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GPS based Voice Navigation System for Blind People

P R Bhole[1], N L Lokhane[2], M L Patel[3]
[1, 2, 3]*Department of Electronics & Telecommunication, KBC North Maharashtra University, Jalgaon*

***Abstract:** In this paper we have presented the design of the GPS based voice navigation system for blind peoples. This system helps the blind person to navigate. The blind person will give the destination's name as the input to voice recognition module. GPS module continuously receives the latitude and longitude of the current location. GPS compares it with the destination's latitude and longitude. The blind person receives the pronounced directions which he needs to follow to reach his destination.*
***Keywords:** Arduino, GPS, Navigation, Voice Recognition, Ultrasonic Sensor.*

I. INTRODUCTION

Due to the huge population in our country there is lot of traffic on the road and in today's world no one have time even to talk with each other especially in metro cities, so the blind people or vision impaired persons feels alone in this environment. People who have impaired vision regularly use white canes and /or guide dogs to assist in obstacle avoidance. Guide dogs can also be of limited assistance for finding the way to a remote location, known as way finding. So our goal is to create a portable, self-contained system that will allow visually impaired individuals to travel through familiar and unfamiliar environments without the assistance or guide. The system explained here provides a cost effective and reliable solution to the above problem. The main objective of our project is to design a small and simple navigation device to help the blind people to get navigation directions through audio message which depends on the real-time assistance pro-vide by the Global Positioning System.

II. BLOCK DIAGRAM

The term blindness refers to the people who have no vision at all or people who have less vision. Most of the blind people take support from guide dogs to walk. We are explaining about the GPS and voice navigation system for blind people. In this blind people issues the commands and then receive the response using audio signals. GPS receiver is used to receive the values of the latitude and longitude continuously. With the advancement in technology usage of voice recognition is easier to send commands regarding directions to the blind people. As an application of this GPS technology here GPS based voice alert system for the blind persons are explained practically in subsequent paragraphs.

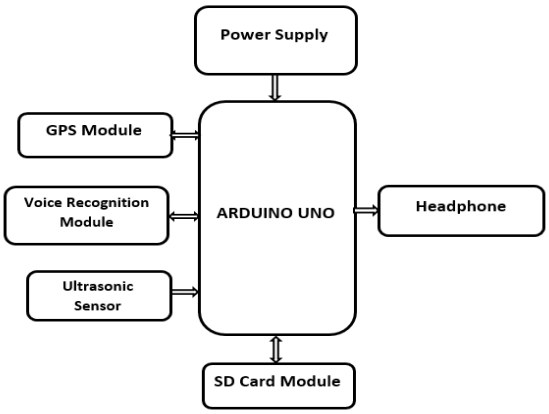


Fig.1 Block diagram of system developed

The system is realized using a GPS module and a Voice Module interfaced with Arduino. In this project blind people issues the commands and then receive the response using audio signals. GPS receiver is used to receive the values of the latitude and longitude continuously. With the advancement in technology usage of voice recognition is easier to send commands regarding directions to the blind people.

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III.HARDWARE DESCRIPTION

A. Arduino

Arduino is an open-source computer hardware and software company, project and user community that designs and manu-factures kits for building digital devices and interactive objects that can sense and control the physical world. An Arduino board consists of an Atmel 8-bit AVR microcontroller with complementary components that facilitate programming and incorporation into other circuits. The Arduino integrated development environment (IDE) is a cross-platform application written in Java, and derives from the IDE for the Processing programming language and the Wiring projects. Some of the main important features of Arduino Uno board are as listed below:

1) On-board controller ATmega328 microcontroller,
2) Wide input DC voltage range - 7-12V,
3) 14 Digital I/O Pins (6 PWM outputs),
4) 6 Analog Inputs,
5) 32k Flash Memory,
6) 16Mhz Clock Speed



Fig.2 Arduino Uno board

B. GPS

The Global Positioning System (GPS) is a satellite-based navigation system made up of a network of 24 satellites placed into orbit . A GPS receiver must be locked on to the signal of at least three satellites to calculate a 2D position (latitude and longitude) and track movement.

