ARDUINO SMART CANE

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FINAL REPORT

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SUPERVISOR:PUAN NURHIDAYAH BINTI JAMALUDDIN

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Pengesahan Laporan Projek

"Laporan projek bertajuk Arduino Smart Cane ini adalah dikemukakan,deisemak serta disahkan sebagai memenuhi syarat dan keperluan Penulisan Projek seperti yang telah ditetapkan".

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Penghargaan

Sekalung budi ditujukan kepada seluruh warga pengajar Politeknik Seberang Perai yang banyak mencurahkan bakti,kasih,dan ilmu.Alhamdullilah,bersyukur saya ke hadrat Ilahi kerana dengan limpah kurniaan serta keizinan daripada – Nya,dapat juga kami menyempurnakan projek akhir ini pada waktu yang ditetapkan.Untuk memenuhi keperluan pendidikan dalam usaha bagi melengkapkan jurusan Diploma Kejuruteraan Elektronik selama dua tahun ini di Politeknik Seberang Perai,kami telah menyiapkan projek akhir ini bagi modul projek (DEE6092) pada semester akhir ini.

Dalam ruangan ini juga saya ingin mengucapkan setinggi-tinggi penghargaan kepada semua yang turut terlibat dalam menyiapkan laporan akhir ini terutama sekali kepada penyelia projek kami iaitu Puan Nurhidayah Binti Jamaluddin di atas kesudian beliau menjadi penyelia kami sepanjang menjalani proses projek akhir selama lebih kurang 10 bulan.Di ruangan ini,sekalung budi penghargaan ditujukan juga kepada pihak pengurusan Politeknik Seberang Perai yang turut terlibat sama dalam menguruskan pembentangan projek akhir bagi para pelajar.Selain itu juga ucapan terima kasih ini ditujukan kepada mereka yang terlibat dalam membantu menyiapkan laporan akhir ini.Kerjasama daripada semua pihak amatlah dihargai dan segala pengorbanan ini akan dibalas oleh Allah dengan keberkatan-Nya.Alhamdullilah.

SEKIAN TERIMA KASIH

Abstract

The normal cane, due to its primitive design, is unable to offer the blind and visually impaired a level of independence that is achievable with modern technology. The Smart Cane looks to upgrade the white cane by increasing security and usability of the cane while ensuring an affordable price for an older and lower income demographic. This was done by including an ultrasonic sensor to detect potential obstacles at an extended distance from the user, vibrating motors to alert the user of these obstacles via haptic feedback, and an adjustable and echonomic handle in order to increase the comfort and ease of the cane. Observations and basic testing confirm the effectiveness of the vibrations in the handle and the accuracy of the ultrasonic sensor up to 0.5 meters past the tip of the cane.

Abstrak

Tongkat bisasa,disebabkan reka bentuknya yang primitif,tidak dapat menawarkan orang yang buta dan cacat penglihatan ke tahap kebebasan yang boleh dicapai dengan teknologi moden.Tongkat pintar kelihatan menaiktarafkan tongkat biasa dengan meningkatkan keupayaan tongkat dan pada waktu yang sama memastikan penentuan harga untuk golongan yang lebih tua dan jualan harga yang rendah.Ini dapat dilakukan dengan memasukkan sensor ultrasonik untuk mengesan halangan yang berpotensi pada jarak jauh dari pengguna,motor bergetar untuk memberi amaran kepada pengguna halangan ini melalui maklum balas haptik,dan pemegang laras dan ekonomik untuk meningkatkan keselesaan dan kemudahan tongkat.Kelaburan dan ujian asas mengesahkan keberkesanan getaran pada pemegang dan ketepatan sensor ultrasonic sehingga 0.5 meter melepasi hujung tongkat.

SENARAI KANDUNGAN

Senarai Jadual Dan Gambar Rajah

CHAPTER 1

1.1 Introduction

Consumer and medical technology has made significant advancements over the past 60 years. However, the functionality of canes for the visually impaired remains limited, relying on the user's ability to physically detect objects and forcing the user to be entirely responsible for their safety. This burden can be mitigated with the added security of an object detector. In addition, the standard white cane has no range of physical options. It

places additional burden on the user by forcing a change in handle grip depending on how crowded the surroundings are. The white cane thus requires the user to adapt to the cane rather than having a cane that will adapt to the user.

To address these shortcomings, The Smart Cane project examines how canes can be technologically equipped to improve their functionality in a way that is also economically accessible. The goal for the Smart Cane project is to eliminate this problem by designing, building, and testing a cane for the blind that utilizes computer and sensory technology to provide object detection capabilities and freedom of physical range. Once the project is completed, the cane design will be quantitatively and qualitatively examined to determine its success as a product.

