play about with Uno without worrying too much about making a mistake; worst case scenario, it can replace the chip for a few bucks and start over.

The Arduino Software (IDE) 1.0 version is denoted by the Italian word "uno," which means "one." Later versions of Arduino were built on top of the Uno board and the Arduino Software (IDE) version 1.0. The Uno board, the first in a series of USB Arduino boards, acts as the standard for the system. See the Arduino index of boards for a complete list of all former, present, and outdated boards.