VISVESVARAYA TECHNOLOGICAL UNIVERSITY

Jnana Sangama, Belagavi - 590018

A Project Work Phase-2 (18CSP83)

Report on

"SMART STICK FOR BLIND PEOPLE"

Project Report submitted in partial fulfilment of the requirement for the award of the degree of

BACHELOR OF ENGINEERING

IN

COMPUTER SCIENCE AND ENGINEERING

Submitted by

DHIKSHITH T	1KG20CS029
GAUTHAM BJ	1KG20CS038
D TEJESH	1KG20CS022
J SASIDHAR	1KG20CS048

Under the guidance of

Mrs.Belji.T
Assistant Professor
Department of Computer Science & Engineering KSSEM,
Bengaluru-560109

K. S. School of Engineering and Management

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
#15,Mallasandra, off. Kanakapura Road, Bengaluru – 560109
2023 - 2024

K. S. School of Engineering and Management

#15, Mallasandra, off. Kanakapura Road, Bengaluru - 560109

Department of Computer Science & Engineering

CERTIFICATE

Certified that the Project Work Phase-II (18CSP83) entitled **"SMART STICK FOR BLIND PEOPLE"** is a bonafide work carried out by:

DHIKSHITH T	1KG20CS029
GAUTHAM BJ	1KG20CS038
D TEJESH	1KG20CS022
J SASIDHAR	1KG20CS048

in partial fulfilment for VIII semester B.E., Project Work in the branch of Computer Science and Engineering prescribed by **Visvesvaraya Technological University, Belagavi** during the period of February 2024 to May 2024. It is certified that all the corrections and suggestions indicated for internal assessment have been incorporated. The Project Work Phase-2 Report has been approved as it satisfies the academic requirements in report of project work prescribed for the Bachelor of Engineering degree.

Signature of the Guide	**Signature of the HOD**	**Signature of the Principal**
[Mrs Belji T] Assistant professor,CSE, KSSEM, Bengaluru	[Dr. K Venkata Rao] Professor & Head, CSE, KSSEM,Bengaluru	[Dr. K Rama Narasimha] Principal & Director KSSEM,Bengaluru

HOD
Department of Computer Science Engineering
K.S School of Engineering & Management
Bangalore-560109

Dr. K. RAMA NARASIMHA
Principal/Director
K S School of Engineering and Management
Bengaluru - 560 109

DECLARATION

We, the undersigned students of 8th semester, Computer Science & Engineering, KSSEM, declare that our Project Work Phase-II entitled "SMART STICK FOR BLIND PEOPLE", is a bonafide work of our's. Our project is neither a copy nor by means a modification of any other engineering project.

We also declare that this project was not entitled for submission to any other university in the past and shall remain the only submission made and will not be submitted by us to any other university in the future.

Place:

Date :

Name and USN		Signature
DHIKSHITH T	1KG20CS029	
GAUTHAM BJ	1KG20CS038	
D TEJESH	1KG20CS022	
J SASIDHER	1KG20CS048	

ACKNOWLEDGEMENT

The satisfaction and euphoria that accompany the successful completion of any task will be incomplete without the mention of the individuals, we are greatly indebted to, who through guidance and providing facilities have served as a beacon of light and crowned our efforts with success.

We would like to express our gratitude to our **MANAGEMENT,** K.S. School of Engineering and Management, Bengaluru, for providing a very good infrastructure and all the kindness forwarded to us in carrying out this project work in college.

We would like to express our gratitude to **Dr. K.V.A Balaji, CEO**, K.S. School of Engineering and Management, Bengaluru, for his valuable guidance.

We would like to express our gratitude to **Dr. K. Rama Narasimha, Principal**, K.S. School of Engineering and Management, Bengaluru, for his valuable guidance.

We like to extend our gratitude to **Dr. K Venkata Rao**, **Professor and Head**, Department of Computer Science & Engineering, for providing a very good facilities and all the support forwarded to us in carrying out this Project Work Phase-2 successfully.

We also like to thank our Project Coordinators, , **Mrs.Supriya Suresh Suchindra , Asst. Professor, Mrs.Meena.G,Asst.Professor,Department of Computer.Science & Engineering** for their help and support provided to carry out the Project Work Phase-2 successfully.

Also, we are thankful to **Mrs.Belji T ,Asst.Professor,Department of Computer.Science & Engineering** for being our Project Guide, under whose able guidance this project work has been carried out Project Work Phase-2 successfully.

We are also thankful to the teaching and non-teaching staff of Computer Science & Engineering, KSSEM for helping us in completing the Project Work Phase-2 work.

Name & USN

DHIKSHITH T	1KG20CS029
GAUTHAM BJ	1KG20CS038
D TEJESH	1KG20CS022
J SASIDHER	1KG20CS048

ABSTRACT

The Smart Stick for Blind People using Arduino Board is an innovative assistive technology designed to enhance the mobility and independence of visually impaired individuals. The project utilizes a combination of ultrasonic sensors, an Arduino micro controller, and audio feedback to provide real-time environmental information to the user, aiding them in navigating their surroundings safely. The system employs ultrasonic sensors to detect obstacles in the user's path. The Arduino board processes the sensor data and translates it into audible signals, which are then relayed to the user through a set of headphones or a small speaker. These signals provide information about the distance and location of obstacles, allowing the user to make informed decisions about their movements. The Smart Stick for Blind People offers a practical and affordable solution to address the mobility challenges faced by visually impaired individuals, empowering them to navigate through their surroundings with increased confidence and independence. The project aligns with the principles of inclusive design and aims to make a positive impact on the lives of those with visual impairments

TABLE OF CONTENTS

LIST OF FIGUR

Chapter 1

INTRODUCTION

1.1 Overview

There are 285 million people worldwide that have some level of visual impairment. The blind navigation system caters to the needs of the blind people who are not able to move from one place to another without the help of others. Recent survey source of India has now become the world's largest number of blind people. There are 37 million blind people across the globe, of which 15 million people are from India. The usage of the blind navigation system is very less and not efficiently used for Indian environment. The blind traveller should depend on any other guide like blind cane, people's information, trained dogs, etc. Visual function can be classified by four tiers: normal vision, moderate visual impairment, severe impairment, and complete blindness. Legally blind refers to a person who has less than 20/200 vision in either eye, or a limited field of vision. Many virtually impaired people use walking sticks and guide dogs to move from place to place.For this group of population; the goal is often to complete tasks in the least obstructive method. A guide dog is trained to guide its users to avoid the accidents from objects and barriers. When a visually impaired person is using a walking stick, they wave their walking stick and find the obstacle by striking obstacles ahead of them.

God gifted sense to human being which is an important aspect in our life is vision. We are able to see the beauty of nature, things which happen in day-to-day life with the help of our eyes. But there are some people who lack this ability of visualizing these things. They face many difficulties to move on with their daily life. The problem gets worse when they move to an unfamiliar location. Visually impaired people face many challenges when moving in unfamiliar public places. As many of these people have difficulty knowing where they are or where they are going, frequently feeling totally disorientated or even isolated, supplemental navigational guidance is very important for them. Navigation involves updating one's position and orientation while he or she is travelling an intended route, and in the event the person becomes lost, reorienting and re-establishing a route to the destination.