1.2 Research Background

In today's technology, many of handicap people are having difficulty in reaching their destination due to their disability. We may not be able to feel their difficulty in their daily life, but we can control at least find a way to assist them. You can choose to be overwhelmed, or you can choose to accept where you are today, while taking steps to improve your situation. In order to cope with all the situations, as a human being need to be prepared with fresh ideas and surround ourselves in a harmony surrounding. There is a way that can help to enhance ourselves and to relax our mind.

1.3 Motivation

My motivation to undertake this project is due to my experience and observation in programming. Besides that, I believe that nowadays people are taking for granted about our technology which is, it is much more important to take advantage of technology nowadays.Other than that, I also need to raise awareness in careers of programming to all people including children, teenagers, youth, parents and adults. This is because; they lack the knowledge and information about programming.

1.4 Problem description

Implement a program into the device is usually a very time-consuming activity, to be done in a reasonable amount of time, it requires a large amount of human resources. Traditionally, all the steps were executed by humans. Nowadays, some systems use technology to reduce time. With such systems, the control is very limited, and many resources are still wasted.

In addition to the excess cost of component, the equipment is becoming more and more expensive. As a result, if no effort is invested in optimizing these resources, there will be more money involved in the same process. Technology is probably a solution to reduce costs and prevent loss of resources.

1.5 System objectives

The objective of this project was to design a small-scale navigation system for indoors and outdoors that would use smart cane in a more efficient way, in order to prevent less unwanted accident and more safety.

The following aspects were considered in the choice of a design solution:

- Installation costs.
- Energy savings.
- Human intervention.

- Reliability.
- Power consumption.
- Maintenance.
- Expandability.

A critical consideration is the installation costs, since costs generally determine the feasibility and viability of a project. The installation must be simple enough for a domestic user. The energy savings was also an important aspect, since there is a demand to minimize energy loss and to maximize the energy of used. Since the objective is to minimize the cost of labor, minimal supervision and calibration must be needed. The system must operate with optimized consistency. The power consumption must also be monitored. For maintenance, the replacement parts must be readily available and easy to install in the case of failure. Finally, the possibility for implementing the system at a larger scale (e.g. in a school for the blinds) should be investigated.

1.6 System Scope

This system will act like a medium of communication between system and walking stick. This system also will allow the owner of the walking stick to reach their destination more easily, when the consumers needs it. It is amazing that I can control all the activity that necessary by just setting the coding to make a instruction.

1.7 System Limitation

The proposed system causes a lot of vague situations. For example,the limitation of range on how far can the ultrasonic sensors can detect. Besides, the limitation of this system is, it can only be reach by using buzzer to represent warning on surrounding things.

1.8 Proposed solution

In order to solve the problem that are facing now, I proposed a smart navigation system called as 'Smart Arduino Cane'. 'Smart Arduino Cane' is a simple and easy to use navigation system. Instead of using traditional or manual way to navigate using only simple walking stick, I proposed some ideas that injected some intelligent on it to make it more intelligent by the helps of internet. For the system functionalities, I will make sure that the user will be at ease when using this system due to I will provide a very user-friendly system to use. I will use buzzer and ultrasonic sensor at the walking stick.

CHAPTER 2

2.0 LITERATURE REVIEW

There is a lot of different guide navigation systems on the market, but they all have some sort of deficiency lack in certain points. As I could see, some continuously need large amount of power supply, some price are too much expensive, sand some are much fragile. Different with the other product that is already available on the market, I believe that my system "Arduino Smart Cane" are much more unique .

Another study done by (Jayant, Pratik and Mita, 2012) [5] proposed a smart cane assisted mobility for the visually impaired. The system is based on normal ultrasonic sensors and ATMEL microcontroller. It operates with two rechargeable battery (7.4v) it can be recharged using USB cable or AC adaptor. The control unit is programed using ATMEL AVR microcontroller ATMEGA328P microcontroller. Once any obstacles are detected vibration and buzzer will start in order to warn the user. This system is a non-complex system to use. It has the ability to cover a distance up to 3 meters and has the rechargeable feature of the battery. Also, this system can be folded in small piece so that the user can carry it easily. **However, this system has only one direction detection coverage and it is inaccurate in detecting the obstacles.**
All the studies which had been reviewed show that, there are many techniques of making a smart sticks for blind people. However, the study conclusion shows that, using the ultra-sonic sensors would be an efficient solution to detect the obstacles with maximum range of 7 meters and 45 degree coverage

Figure 2.0a:The Variation Of Smart Cane

2.1 Concept and theories of existing models

Traditionally cane just use as to know did have a obstacle to the blind people .Due to this, "Arduino Smart Cane" are dependent on sensor that detect obstacle to blind people and it will be vibrate and make a sound to the owner, so in the same time they (the owner) and other citizen need to make sure that blind people(owner) are safe and will be provided with the amount of criminal and the owner will be more safe.This innovation can help blind people in many ways.As stated in one of the articles;

> Another study in the same field to help blind people uses the pulse echo technique in order to provide a warning sound when detecting the obstacles. This technique is used by the United States military for locating the submarines. They used pulse of ultrasound range from 21 KHz to 50 KHz which hit the hard surface to generate echo pulses. By calculating the difference between signals transmit time and signal receiving time we can predict the distance between the user and the obstacles. This system is very sensitive in terms of detecting the obstacles. It has a detection range up to 3 meters and a detection angle 0 to 45 degree.

