Indian Journal of Science and Technology, Vol 9(2), DOI: 10.17485/ijst/2016/v9i2/85809, January 2016
ISSN (Print) : 0974-6846
ISSN (Online) : 0974-5645

Design and Development of Blind Navigation System using GSM and RFID Technology

S. Dhananjeyan[1*], Dr. K. Mohana Sundaram[2], A. Kalaiyarasi[3] and Dr. P. G. Kuppusamy[4]

[1,2,3] Department of Electrical and Electronics, Vel Tech Multitech, Avadi, Chennai; jeyan.dhanan@gmail.com, kumohanasundaram@gmail.com, kalaiyarasi@veltechmultitech.org
[4]Department of Electronics and Communication Engineering, Vel Tech Multitech, Avadi, Chennai; kuppusamy@veltechmultitech.org

Abstract

Objectives: The main objective of this work is to provide a cost effective way to allow path planning for blind people. **Methods:** The Blind Audio guidance system hopes to allow the visually impaired users to simply press a button, speak the desired destination to the Blind customer care, and be guided there with the use of audio instructions. The system provides a portable unit that can be easily carried out and operated by a visually impaired user.. To implement a wrong path identification alert system for Blind and to provide blind to communicate with the customer care in a finger Tip. In this work ultrasonic and RFID are combined to navigate the blind. **Findings:** The tool provides information about the direct surroundings of the blind to allow him to move around without collisions. The Obstacles around the blind person up to a certain distance can be understand by a system using a sensors. **Applications/Improvements:**

Keywords: Blind Audio Guidance System, Blind Customer Care, RFID Technology, Blind Unit.

1. Introduction

About 1% of the Human Population is visually impaired, and amongst them about 10% is fully blind. For Global navigation, many tools already exist. For instance, in outdoor situations, handheld GPS systems for the blind are now available. These tools are not helpful for local navigation: local path planning, and collision avoidance. This paper describes the system architecture for a navigation tool for visually impaired person.

Whenever the blind wants to go to particular place, before that he/she will set the path through the mobile. Where ever he wants to go he has to carry this system. Customer care unit is for helping to set the path planning for Blind Person(BP) where he wants to go. By Pressing a One of the two present in the System Blind Person can make a call to customer care to give information about the Source and Destination Places. So the Customer Care unit will send the path planning IDs to the Blind Unit(System with the Blind) by SMS. RFID ID Transmitter unit is fixed in every landmark which transmits the ID of the particular landmark to the Blind Unit. Blind Unit is fixed in an walking stick act as Electronic eye for BP. GSM communication is to for communicating with the customer care unit as well the emergency call to dear ones by just pressing the buttons provided in the walking stick(Auto dialling option utilized here). After getting the path planning Ids from CCU , the mapped process is set by the microcontroller and then while BP is walking the RF Signal is received from RF id TX unit and will be checking the BP is going in right direction or not. If the BP is moving is wrong direction then the system will give aid by providing audio output for each RF ID TX spot.

[1]In 2013 has Proposed a system that detects the obstacle via an Infrared based detecting system and sends back the vibro-tactile or sound(Buzzer) feedback to inform the user by blind about its position. A sensor module is fixed on a light weight cap allowing the user to obtain the information about the obstacles and allows

*Author for correspondence

correct path on which the user should move.[2] M.S.M Jamri, M.S.Kassim, A.M. Rashid, M.Z.A. and Yaacob, M.R in 2012 has designed Obstacle Detection and warning Device for above abdomen level of human. In which the Distance measurement sensor is used to detect the obstacles and headphone is used as the warning device to give the obstacle information to the user.

[3]In 2012, has Proposed a method about developing of warning system by using a vibration motor as a warning device via microcontroller that from receiving a input from distance measurement sensor when detecting obstacle. [4]In 2011 has Given a concept of Indoor location tracking and navigation system to help the blind and Visually impaired to easily navigate their chosen destination in a Public building. INSIGHT makes use of RFID and Bluetooth Technology Deployed within the building to locate and track the Users.

The fault tolerant technique addressed[5] utilizes a master GSM/GPRS modem which is capable of communicating with all the GSM/GPRS modems in the client side.