1.2 Purpose of the Project

God gifted sense to human being which is an important aspect in our life is vision. We are able to see the beauty of nature, things which happen in day-to-day life with the help of our eyes. But there are some people who lack this ability of visualizing these things. They face many difficulties to move on with their daily life. The problem gets worse when they move to an unfamiliar location. Visually impaired people face many challenges when moving in unfamiliar public places. Hence a system has to be found to minimize the difficulties of virtually impaired people to reach their destination. Studies indicate that there are approximately 10 to 11 million blind and visually impaired people in North America, and this number is growing at an alarming rate. As many of these people have difficulty knowing where they are or where they are going, frequently feeling totally disorientated or even isolated, supplemental navigational guidance is very important for them. Navigation involves updating one's position and orientation while he or she is travelling an intended route, and in the event the person becomes lost, reorienting and re-establishing a route to the destination.

1.3 Scope of the Project

Diabetic eye disorders refer to a group of eye conditions that can affect individuals with diabetes. These disorders are primarily caused by changes in the blood vessels of the retina, the light-sensitive tissue at the back of the eye. The most common diabetic eye disorders include diabetic nephropathy, diabetic oracular edema, cataracts, and glaucoma. The scope of diabetic eye disorders encompasses various facts, including epidemiology, healthcare infrastructure, research, technology, public health, and global collaboration. Efforts in these areas aim to mitigate the impact of diabetic eye disorders and improve the quality of life for individuals living with diabetes.

1.4 Definitions

INTRODUCTION TO INTERNET ON THINGS

The Internet of Things (Io T) is the interconnection of uniquely identifiable embedded computing devices with in the existing Internet in infrastructure.Typically,Io T is expected to offer advanced connectivity of devices, systems, and services that goes beyond machine-to-machine communications (M2M) and covers a variety of protocols, domains, and applications. The interconnection of these embedded devices (including smart objects), is expected to user in automation in nearly all fields, while also enabling advanced applications like a Smart Grid. Things, in the Io T, can refer to a wide variety of devices such as heart monitoring implants, bio chip transponders on farm animals, electric clam sin coastal waters,automobiles with built-in sensors,or field operation devices that assist fire- fighters in search and rescue. Current market examples include thermostat systems and washer/dryers that utilize WiFi for remote monitoring.

Things Oriented Vision

This vision is supported by the factthatwecantrackanythingusingsensorsandpervasive technologies using RFID. The basic philosophy is uniquely identifying any object using specifications of Electronic Product Code(EPC).This technique is extended using sensors.It is important to appreciate the fact that future vision will depend upon sensors and its capabilities to fulfill the “things” oriented vision. We will be able to generate the data collectively with the help of sensors, and sensor type embedded system. The summarized vision will be dependent upon sensor based networks as well as RFID-based Sensor Networks which will take care of the integration of technology based on RFID and sophisticated sensing and computing devices and the global connectivity.

Semantic Oriented Vision

This visionis powered by the fact that the amount of sensors which will be available at ourdisposa ill be huge and the data that they will collect will be massive in nature. Thus we will have vast amount of information, possibly redundant, which needs to be processed meaningfully. The raw data needs to be managed, processed and churned out in an understandable manner for better representations and understanding .If we are able to make the sets of data into homogeneous and heterogeneous formats then the interoperability issues of understanding the data will be dependent upon the semantic technologies to process the data.It is here that needs generic vision of processing the raw data into meaningful at a and a marked separation of data and the ir interpretation.

Wireless Sensor Networks hardware

Typically a WSN node contains interfaces to sensors, computing and processing units, transceiver units and power supply.More sophisticate sensorndes can communicate over multiple frequencies

Communication Mechanism

All the objects that are present in the environment can be called object fit to bethe "things" of the internet. All these objects need an address which must be unique. This uniqueness property will beaunique constraintand it will pavethe way to gather information an devencontrol sensor based devices.Internet Protocol is the standar dbased protocol which is used for internet working methods of Internet. The first version was IPv4 and was thought of having huge address spaces. But IPv4 got exhausted. smart embedded devices or simply a sensor. Their communication mechanisms will be Wi-Fi, DSL, Satellite, Cable, Ethernet and so forth.

The typical packet size of the communicating protocol will be around 1500 data bytes to 9000 data bytes and even more. Today large amount of spatial data is also being generated and thus we can use to use metadata for connecting database and Internet. As happens in World Wide Web, the operations with sensor nodes may not be possible by giving unique names to the sensors. Instead a unique address scheme must be formulated and will be known as Unique Resource Name (URN).A look up table of these URN must be present at the centralized node commonly known as gateway to the sensor sub system.

Data Storage

As Io T is getting developed the amount of data getting created is huge. The data centers which will be storing this data will also needs space requirement as well as the energy and power resources. It is this data which needs to be organized and processed.

Visualization

Any interaction of user environment will need proper visualization software which will highlight the sensing mechanism as well the interpretation of data scenario too.Touch screens and smart embedded table shave created conductive environment for the system. The information which is being processed in to meaningful data using sensor fusion algorithms will present lot many inferences about the current situation.

Tracking

The basis of this tracking is indeed RFID tags which are placed on object, human beings, animals, logistics etc. RFID tag reader may be used in all the intermediate stages for tracking anything which has the RFID tag in it. This object position identification can be smartly used to trigger an alarm, event or a specific inference regarding a specific subject

Semantic data fusion models will also be required to create meaning out of this data .Artificial Intelligence algorithms must be applied to extract meaning from this redundant data .Datastorage and analysis will be a challenge when the whole world will be connected through IoT .Semantic data fusion models will also be required to create meaning out of thisdata. Artificial Intelligence algorithms must be applied to extract meaning from this redundant data.Data storage and analysis will beach allege when the whole world will be connected through Io T

Local, Global and Social Sensing

Imagine a scenario where each of the family members of the family have a RFID enabled gadget and thus object tracking can result actually in human tracking. This can readily happeninIoTwherecommonmobilephonescanbeusedfortrackinghumanbeings.There can be various types of sensors based devices which can be used for such type of tracking. This is whole process is known as local,global and social sensing.The object can be tracked locally, globally and in any place, any time and over any network

Internet Oriented Vision

The internet-oriented vision has pressed upon the need to make smart objects which are connected. The objects need to have characteristics of IP protocols as this is one of the major protocols being followed in the world of Internet. The sensor based object can be converted into an understandable format,which can be identified uniquely an distributes can be continuously monitored.This makes the base for smart embedded objects which can be assumed to be a microcomputers having computing resources.

Healthcare Monitoring Applications

a scenario in a village where old age persons, infants, pregnant ladies etc. have RFID enabled chips over their bodies to track their vital health parameters. Any unusual activity on their part will raise an alarm or an alert in the nearby local medical assistance home.For example,RFID chip scan beim plant patient orderings to track the irmedical history. Sensor technology can be used in emergency response, and health monitoring applications. The information can be used to give medical assistance to the needful person and in case of higher abnormalities, the nearby efficient hospitals can be alerted and thus the hospitalization costs can be reduced through early intervention and treatment.

Semantic Oriented Vision

This visions powered by the fact that the amount of sensors which will be available at our disposal will be huge and the data that they will collect will be massive in nature. Thus we will have vast amount of information, possibly redundant, which needs to be processed meaningfully. The raw data needs to be managed, processed and churned out in an understandable manner for better representations and understanding.

