Ultrasonic Based Guidance System for Blind

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Abstract- *The These This project report incorporates all the details of 'Ultrasonic Based Guidance System for Blind using PIC microcontroller for helping the blind peoples to reach their destination and avoiding the obstacles throughout their path.*

In this project we have designed a small, cheap and easy to handle prototype using PIC18F microcontroller for the persons suffering from vision related problems.

This prototype is an automatic system with integrated ultrasonic sensors for object detection, the communication module (containing GSM and GPS module) and all of these components are packed inside a plastic housing.

Our work on this system mainly focuses on the disadvantages of previous solutions for the blind peoples and to eliminate them by using updated technology to develop a good product. In our system the ultrasonic sensor will continuously fire the Ultrasonic towards the target and by receiving their reflections off the target it will calculate the distance with the help of microcontroller.

Here we have also provided the facility to find the location of the user in case if he gets lost.

Keywords- DF Player Mini, GPS, GSM, Multiplexer, PIC Microcontroller.

I. INTRODUCTION

Vision or eye sight has significant importance in human physiology as maximum percentage of information from surroundings is feeds through eyes to the human brain. Approximately around the world 15 % out of total population are suffering from blindness and 20% with low vision problems.

The traditional solutions for persons with blindness and low eye sight are the wooden walking sticks, or the 24 hours help of a person (which is almost impossible).

Out of these the most famous and mostly preferred option is old wooden stick but it cannot assure them a high guarantee to protect themselves and to safeguard from the obstacles in their path.

In our project we used an Ultrasonic sensor which is based on the concept some of birds like BATS uses to find the way in nights.

Ultrasonic sensor emits a high frequency pulses with a 15 degree angle. If any obstacle is present ahead then these waves are reflected back to the sensor. Depending upon time difference the distance between the object and sensor can be calculated.

Additionally, use of GSM and GPS modules facilitate to track the blind person any time anywhere and to guide visually impaired pedestrian and let them to assured their safety from obstacles and reach their destination.

II. LITERATURE REVIEW

Vision or eye sight has significant importance in human physiology as maximum percentage of information from surroundings is feeds through eyes to the human brain. Approximately around the world 15 % out of total population are suffering from blindness and 20% with low vision problems.This project describes the implementation of the new latest technologies into the conventional wooden or plastic sticks used by the blind persons. For this purpose an ultrasonic sensor is integrates with the microcontroller and GSM and GPS module to make a useful prototype for the guidance of the blind peoples. If the object is came into the path of blind person, it will be detected by ultrasonic sensor, and then the voice response system will provide the voice feedback. Compared to other solutions for the blinds developed previously, our prototype offers advantages like low cost, low weight, easy to carry, easy to use etc.

10% of people considered legally blind also have mobility impairment, leading to reliance on others for mobility. Although there are limited specialty options available for blind people with mobility impairments, people have been successful using the current obstacle detection options like ultrasonic sensor. Instead of ultrasonic sensor we can also use IR sensor but it will limit the range to be covered.

III. PROBLEM DEFINITION

Traditional solutions derived for the blind persons are not that much effective and safe. Also there is no guarantee of assuring total safety of the user.

IV. OBJECTIVE

To develop an interactive guidance system for blind peoples that can assure the safety of them at a affordable cost.

I am eager to find an easy and simple solution for those blind people in this project work. In the present project, an automated guidance system has been designed for blind peoples using microcontroller so that it could be cheaply implemented in a small size with a low cost. A small prototype has also been developed in this project.

Block Diagram:

The blind stick is incorporated with ultrasonic sensor along. Our proposed systemmakes the use of ultrasonic sensors HC SR04 for detection of the hurdles (Objects) in the path using ultrasonic waves. On sensing obstacles the sensor passes this data to the Micro-Controller for processing purpose.

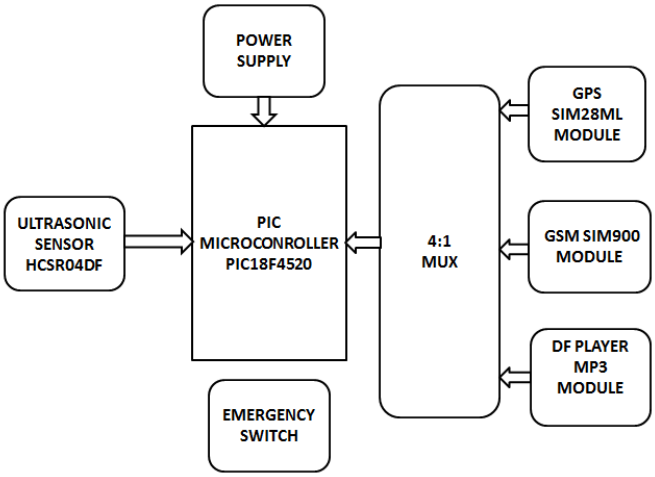
After reception of the data from Ultrasonic Sensor the Micro-Controller analyse it and check is the object is close or not from the blind person. If yes then it alerts the blind person through the buzzer indication and or responding with a voice response.

A wireless RF based remote is used for the purpose to find the stick if it gets lost. Pressing the remote button sounds a buzzer on the stick which helps the blind to find their stick.

GPS module is incorporated to find the current location of person and accordingly to it the GSM modem will send this location information to their home.