2. Materials and Methodology

2.1 Description of Transmission Unit

ATMEL AT89C2051:
The AT89C2051 is used in this work which is used to store the information about particular landmark and its ID to send the information to BLIND Unit which has RFID receiver.

RFID TRANSMITTER:
The fundamental component of a radio frequency transmitter is its frequency oscillator. An oscillator modulated with an information signal then carried out to an antenna where it can be broadcast to a radio receiver. This RFID transmitter is used to broadcast the information about the landmark and its ID to the BLIND Unit RFID Receiver. Transmitter Broadcast the Analog signal to the Receiver once it detects the Receiver within the certain frequency.

RF ENCODER:-
The RF encoder RF600E is easy to use. It has been designed to achieve the maximum possible range from any radio / Infra-Red transmitter receiver set. Then it is given to the RFID Transmitter which broadcast the analog signal to RFID Receiver.

2.2 Description of Receiving Unit

PIC16F877A UNIT:
PIC16F877A CMOS FLASH –Based 8 bit microcontroller is upward compatible with the PIC165xx, PIC12Cxxx and PIC16C7x devices. It is powerful(200 nanosecond instruction execution) yet easy to- program(only 35 single word instructions).

GSM Technology:
The Figure 1 shows GSM module of the receiving unit. The GSM modem which acts as a mobile phone accepts any GSM network operator SIM card with its own unique phone number. This SIM900A GSM modem can communicate and develop embedded application of SMS based remote control, for example, to send/receive SMS and make/receive voice calls..

MAX 232 UNIT:
The MAX232 device is a dual driver/receiver that includes a capacitive voltage generator to supply TIA/EIA-232-F voltage levels from a single 5-V. 1.0-µF Charge-Pump Capacitors to 5-V TTL/CMOS levels.

RF DECODER UNIT:
The RF600D is simple to use. As shown in the typical application circuits, in the stand alone operation the RF600D has the capability to learn up to 7 unique RF600E transmitters.

AUDIO AMPLIFIER UNIT:
The LM386 is a power amplifier designed for use in low voltage consumer applications. It is used in this Project to amplify the analog signal level.

Figure 1. GSM Module

APR9600 DSP SPEECH IC UNIT:
The Figure 2 shows APR9600 speech IC. The APR9600 device offers true single-chip voice recording, non-volatile storage, and playback capability for 40 to 60 seconds. This device is used in this project to reproduce the voice signals in the natural form.

ULTRASONIC SENSOR UNIT:
The Figure 3 shows Ultrasonic Sensor unit. An ultrasonic sensor transmits ultrasonic waves into the air and detects reflected waves from an object. Ultrasonic waves are sounds which cannot be heard by humans and are normally, frequencies of above 20 kHz. In order to detect the presence of an object, ultrasonic waves are reflected on objects. It is used to detect the Obstacles in front of the Blind to navigate.

3. Design Methodology

In this paper there is a Three Systems namely, Customer Care Unit, Blind Unit and Transmitting Unit. There is a Customer Care Unit for helping to set the path planning for Blind Person(BP),by calling to customer care number to give information source and destination places by BP. So that this unit will send path planning IDs to Blind unit by SMS.

Figure 2 APR9600 Speech IC

Figure 3. Ultrasnoic Sensor

The Figure 4 shows the transmitter block section. The Transmitter Block Section is fixed in every landmark which transmits the ID of the particular landmark to the blind Unit. This circuit consist of the microcontroller ATMEL89C2051 which is used to transmit the ID for each spot. i.e. name of the bus stop, place and shop etc. This circuit has RF TX module which is 433MHZ connected to the Encoder HT12E 8bit address and 4bit Data encoder. The Encoder encodes the data which is given from microcontroller port P1. To manipulate ID for each spot.