If we are able to make the sets of data into homogeneous and heterogeneous formats then the interoperability issues of understanding the data will be dependent upon the semantic technologies to process the data.It is here that need generic vision of processing the raw data in to meaning fuldata and a marked separation of data and their interpretation.

Chapter 2

LITERATURE SURVEY

2.1 Smart Stick for the Blind and Visually Impaired People

Date of Conference: 20-21 April 2018

Date Added to IEEE *Xplore*: 27 September 2018

Authors:

Mukesh Prasad Agrawal

Department of Electrical Engineering, National Institute of Technology Kurukshetra, Kurukshetra, Haryana, 136119, India

Atma Ram Gupta

Department of Electrical Engineering, National Institute of Technology Kurukshetra, Kurukshetra, Haryana, 136119, India

There are many issues over which humans have no control blindness is one of such issues. It snatches the vivid visual beauty of the world from an individual's life. But missing the beauty of nature becomes one of the last worries of such people as they have to face numerous difficulties in order to perform even the most basics of tasks in their day to day life. One of their most dominant problems is of transport, such as crossing roads, traveling in trains, or other public places. They always require human assistance to do so. But sometimes they are rendered helpless when no such assistance is offered. Their dependencies deteriorate their confidence. Traditionally they have been using the conventional cane stick to guide themselves by touching/poking obstacles in their way. This causes a lot of accidents and hence is dangerous for them and others. As this is a technologically driven era we decided to aid these differently abled people by coming up with a technology utilizing solution. We call it the “Smart Stick”.

2.2 Autonomous walking stick for the blind using echolocation and image processing

Date of Conference: 14-17 Dec. 2016

Date Added to IEEE *Xplore*: 04 May 2017

Authors:

Akhilesh Krishnan

Department of Computer Science and Engineering, Easwari Engineering College, Chennai, India

G Deepakraj

Department of Computer Science and Engineering, Easwari Engineering College, Chennai, India

The smart walking stick, the Assistor, helps visually challenged people to identify obstacles and provide assistance to reach their destination. The Assistor works based on the technology of echolocation, image processing and a navigation system. The Assistor may serve as a potential aid for people with visual disabilities and hence improves their quality of life. There is a lot of work and research being done to find ways to improve life for visually challenged people. There are multiple walking sticks and systems which help the user to move around, indoor and outdoor locations but none of them provide runtime autonomous navigation along with object detection and identification alerts. The Assistor uses ultrasonic sensors to echo sound waves and detect objects. An image sensor is used to identify the objects in front of the user and for navigation by capturing runtime images and a Smartphone app is used to navigate the user to the destination using GPS (Global Positioning System) and maps

2.3 Assistive infrared sensor based smart stick for blind people

Date of Conference: 28-30 July 2015

Date Added to IEEE *Xplore*: 03 September 2015

Authors:

Ayat A. Nada

Department of Computers and Systems, Electronics Research Institute, Giza, Egypt

Mahmoud A. Fakhr

Department of Computers and Systems, Electronics Research Institute, Giza, Egypt

Ahmed F. Seddik

Department of Biomedical Engineering, Faculty of Engineering, Helwan, University, Cairo, Egypt

Blind people need some aid to feel safe while moving. Smart stick comes as a proposed solution to improve the mobility of both blind and visually impaired people. Stick solution use different technologies like ultrasonic, infrared and laser but they still have drawbacks. In this paper we propose, light weight, cheap, user friendly, fast response and low power consumption, smart stick based on infrared technology. A pair of infrared sensors can detect stair-cases and other obstacles presence in the user path, within a range of two meters. The experimental results achieve good accuracy and the stick is able to detect all of obstacles.

2.4 Embedded Assistive Stick for Visually Impaired Persons

Date of Conference: 10-12 July 2018

Date Added to IEEE *Xplore*: 18 October 2018

Authors:

Himanshu Sharma

Dept. of CSE, MNIT Jaipur, Jaipur, India
MeenakshiTripathi
Dept. of CSE, MNIT Jaipur, Jaipur, India
Amit Kumar
Dept. of CSE, IIIT Kota, Jaipur, India
Manoj Singh Gaur
Dept. of CSE, IIT Jammu, Jammu, India

In this paper, a smart stick is intended and executed to aid blind persons so that they can walk independently without much difficulty. Firstly, pothole detection and avoidance system are implemented by setting the ultrasonic sensor at 30-degree angle on a suitable blind stick to sense if there is a hole or staircase in front of the blind at about 30 cm distance to avoid a person from falling and as a result may be producing many damages. Secondly, a moisture sensor is placed at the down of stick to measure the degree of water land soil moisture in forward-facing of the user and aware him as soon as that degree exceeds a measured level that may submerge the foot of him. Thirdly, knee above obstacle detection and avoidance system is implemented by using an additional ultrasonic sensor on the top of the stick to turn an alarm and vibration ON when there is a person, obstacle or wall at a distance of 50 cm in front to avoid an accident and thus helping the person to move independently. Fourthly, an ultrasonic sensor is placed down the stick at about 20 cm from the ground level to detect and avoid knee below obstacles and stairs at a distance of 70 cm in front of the user. Fifthly, a wireless remote consisting of RF modules (transmitter and receiver) is implemented, so if a person drops stick or forget it somewhere, he can press a switch of the remote consisting of transmitter part, and as a result alarm with vibrations will turn on, so the user can know the location of the stick.

2.5 Advanced electronics based smart mobility aid for the visually impaired society

Date of Conference: 19-22 Feb. 2012

Date Added to IEEE *Xplore*: 03 April 2012

Authors:

Ahmed El-Koka

Division of Computer and Information Engineering, Dongseo University, Korea
Gi-Hyun Hwang
Division of Computer and Information Engineering, Dongseo University, Korea
Dae-Ki Kang
Division of Computer and Information Engineering, Dongseo University, Korea

The realm of electronics has been growing rapidly in the past few decades. Nowadays, advanced electronics are employable in assisting the visually impaired society in various ways. According to the World Health Organization, approximately 285 million people of all ages are blind, which is a significantly enormous number [1]. Major researches have been under consideration on developing a smart stick with various sensors attached to it to be used as a mobility aid by the blind as a part on an ongoing study. For seeking a smoother routine life and welfare towards the blind society, this paper proposes and analyses a new thought in eliminating the stick and mount these sensors on the blind person body itself. The mechanism of this system, the electronic flow of detection signal and feedback are illustrated.

2.6 BlinDar: An invisible eye for the blind people making life easy for the blind with Internet of Things (IoT)

Date of Conference: 19-20 May 2017

Date Added to IEEE *Xplore*: 15 January 2018

Authors:

ZeeshanSaquib

ECE Dept, BNMIT, Bangalore

VishakhaMurari

ECE Dept, BNMIT, Bangalore

Suhas N Bhargav

ECE Dept, BNMIT, Bangalore

Blindness is a condition in which an individual loses the ocular perception. Mobility and self-reliability for the visually impaired and blind people has always been a problem. In this paper a smart Electronic Traveling Aid (ETA) called BlinDar has been proposed. This smart guiding ETA ameliorates the life of blind as it is well equipped with Internet of Things (IoT) and is meant to aid the visually impaired and blind to walk without constraint in close as well as open environments. BlinDar is a highly efficient, reliable, fast responding, light weight, low power consuming and cost effective device for the blind. Ultrasonic sensors have been used to detect the obstacle and potholes within a range of 2m. GPS and ESP8266 Wi-Fi module has been used for sharing the location with the cloud. MQ2 gas sensor is used for detecting fire in path and a RF Tx/Rx module for finding the stick when it is misplaced. Arduino Mega2560 is the microcontroller used, which has 54 digital I/O pins which makes the interfacing of components easy.