Also in this system an emergency switch (kill switch) is given to assure extra security. If the blind person gets lost, upon pressing of this switch an SMS is sent to the registered mobile number that contain the location co-ordinates of person's current position.

If the parents or relatives of the user want to find his address then they can send message like for example "LOCATE" then in response, the system will send location co-ordinates to the relative. This function is useful to assure his safety.



V. POWER SUPPLY DESIGN

The circuit diagram of power supply which gives output of 5V, as only that much is required for microcontroller. Its circuit diagram and designing calculation are given below.

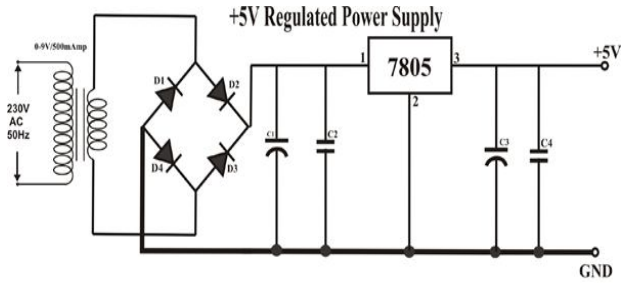


Fig. Regulated Power Supply

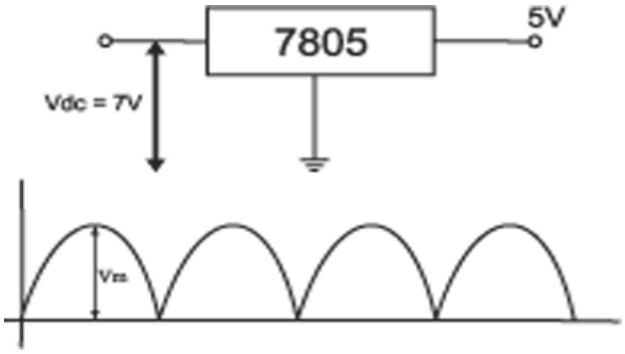
The +5 volt power supply is based on the commercial 7805 voltage regulator IC. This IC contains all the circuitry needed to accept any input voltage from 8 to 18 volts and produce a steady +5 volt output, accurate to within 5% (0.25 volt). It also contains current-limiting circuitry and thermal overload protection, so that the IC won't be damaged in case of excessive load current; it will reduce its output voltage instead.

The advantage of a bridge rectifier is you don't need a centre tap on the secondary of the transformer. A further but significant advantage is that the ripple frequency at the output is twice the line frequency (i.e. 50Hz) and makes filtering somewhat easier.

The use of capacitor c1, c2, c3 and c4 is to make signal ripple free. The two capacitor used before the regulator is to make ac signal ripple free and then later which we are using is for safety, if incase there is a ripple left after regulating, then c3 and c4 will remove it.

VI. POWER SUPPLY COMPONENT DESIGN

Transformer Design:



We require 5V at the o/p of the regulator.
The drop out voltage of the regulator is 2V As per the data sheet)
Vdc = 5+2 = 7V

So at the regulator input, the voltage applied should be of 7V.

According to the formula,
Vdc = 2Vm/Pi

Assuming there is no ripple Capacitor from
Vm= Vdc .pi/2
=7 x 3.14)/2
=10.99V
Vm= 10.99V

During one cycle, two diodes are conducting.Drop out voltage of one diode = 0.7V
Vim = Vm+ 1.4V
=10.99+1.4= 12.39V
Vim=12.39V
Vrms = Vim/sqrt (2)
= 12.39/sqrt (2)
= 8.76V
Vrms = 8.76V

So we select transformer of 9V.
Similarly
Im=Idc x pi/2
Im=400m x 3.14/2
= 628mA.

Irms= Im/sqrt (2)
= 628mA/sqrt (2)
` = 444.06mA
Irms = 444.06mA

So we select the transformer of current rating 500mA.
Considering the above transformer rating.

We take the transformer of 0-9V/500mA

TRANSFORMER - 0-9V/500mA Step-down transformer.

RECTIFIER DESIGN:-

PIV of diode = Vm = 12.39V
Im= 628mA

BRIDGE RECTIFIER- So, we select the bridge IC of 1Ampere rating.

ADVANTAGES-

1. The system can be used for navigation.
2. Blind person's location can be tracked whenever needed which will ensure additional safety.
3. Detects obstacles and alerts the user through vibration alert and speech output.
4. It is battery operated. Hence it reduces the complexity.
5. Over all weight of the system is less.

VII. CONCLUSION

With our project, the blind people will able to move from one place to another without others help.

In this project, we used 3 ultrasonic sensors to cover the left, right and front areas. With increase in the number of ultrasonic sensors we have increased the accuracy of the system. With 3 ultrasonic sensors we covered an angle of 180 degree approximately.

And as far as the localization is concerned it will be able to provide accurate details of the location of the blind if in case they lost with help from the GPS.

The developed prototype gives good results in detecting obstacles paced at distance in front of the user. It can detect the obstacles successfully up to 3 meters approximately. Our project offers more advantages over the conventional sticks and other solutions for blind peoples.

ACKONOWLEGEMENT

We had great pleasure in presenting a project report on "Ultrasonic Based Guidance System for Blind"

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