With four or more satellites in view, the receiver can determine the user's 3D position (latitude, longitude and altitude). Once the user's position has been determined, the GPS unit can calculate other information, such as speed, bearing, track, trip distance, distance to destination, sunrise and sunset time and more.

Main Features of this module are:

1) Required DC power supply voltage 2.8 ~3.3V,
2) Backup power 2~4.3V
3) Digital I/O: UART, GPIO, TIMEMARK.



Fig.3 GPS module

C. Voice Recognition Module

The blind person gives destination's name as the input to the voice recognition module. The system compares the destination with the stored locations in the database. We have used Voice Recognition Module V3. Voice Recognition Module is a compact and easy-control speaking recognition board.

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Fig.4 Voice recognition module (V3)

This product is a speaker dependent voice recognition module. It supports up to 80 voice commands in all. Max 7 voice commands could work at the same time. Any sound could be trained as command. Users need to train the module first before let it recognizing any voice command. This board has 2 controlling ways: Serial Port (full function), General Input Pins (part of function). General Output Pins on the board could generate several kinds of waves while corresponding voice command was recognized.
Features of utilized module are:

1) Voltage: 4.5-5.5V
2) Current: 40mA

D. SD Card Module

It allows to read and write to the SD card using your arduino through programming. It is easily interfaced as a peripheral to the used arduino sensor shield module. It can be used for SD Card more easily, such as for MP3 Player, MCU/ARM system control With all SD SPI Pins out: MOSI, SCK, MISO and CS, for further connection Input Voltage: 3.3V/5V. The navigation directions are stored in audio format in the SD Card with the help of which the blind person gets the directions.



Fig.5 SD card module

E. Ultrasonic Sensor

This sensor is used for detecting the obstacles on the way for the blind persons in this project. This sensor transmits an ultrasonic burst and correspondingly gives an output pulse based on the time required for the burst echo to return to the ultrasonic sensor. By this way depends on the echo pulse width, distance target is easily be detected and measured.



Fig.6 Ultrasonic sensor module

IV. WORKING

The whole circuit is powered with regulated DC power supply as shown in block diagram. The GPS receiver used in this project is capable of receiving the signals from 65 GPS (Global Positioning System) satellites. These received signals are transferred into precise position and timing information that can be read from RS232 port of this receiver. This longitude, latitude, altitude and timing data send to the microcontroller unit. These values are continuously processed in microcontroller. Voice recognition module recognizes the user spoken words and correspondingly sends those signals to microcontroller. Microcontroller compares that spoken place values (longitude, latitude and altitude) with signals from GPS receiver. Upon this comparison microcontroller drives the voice playback unit for providing voice navigation to the user. Predefined voices are stored in this module as navigating commands to the blind persons. We can store the destination values for each voice of spoken command in the microcontroller for recognizing the destinations. Ultrasonic sensor detects the obstacle in the way onto the destination, so that microcontroller gets it and alerts the visually impaired persons.

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V. RESULTS

We have tested our system where our current location was our institute's department of electronics and telecommunication building and destination was main market area 2 km away from the institute. We gave the destination's name as the input to the voice recognition, the program takes the corresponding latitude and longitude. The GPS starts giving the distance between the two locations, direction to destination, current speed etc. In our actual implementation instead of printing the directions, the directions will be heard by the blind person. Figure below shows the implementation of the project.