2.7 Arduino based automated STICK GUIDE for a visually impaired person

Date of Conference: 2-4 Aug. 2017

Date Added to IEEE *Xplore*: 30 October 2017

Authors:

KunjaBihari Swain

Department of Electronics and Instrumentation Engineering, National Institute Of Science and Technology Berhampur, India

Rakesh Kumar Patnaik

Department of Electronics and Instrumentation Engineering, National Institute Of Science and Technology Berhampur, India

Suchandra Pal

Department of Electronics and Instrumentation Engineering, National Institute Of Science and Technology Berhampur, India

In this paper a stick guide model represented for visually impaired persons to guide in their way, which consist of a Global Positioning System (GPS) and a Global System for Mobile communication (GSM) modules along with sensors like Ultrasonic and Infrared sensors. This is a smart stick that will make the visually impaired persons guiding their way. GPS module is used in this to get the current location information of the person, that location will be sent via Short Message Service (SMS) to the registered numbers using a GSM module, on pressing of a switch whenever he feels he is lost. Ultrasonic sensors are used for obstacle detection through the ultrasonic waves produced by it, and Infrared sensor is used for level detection and both the sensors are interfaced with the vibrator which vibrates on detecting an obstacle. The main objective of this model is to help a blind to live a better life.

2.8 Blind aid stick: Hurdle recognition, simulated perception, android integrated voice based cooperation via GPS along with panic alert system

Date of Conference: 27-28 Jan. 2017

Date Added to IEEE *Xplore*: 15 June 2017

Authors:

AkshaySalilArora

Electronics and Telecommunication.RamraoAdik, Institute of Technology, Navi Mumbai, India

VishakhaGaikwad

Electronics and Telecommunication.RamraoAdik, Institute of Technology, Navi Mumbai, India

Evolution of technology has always been endeavored with making daily life simple. With a fast paced life everybody today is harnessing the benefits of technology except some parts of the society. One of them is the visually impaired who have to rely on others for travelling and other activities. This paper aims at providing one such theoretical model which incorporates the latest technologies to provide efficient and smart electronic aid to the blind. We have used IR sensors along with ultrasonic range finder circuit for hurdle detection. Bluetooth module which along with GPS technology and an Android application for blind, will provide voice assistance to desired location and in panic situations will send SMS alert to registered mobile numbers The basic objective of the system is to provide a convenient and easy navigation aid for unsighted which helps in artificial vision by providing information about the environmental scenario of static and dynamic objects around them.

2.9 Design and implementation of mobility aid for blind people

Date of Conference: 12-14 Aug. 2015

Date Added to IEEE *Xplore*: 24 September 2015

Authors:

B.S. Sourab
RanganathaChakravarthy H.S

EEE Department, BNM Institute of Technology, Bangalore, India

Sachith D'Souza

EEE Department, BNM Institute of Technology, Bangalore, India

With the scope of electronics increasing day by day, the need for utilizing these advanced technologies to make human lives simpler is becoming more and more necessary. The demand for using these technologies to make lives easier for disabled people is also increasing. This has prompted many new areas of research and one of the areas is electronic mobility aid for blind people. According to the World Health Organization, approximately285 million people of all ages are blind, which is significantly a large number [1]. Traditional mobility aids include the white stick and the guide dogs which take a lot of time getting used to. There are a few smart systems available in the market which uses electronic sensors mounted on the cane but those systems also have certain disadvantages. This paper analyses the available solutions and proposes an entire new approach to solve the above problem. The new approach not only eliminates the disadvantages of the existing solutions, but it also is reliable, cost effective and most importantly easier to use.

2.10 Performance comparison of communication module againts detection location for blind cane

Date of Conference: 26-27 Oct. 2017

Date Added to IEEE *Xplore*: 01 February 2018

Authors:

GivaAndrianaMutiara

Applied Science School, Telkom University, Bandung, Indonesia
Gita Indah Hapsari
Applied Science School, Telkom University, Bandung, Indonesia
Periyadi
Applied Science School, Telkom University, Bandung, Indonesi

A Blind Cane is a tools resembles an ordinary wooden stick that can help blind people to recognize the environment atmosphere around them. However, this Blind Cane only help the blind, passively. Many research has been developed and enhanced for the Blind Cane. One of the research conducted is to create a smart cane that can detect the location while the blind doing travel. This research is comparing the performance comparison of module communication that will be implemented on Blind Cane in Telkom University area. There are three module communications that will be compared in order to have the best performance and the most economics cost implementation. They are module NRF24L01, module XBee Pro S2C, and module USR-BLE101. Based on the testing scenario, the best performance module communication is gained by XBee Pro S2C Module. While the minimum cost for implementation system is using module communication NRF24L01.

Chapter 3

PROBLEM IDENTIFICATION

The Internet of Things (Io T) is the interconnection of uniquely identifiable embedded computing devices with in the existing Internet infrastructure.Typically,Io T is expected to offer advanced connectivity of devices, systems, and services that goes beyond machine-to-machine communications (M2M) and covers a variety of protocols, domains, and applications. The interconnection of these embedded devices (including smart objects), is expected to user in automation in nearly all fields, while also enabling advanced applications like a Smart Grid. Things, in the Io T, can refer to a wide variety of devices such as heart monitoring implants, bio chip transponders on farm animals, electric clams in coastal waters, auto Mobil es with built-in sensors,or field operation devices that assist fire- fighters in search and rescue. Current market examples include thermostat systems and washer/dryers that utilize WiFi for remote monitoring.According to Garner, Inc.

3.2 Problem Statement

To a large extent, the future of the Internet of Things will not be possible without the support of IPv6 and consequently the global adoption of IPv6 in the coming years will be critical for the successful development of the Io T in the future. The embedded computing nature of many Io T devices means that low-cost computing plat forms are likely to be used. In fact, to minimize the impact of such devices on the environment and energy consumption, low-power radios are likely to be used for connection to the Internet. Such low-power radios do not use WiFi, or well established Cellular Network technologies,and remain an actively developing research area.

3.3 Project Scope

The scope of this system is to develop a low-cost system that assist the blind and visually impaired without the help of sighted person. The system is a Wi-Fi based so that it takes the advantages of the Wi-Fi network such as the popularity and cost-effectiveness.

Chapter 4

GOALS AND OBJECTIVES

1. **Enhanced Navigation** : Enable blind individuals to navigate safely and independently through various environments, including indoor and outdoor spaces.

2. **Obstacle Detection and Avoidance**: Develop a system that can detect obstacles in the path of the user and provide timely alerts to avoid collisions.

3. **Distance Measurement** : Implement distance sensors to accurately measure the proximity of obstacles or objects in the surroundings, providing real-time feedback to the user.

4. **Audio Feedback** : Integrate audio feedback mechanisms to communicate information about the environment to the user, such as the presence and location of obstacles, changes in terrain, or approaching intersections.