Figure 2.1 The operation of Smart Cane

2.2 General description of the existing system (problems, weaknesses, opportunities)

Blind people enjoy the walking stick, their benefits and the feeling related to safety them. However for most people it becomes challenging to keep them safety.

Other than that, blind people take care of their safety by checking the condition of the way by using traditional walking stick. Thus, it becomes problematic to those who don't really have time to spend time to handle their pack daily schedule and more importantly having a hard time carrying an existing smart cane which is quite heavy and bulk..

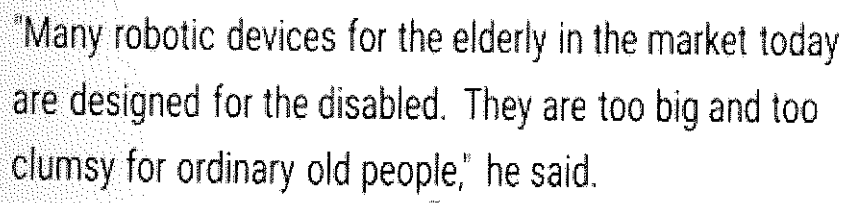

Figure 2.2:Disadvantages of smartcane technology

Thus, I taking this opportunity to develop a smart navigation system to help out these kinds of people to guide the in their journey so that the user would feel at ease during their journey. I believe that there is a need for a smart navigation system, which take care of all the different aspects in guiding them. I also believe that technology can assist people in many ways, not only by automation but also through digital communication with their owner.

2.3 Brief introduction of the proposed work/solution

This smart navigation system will enable the user to handle and plan their journey so that it will ease them to keep track the condition of their plan in a more effective way and improve their ways to manage and adjusting the action that they need to do for their self especially when the users are handicap.

As an example, this system is a demand product from other countries base on article below:

> According to Anubhav Mitra, Executive Director of the Saksham Trust, more than 6,000 Smart Canes have been sold in India, and there is also demand from overseas. "This Smart Cane is already selling in Sri Lanka and Iran," he said, adding that countries including Kenya, Ethiopia and Qatar have also shown interest.

Figure 2.3:Production of Smartcane on international market.

This project is designed according to the needs of an individual which it will help the user that use this system to take care of users no matter where they are, either at home or they are outside. Other than that this system also will help to keep track information regarding the walking stick and in the same way could enhance and make things easier for the owner of taking care of themself compare to the manual way. It could also help to assign action which will need immediate action about their condition. Thus, the user will easily reach their destination through their portable device and at the same time retrieve information with ease and faster.

2.4 Full system block diagram

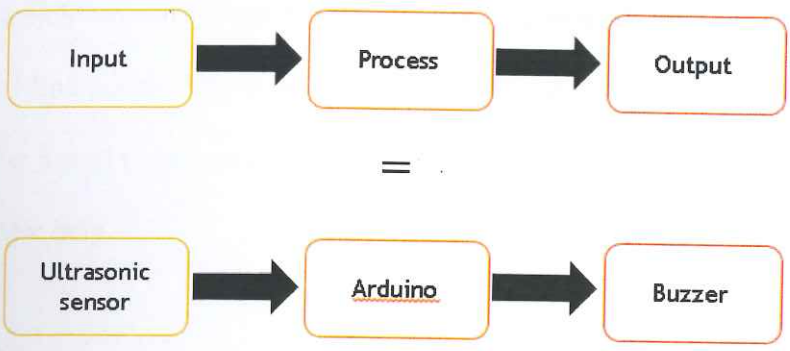

Figure 2.4 : Full system block diagram

This system controlled by Arduino Uno, which is coonected by ultrasonic sensor and buzzer. Ultrasonic sensor and buzzer will be controlled instruction on Arduino Uno. Ultrasonic sensor will be detect the obstacle of in front it then iw will send the code to the Arduino Uno.After the arduino receive the code,it will read the code and sent its deocoded code to the buzzer and the buzzer will gives a feedback response in a form of sound.. Arduino is the main board circuit, they is to control the whole instruction of the system by using C language programming.

2.5 Conclusion

From the article above,we can explain that the innovation of Smart Cane is very important to blind people.This is because they have hard time in walking without using their eyes.The Smart Cane can also help them to be more dependent without depending on other people help.

The smart cane is equipped with the main component such as an Arduino UNO,ultrasonic sensor,and a buzzer.The technology that works within this technology is that whenever the ultrasonic sensor senses a obstacle within its range,it will send a coding to the Arduino,Then,arduino will read the coding and send its information to the buzzer.Hence,the buzzer will generate a feedback and the user will acknowledge the feedback indicating there is a obstacle within a range nearby.