The Figure 5 shows working principle the blind unit. The Blind Unit is fixed in the walking stick act as an Electronic Eye for Blind Person; this unit consist of an Ultrasonic Sensor for Detection of Obstacle while walking.GSM communication to communicate with Customer care Unit as well as emergency call to dear ones by just pressing buttons provided in the walking stick(Auto Dialling Option Utilized here).After getting path planning IDs from CCU, the mapped process is set by the microcontroller and then while BP is walking the rf signal is received from RF id

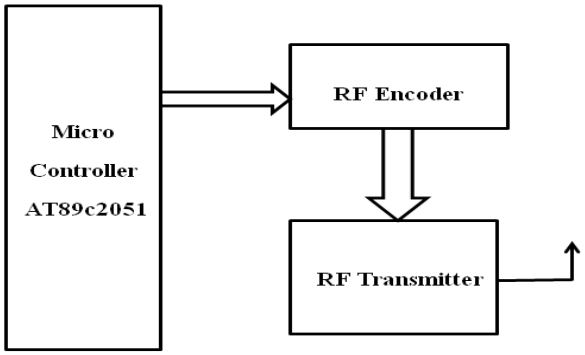

Figure 4. Transmitter Block Section

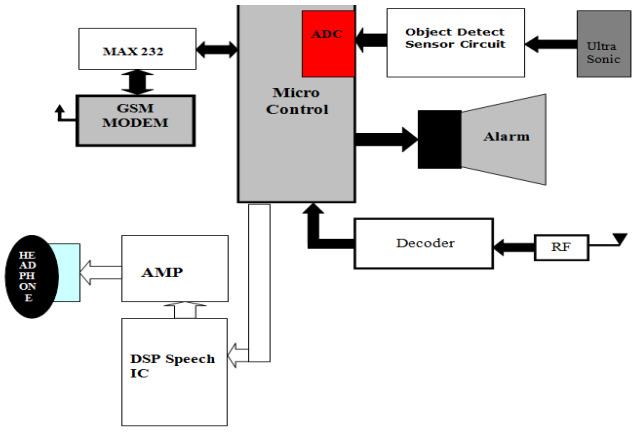

Figure 5. Working Principle of the Blind Unit Block

TX unit and will be checking the BP is going in the right direction or not. If BP is not moving on right direction then the system will give audio output that concern person is moving in wrong direction. This unit will give aid by providing audio output for each RF ID TX spot.

4. Results and Discussion

The GSM Path Planning for Blind Person using Ultrasonic has been successfully implemented.

BLIND UNIT:
The Figure 6 shows the hardware blind unit. The hardware Unit which is with Blind to initiate the call to Customer Care and to receive the ID's from RF Transmitter.

TRANSMITTER UNITS:
A. Bus Stop RF Transmitter ID:
The Figure 7 shows the hardware unit of bus stop unit. The Transmitter Hardware which has the ATMEL89C2051 microcontroller to store the Information about the Particular Landmark and RF Transmitter to Send the Particular Landmark's ID to the Receiver.