5. **Vibration Feedback** : Incorporate vibration feedback to supplement audio cues, providing tactile feedback to the user for enhanced awareness of their surroundings.

7. User-Friendly Interface : Design an intuitive and easy-to-use interface for controlling and interacting with the Smart Stick, considering the unique needs and abilities of blind users.

8. Battery Efficiency : Optimize power consumption to ensure extended battery life, allowing users to rely on the Smart Stick for extended periods without frequent recharging.

9. Durability and Portability : Ensure that the Smart Stick is durable, lightweight, and portable, making it suitable for daily use in various environments and weather conditions.

10.Integration with Existing Assistive Technologies : Explore opportunities to integrate the Smart Stick with other assistive technologies or smartphone applications commonly used by blind individuals, enhancing its functionality and usability.

11.Cost-Effectiveness : Strive to develop the Smart Stick using affordable and readily available components, making it accessible to a wide range of users, including those in resource-constrained settings.

12.User Testing and Feedback : Conduct thorough testing with blind individuals to gather feedback on the usability, effectiveness, and overall user experience of the Smart Stick, interactively refining the design based on their input.

Chapter 5

SYSTEMREQUIREMENT SPECIFICATION

HARDWARE & SOFTWARE REQUIREMENTS:

5.1 Hardware Requirements:

- Microcontroller- Arduino Uno(ATmega328p)
- Ultrasonic sensor (HC-SR04)
- Mems Sensor
- IR Sensor
- Light dependent resistor (LDR)
- Moisture sensor
- NodeMCU
- Buzzer
- Switch

5.2 Software Requirements:

- Arduino IDE
- Embedded C
- Laptop
- Open Cv

Chapter 6

METHODOLOGY

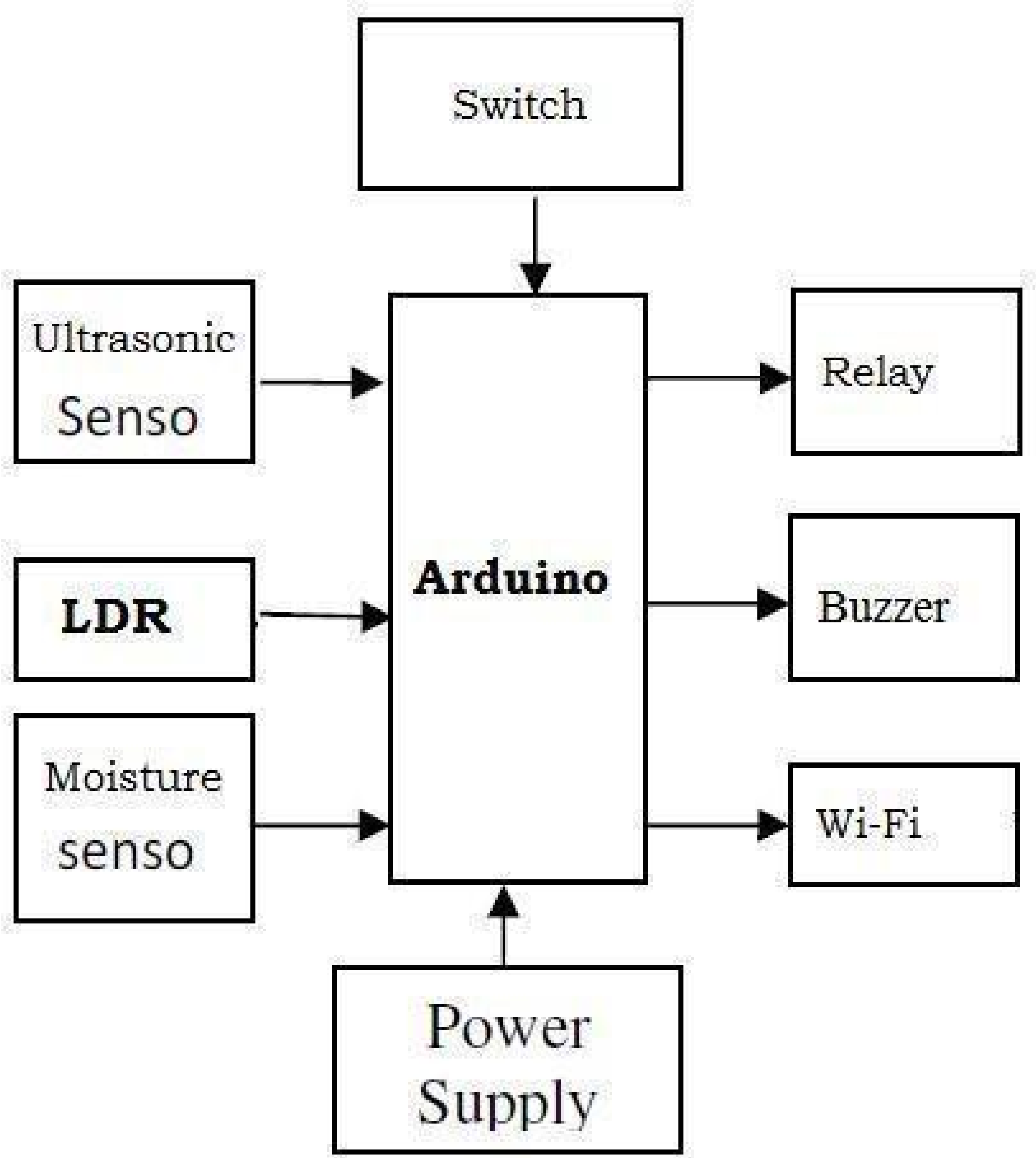


Fig 01 block diagram

The system is fully an embedded based system. Embedded Systems is the evolution or further development of computing system. The object avoidance algorithm prescribes an alternative direction that would clear the obstacle and then resume in the desired direction An embedded system is a combination of computer circuitry and software that is built into a product for purposes such as control, monitoring and communication without human intervention.There are two types of components 1)Hardware 2)Software

Blind stick is an innovative stick designed for visually disabled people for improved navigation. We here propose an advanced blind stick that allows visually challenged people to navigate with ease using advanced technology. The blind stick is integrated with ultrasonic sensor in fig along with water sensing. LDR used for light sensing. Our proposed project first uses ultrasonic sensors to detect obstacles ahead using ultrasonic waves. On sensing obstacles the sensor passes this data to the microcontroller. The microcontroller then processes this data and calculates if the obstacle is close enough. If the obstacle is not that close the circuit does nothing.

Chapter 7

IMPLEMENTATION

Text-to-speech (TTS) algorithm:-

Step 1: Start

Step 2: Choose option OP1 to convert text to voice.

Step 3: Call the function Text-to-Speech ().

Step 5: Convert text to speech using e-speak synthesizer.

Step 6: Voice is generated.

Step 7: Stop

6.4.2 Image-to-speech using camera (ITSC) algorithm:-

Step 1: Start

Step 2: Choose option OP2 to convert image to speech

Step 3: Call the function Image-to-Speech ().

Step 4: Capture the required image.

Step 5: Convert image to text using Tesseract OCR.

Step 6: Split the text into paragraph.

Step 7: Text is displayed on the screen.

Step 8: Next, call TexttoSpeech () function.

Step 9: Convert text to speech using e-speak synthesizer.

Step 10: Voice is generated.