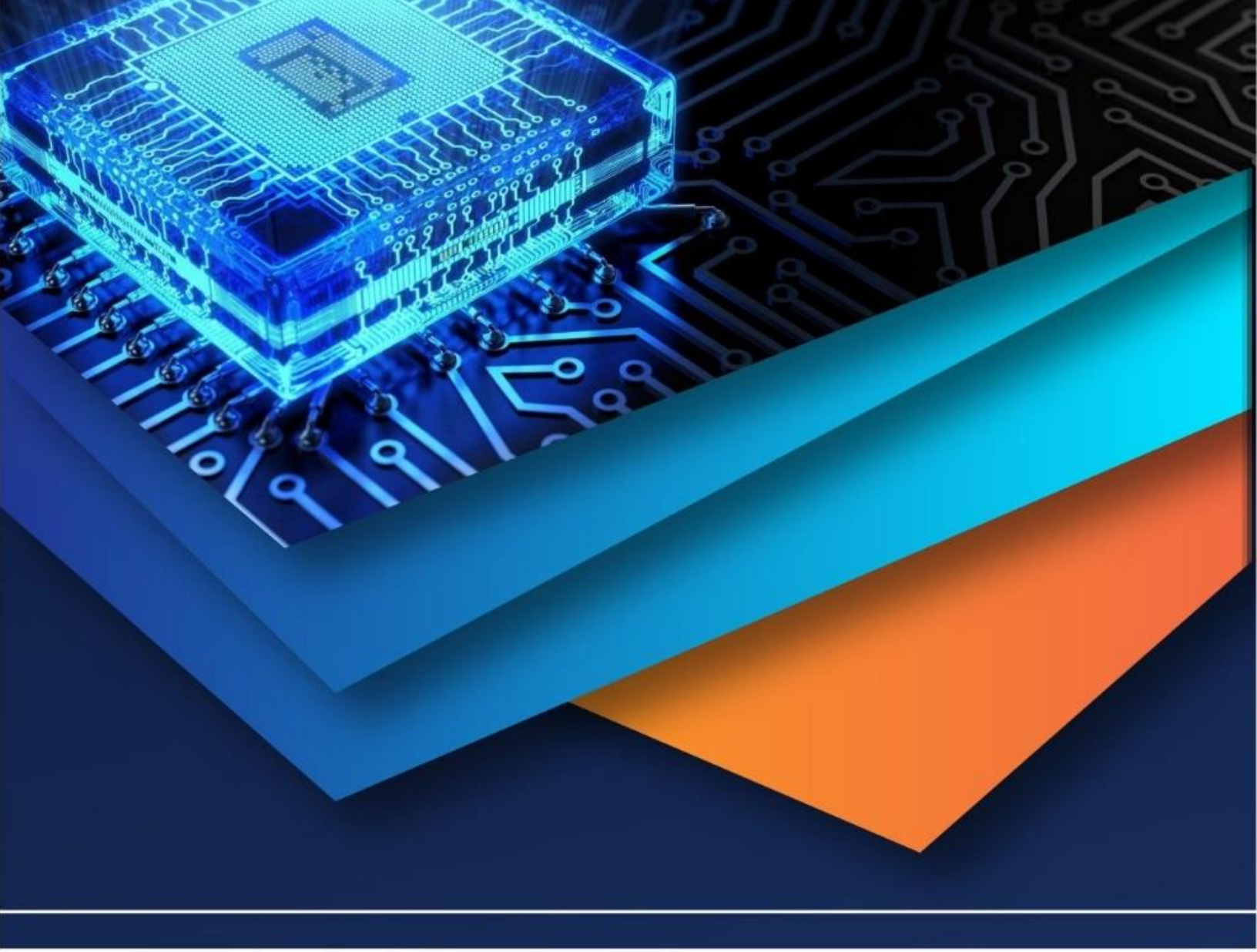
VI.CONCLUSION

India is one of the countries with world's largest population of blind people. Initially many blind people prefer to not use electronic aids, and use only canes or guide dogs. This is because of relatively high costs and poor levels of user satisfaction associated with existing electronic systems. So we tried to develop a low cost and user friendly system for blind people. This method offers innovative solutions in order to replace the conventional methods of guiding blind person. The system designed consists of a GPS receiver and a voice recognition module which is interfaced to the Arduino. It is programmed in such a way that depending on the satellite information about the destination, the blind person gets the navigation directions. We navigate the blind people using voice.

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