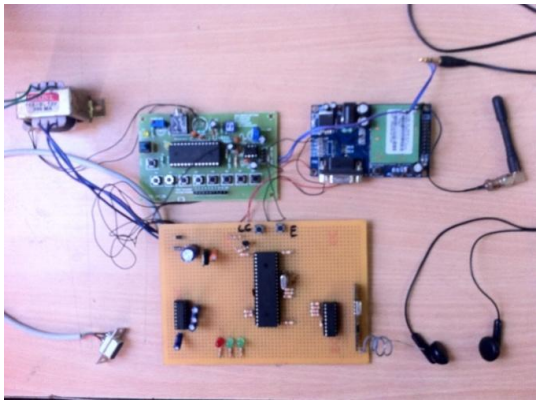

Figure 6. HARDWARE - BLIND UNIT

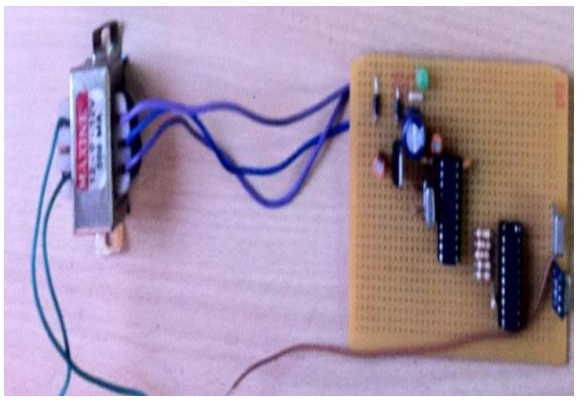

Figure 7. HARDWARE – Bus Stop Unit

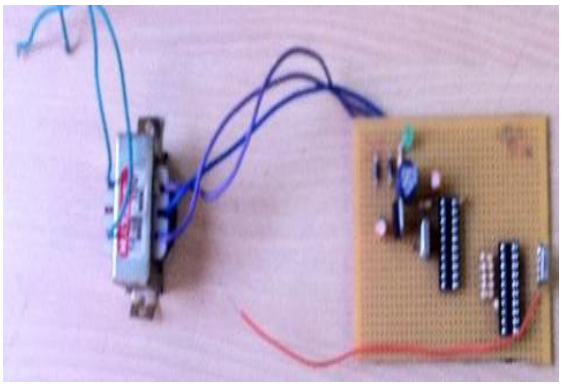

Figure 8. HARDWARE – RF Transmitter ID for Source

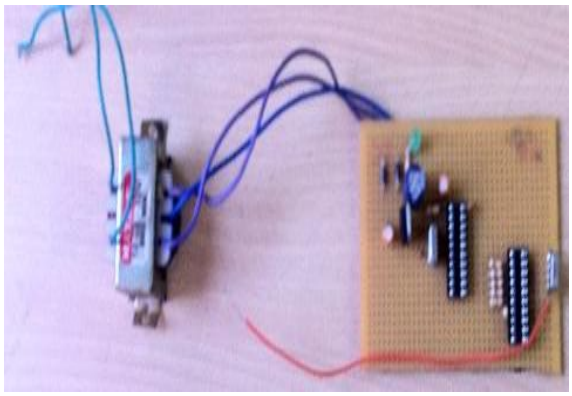

Figure 9. HARDWARE – RF ID For Destination

B. RF Transmitter ID for Source:
The Figure 8 shows the hardware unit of the RF transmitter ID for source. The Hardware which will inform the Blind Person about the Source that he starts to move.

C. RF Transmitter ID for Destination:
The Figure 9 shows hardware unit RF ID for destination section. The Hardware for informing the Blind Person to know that he has reached the Particular Destination. This task has been done by the RF Transmitter in the Particular Landmark that is transmitting the ID's to the Receiver.

5. Conclusion

The concept of setting up an RFID Information Grid for navigation is technically and economically feasible. The barrier to entry for this technology is low as a result of leveraging the commodity pricing and innovation in

the retail sector. This permits the adoption of the RFID Grid to be localized in small businesses, large corporate parks, government buildings or college campuses. Our grid approach is based on mature technology and is economically feasible that we believe it could become a mandate in future for all places with demonstrated success on public/private venues to help blind person.

6. References

1. Singh J, Bhardwaj P. 'Design and Development of Secure Navigation System for Visually Impaired People' International Journal of Computer Science Technology, 2013, 5(4), pp. 159–64.
2. Aras M S M, Jamri M S, Kassim A M, Rashid M Z A, Yaacob M R. 'Design and development of obstacle detection and warning device for above abdomen level, 'Proceedings of 12th International Conference on Control, Automation and Systems (ICCAS), 2012, pp. 410–13.
3. Anwar N S N, Jamaluddin H, Kassim A M, Sani Z M, Yaacob M R. 'Design and Development of MY 2nd EYE for Visually Impaired Person', Proceedings of IEEE Symposium on Industrial Electronics and Applications, (ISIEA), 2011, pp.700–703.
4. Ganz A, Wilson C, Mullett G, Gandhi S R, INSIGHT: RFID and Bluetooth Enabled Automated Space for the Blind and Visually Impaired. 32nd Annual International Conference of the IEEE Engineering in Medicine and Biology Society, Buenos Aires., 2010, pp. 331–34.
5. Karthika K C,Swaminathab P, "Design of Fault Tolerant Automated Energy Metering System using GSM/GPRS modems", Indian Journal of Science and Technology, 2015, 8(S9), pp. 484–88.