Step 11: Stop

Gesture-to-speech (GTS) algorithm:-

Step 1: Start

Step 2: Choose the option OP3 to convert gestures-to-text.

Step 3: Capture and read the gesture.

Step 4: Crop the useful portion.

Step 5: Convert RGB image to Grey scale

Step 6: Blur the image using Gaussian Blur algorithm.

Step 7: Pass the processed image to threshold method to get image.

Step 8: Find contours and object of the image.

Step 9: Next, find middle part using convex HULL method.

Step 10: Find the defects and edges of image.

Step 11: Find number of angles < 90 degree.

Step 12: Count the number of angles.

Step 13: The respective text is displayed.

Step 14: Stop

Speech-to-Text (STT) algorithm:-

Step 1: Start

Step 2: Choose the option OP4 for Speech-to-Text conversion.

Step 3: Call the function Speech-to-Text ().

Step 4: Open chromium browser and connect to the website

speechtexter.com

Step 5: Select any universal language.

Step 6: Speak now, by turning on microphone.

Step 7: Check, if the voice is perfect.

7.1 : Clear the screen.

7.2 : The text is displayed.

Step 8: Recognise it as error and resend the voice, goto step 4.

Step 9: Execute the above steps recursively, until correct output is

obtained.

Step 10: Stop

Text-to-speech (TTS) algorithm:-

Step 1: Start

Step 2: Choose option OP1 to convert text to voice.

Step 3: Call the function Text-to-Speech ().

Step 5: Convert text to speech using e-speak synthesizer.

Step 6: Voice is generated.

Step 7: Stop

Image-to-speech using camera (ITSC) algorithm:-

Step 1: Start

Step 2: Choose option OP2 to convert image to speech

Step 3: Call the function Image-to-Speech ().

Step 4: Capture the required image.

Step 5: Convert image to text using Tesseract OCR.

Step 6: Split the text into paragraph.

Step 7: Text is displayed on the screen.

Step 8: Next, call TexttoSpeech () function.

Step 9: Convert text to speech using e-speak synthesizer.

Step 10: Voice is generated.

Step 11: Stop

Gesture-to-speech (GTS) algorithm:-

Step 1: Start

Step 2: Choose the option OP3 to convert gestures-to-text.

Step 3: Capture and read the gesture.

Step 4: Crop the useful portion.

Step 5: Convert RGB image to Grey scale

Step 6: Blur the image using Gaussian Blur algorithm.

Step 7: Pass the processed image to threshold method to get image.

Step 8: Find contours and object of the image.

Step 9: Next, find middle part using convex HULL method.

Step 10: Find the defects and edges of image.

Step 11: Find number of angles < 90 degree.

Step 12: Count the number of angles.

Step 13: The respective text is displayed.

Step 14: Stop

Speech-to-Text (STT) algorithm:-

Step 1: Start

Step 2: Choose the option OP4 for Speech-to-Text conversion.

Step 3: Call the function Speech-to-Text ().

Step 4: Open chromium browser and connect to the website speechtexter.com

Step 5: Select any universal language.

Step 6: Speak now, by turning on microphone.

Step 7: Check, if the voice is perfect.

7.1 : Clear the screen.

7.2 : The text is displayed.

Step 8: Recognise it as error and resend the voice, goto step 4.

Step 9: Execute the above steps recursively, until correct output is obtained.

Step 10: Stop

7.2 PROGRAM

```
#include<LiquidCrystal.h>
const int
rs=13,en=12,d4=11,d5=10,d6=9,d7=8;
LiquidCrystal lcd(rs,en,d4,d5,d6,d7);
#include <SoftwareSerial.h>
SoftwareSerial Bluetooth(4, 5);
#include <Wire.h>
#include <Adafruit_Sensor.h>
#include
<Adafruit_ADXL345_U.h>
Adafruit_ADXL345_Unified accel = Adafruit_ADXL345_Unified();
#define trigPin 7
#define
echoPin 6 int
Buzzer=3;
int
Sw=2;
int
Vib=
15;
long
duration;
int
distance;
void
setup()
{
 pinMode(trigPin,
OUTPUT);
pinMode(echoPin,
```

```
INPUT);
pinMode(Buzzer,
OUTPUT);
  pinMode(Vib, OUTPUT);
pinMode(Sw,
INPUT_PULLUP);
Bluetooth.begin(9600);
Serial.begin(9600);
lcd.begin(16,2);
lcd.clear();
lcd.print("Smart
Blind");
lcd.setCursor(0,1);

lcd.print("Device");
delay(1000);
if(!accel.begi
n())

{

Serial.println("No valid sensor found");
while(1);
}
}
void loop()
{
Distance();
Wet_Check();
Fall_Check();
Emergency();
}
void Fall_Check()
```

```
{
 sensors_event_t event;
accel.getEvent(&event);
float
X_val=event.acceleration.x;
float
Y_val=event.acceleration.y;
/lcd.clear();
//      lcd.print("X:");
//      lcd.print(X_val);
//      lcd.setCursor(0,1);
//      lcd.print("Y:");
//      lcd.print(Y_val);
//delay(1000);
//  Serial.print("X: "); Serial.print(event.acceleration.x); Serial.print("  ");
//  Serial.print("Y: "); Serial.print(event.acceleration.y); Serial.print("  ");
// Serial.print("Z: "); Serial.print(event.acceleration.z); Serial.print("  ");
// Serial.println("m/s^2 ");
delay(500);
if((X_val<-7.50)||(X_val>7.5))
{
Serial.println("$Fall Detected#");
Bluetooth.begin(9600);
Bluetooth.println("Fall Detected");
delay(1000);
lcd.clear();
lcd.print("Fall Detected");
digitalWrite(Buzzer,HIGH);
digitalWrite(Vib,HIGH);
delay(1000);
digitalWrite(Buzzer,LOW);
digitalWrite(Vib,LOW);
String one ="Fall Detected AT:";
```

```
 String two
="http://maps.google.com/maps?&z=15&mrt=yp&t=k&q="; String
message= one + two +"12.8593142,77.5401834";
// Convert String to char array
int str_len = message.length() +
1; char textmessage[str_len];
 message.toCharArray(textmessage,str_len)
; Serial.print('$');
Serial.print(textmessage);
Serial.println('#');
delay(1000);
}
if((Y_val<-7.50)||(Y_val>7.5))
{
Serial.println("$Fall Detected#"); Bluetooth.begin(9600); Bluetooth.println("Fall Detected");
lcd.clear();
lcd.print("Fall Detected");
digitalWrite(Buzzer,HIGH);
delay(1000);
digitalWrite(Buzzer,LOW);
String one ="Fall Detected
AT:";
String two ="http://maps.google.com/maps?&z=15&mrt=yp&t=k&q=";

String message= one + two +"12.8593142,77.5401834";
// Convert String to char array
int str_len = message.length() +
1; char textmessage[str_len];
 message.toCharArray(textmessage,str_len)
; Serial.print('$');
Serial.print(textmessage);
Serial.println('#');
delay(1000);
```

```
}
}
void Emergency()
{
if(digitalRead(Sw)==LOW)
{
lcd.clear();
lcd.print("Emergency Detected");
Bluetooth.begin(9600);
Bluetooth.println("Emergency Detected");
Serial.println("$Emergency Detected#");

digitalWrite(Buzzer,HIGH);
digitalWrite(Vib,HIGH);
delay(1000);
digitalWrite(Buzzer,LOW);
digitalWrite(Vib,LOW);


}



}
void Wet_Check()
{
int
Wet_val=analogRead(A0);
Wet_val=1023-Wet_val;
lcd.clear();
lcd.print("Wet:"+String(Wet_
val)); delay(1000);
if(Wet_val>100)
```

```
{
Serial.println("$Wet Detected#");
Bluetooth.begin(9600);
Bluetooth.println("Wet Detected");


lcd.clear();
lcd.print("Wet Detected");
digitalWrite(Buzzer,HIGH);
digitalWrite(Vib,HIGH);
delay(1000);
digitalWrite(Buzzer,LOW);
digitalWrite(Vib,LOW);
}
}
void Distance()
{
digitalWrite(trigPin, LOW);
delayMicroseconds(5);
// Trigger the sensor by setting the trigPin high for 10 microseconds:
digitalWrite(trigPin, HIGH);
delayMicroseconds(10);
digitalWrite(trigPin, LOW);


// Read the echoPin, pulseIn() returns the duration (length of the pulse) in microseconds:
duration = pulseIn(echoPin, HIGH);
// Calculate the distance:
distance = duration * 0.034 / 2;
```

```
// Print the distance on the Serial Monitor (Ctrl+Shift+M):lcd.clear();
lcd.print("Distance =
"); lcd.print(distance);
lcd.print(" cm");


delay(500);
if(distance<5
0)
{

Serial.println("$Object Detected#");
Bluetooth.begin(9600);
Bluetooth.println("Object Detected");
lcd.clear();
  lcd.print("Object Detected");
digitalWrite(Buzzer,HIGH);
digitalWrite(Vib,HIGH);
delay(1000);
digitalWrite(Buzzer,LOW);
digitalWrite(Vib,LOW);

}
```

Chapter 8

RESULTS AND SNAPSHOTS

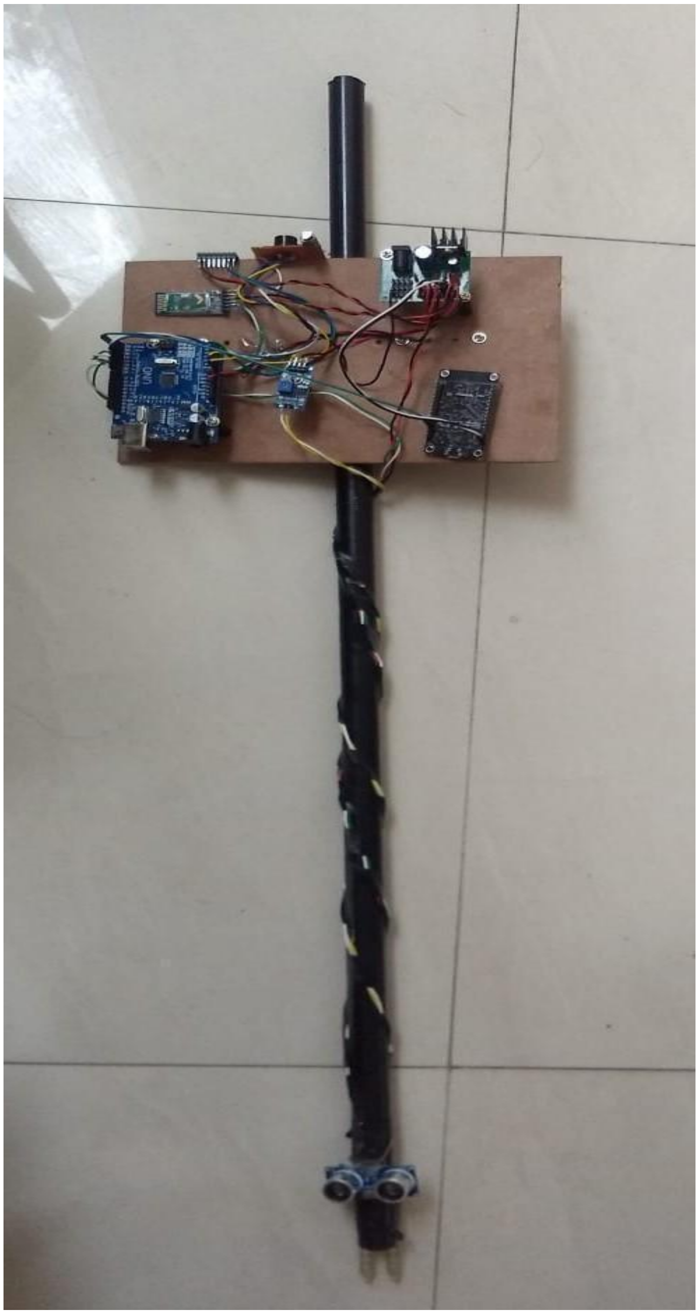


Fig 02 : smart stick

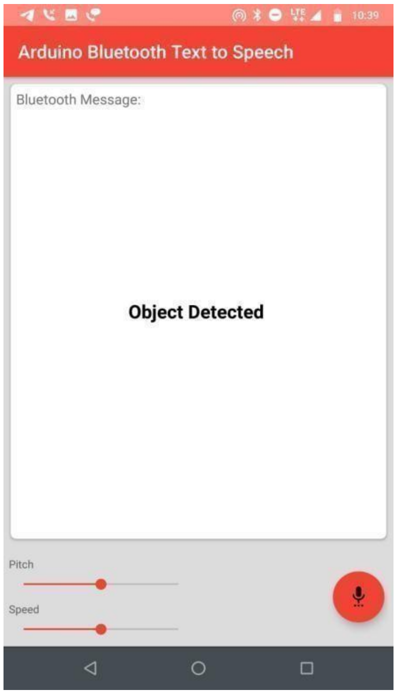


Fig 03: screen shot 01

fig 04:screen shot 02

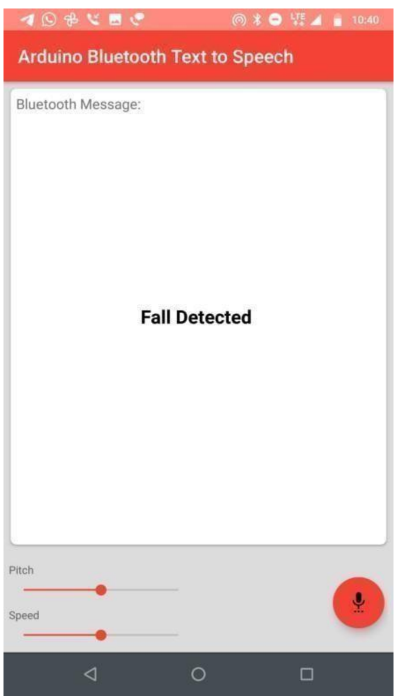


Fig 05 : screen shot 03

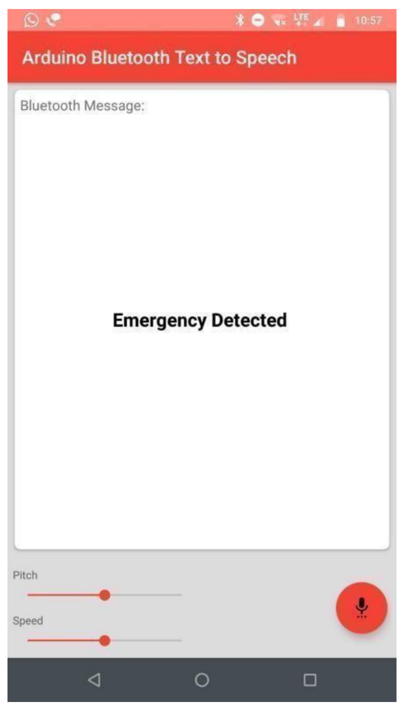


Fig 06 : screen shot 04

Chapter 9

APPLICATIONS

1. **Obstacle Detection and Alert System**: Equip the smart stick with ultrasonic sensors or infrared sensors to detect obstacles in the user's path. Arduino can process sensor data and trigger alerts, such as vibrating motors or audible beeps, to warn the user of obstacles ahead.
2. **Distance Measurement:** Utilize sensors to measure the distance between the smart stick and obstacles. Arduino can convert this distance data into audible or tactile feedback, helping the user gauge the proximity of objects.
3. **GPS Navigation:** Incorporate GPS modules into the smart stick to provide navigation assistance. Arduino can interface with GPS data to give the user information about their current location, destination, and turn-by-turn directions via audio cues or tactile feedback.
4. **Real-time Environment Monitoring**: Integrate environmental sensors (e.g., temperature, humidity, air quality) to provide real-time information about the surroundings. Arduino can process sensor data and convey relevant information to the user, aiding in decision-making and route planning.
5. **Smartphone Connectivity**: Enable the smart stick to connect to a smartphone via Bluetooth or Wi-Fi. This allows for additional features such as remote control, data logging, and interfacing with mobile applications designed for the visually impaired.
6. **Voice Assistance:** Implement voice recognition and synthesis capabilities using Arduino-compatible modules. This enables the user to interact with the smart stick through voice commands and receive spoken feedback or instructions.

battery warnings to ensure uninterrupted operation.

7. **Customizable Settings:** Develop a user interface (e.g., buttons, switches) that allows the user to customize settings such as sensitivity, alert thresholds, and navigation preferences.

Chapter 10

CONTRIBUTION TO SOCIETYAND DEVELOPMENT

1. **Enhanced Mobility and Independence:** By providing real-time obstacle detection, navigation assistance, and environmental feedback, the smart stick empowers blind individuals to navigate their surroundings with greater confidence and independence.

2. **Safety and Risk Mitigation:** The smart stick's ability to detect obstacles and provide alerts helps prevent accidents and injuries for blind individuals while navigating unfamiliar or crowded environments. By mitigating risks associated with mobility, it promotes safety and reduces the likelihood of falls or collisions, thereby improving the overall well-being of users.

3. **Education and Skill Development:** The development and use of the smart stick can facilitate the acquisition of essential skills such as orientation and mobility training for blind individuals. It serves as a practical tool for educators and rehabilitation professionals to teach navigation techniques and promote spatial awareness, empowering users to navigate their surroundings more effectively.

4. **Technology Accessibility and Inclusion:** By leveraging affordable and accessible technologies such as Arduino microcontrollers and sensors, the smart stick promotes inclusivity and accessibility in the design of assistive devices. Its open-source nature encourages collaboration, innovation, and customization, enabling developers and communities to adapt the technology to meet diverse user needs and preferences.

5. **Empowerment and Dignity:** Access to assistive technologies like the smart stick enhances the autonomy and self-esteem of blind individuals by enabling them to participate more actively in daily activities and make informed decisions about their mobility. It promotes a sense of empowerment and dignity by reducing reliance on sighted assistance and fostering greater independence in navigating the physical environment.

Chapter 11

REFERENCES

[1] Chaudhry M., Kamran M., Afzal S., “Speaking monuments — design and implementation of an RFID based blind friendly environment”, 2nd ICEE International Conf. on 25-26 March, 2008.

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

[3] World Health Organization (2009) Visual impairment and blindness- Fact Sheet N°282. Available online at: http://www.who.int mediacentre/ factsheets/fs282/en/

[4] Johann B. and Iwan U. “The GuideCane — A Computerized Travel Aid for the Active Guidance of Blind Pedestrians”, Proceedings of the IEEE International Conference on Robotics and Automation, Albuquerque, NM, Apr. 21-27, 1997, pp. 1283-1288.

[5] Sandra M., Nik A. M., Maxim M., Aaron S. “BlindAid: An Electronic Travel Aid for the Blind”, The Robotics Institute, Carnegie Mellon University, Pittsburgh, Pennsylvania 15213.

[6] B.R.Prudhvi and Rishab B. “Silicon Eyes: GPS-GSM based Navigation Assistant for Visually Impaired using Capacitive Touch Braille Keypad and Smart SMS Facility” Computer and Information Technology (WCCIT), World Congress on 2013, Pages: 1-3, DOI: 10.1109/

The Report is Generated by DrillBit Plagiarism Detection Software

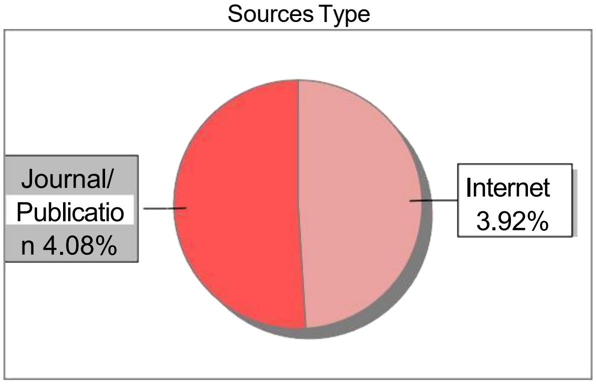
Submission Information

Author Name	Deekshith T
Title	Smart Stick for the Blind and Visually Impaired People
Paper/Submission ID	1808587
Submitted by	supriyasuresh@kssem.edu.in
Submission Date	2024-05-15 13:56:50
Total Pages, Total Words	28, 2933
Document type	Project Work

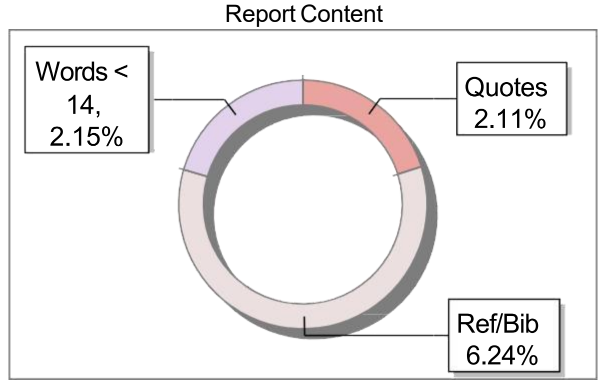
Result Information

Similarity **8 %**

Sources Type



Report Content



Exclude Information

Quotes	Excluded
References/Bibliography	Excluded
Source: Excluded < 14 Words	Not Excluded
Excluded Source	**8 %**
Excluded Phrases	Not Excluded

Database Selection

Language	English
Student Papers	Yes
Journals & publishers	Yes
Internet or Web	Yes
Institution Repository	Yes

A Unique QR Code use to View/Download/Share Pdf File