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Extended Abstract OpenAccess

Haptic Gauntlet for Blind People

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Abstract

This paper is a part of our effort to develop a navigation system to aid the visually impaired using SONAR. SONAR (Sound Navigation And Ranging) system plays a significant role in widespread applications in underwater scenarios. Here emphasis is on the use of the same in real-time detection of obstacle. Our goal is to create a portable, cost-effective, lightweight, unobtrusive, unprecedented system for the blind to enable their movement without assistance. At present, the existing satellite navigation based on GPS is not accurate enough to guide pedestrians, especially around cities. The obstacle avoidance strategy is described in the system, the performance of primarily on the ULTRASOUND sensors used. The effect of their limitation on the proposed system is presented in detail. The results provided show that the performance of a group of sonar devices when placed appropriately make the system suitable as a navigator for the visually impaired.

Introduction

The Aim of the project is to provide simple and cost efficient device used for visually impaired person.Among various forms of disability blindness is regarded as the most devastated characteristic.The main objective of this project is to help the visually impaired people to navigate with ease using advance technology.It helps to provide the person to strive independently and live with independence.In past days headband sonar devices were used, since it shows disadvantages such as highly dangerous objects are not at head level .Furniture and most of the other things that can tripped over and stubbed on are wast level or lower. With minimal practise, this device is capable of greatly aiding someone visually impaired have a sense of their surroundings.This system can be used in both indoor and outdoor purposes.Since this technology is not bulky,One can use it easily.

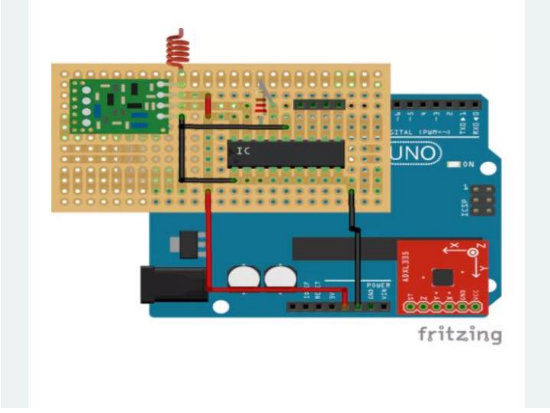
Methods and Materials

The hardware part consist of,

1. Arduino microcontroller
2. Servo motors(nos.2)
3. Ultrasound sensors(nos.2)

And the software part consists of coding used to run theprogram.

A) Arduino Microcontroller: The first requirement for the design of the haptic glove is the microcontroller. In this work, Arduino ATMEGA 328 has been used. It is an open-source electronicsprototyping platform with 14 digital I/O pins, 6 analog inputs, 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header and a reset button.



B) Ultrasound Sensors: The ultrasound sensor used here is HC-SR04 which can be alternatively used for parallax ping used in the circuit. An Ultrasonic sensor is a device that can measure the distance to an object by

using sound waves. It measures distance by sending out a sound wave at a specific frequency and listening for that sound wave to bounce back. By recording the elapsed time between the sound wave being generated and the sound wave bouncing back, it is possible to calculate the distance between the sonar sensor and the object.Thus here the ultrasound waves and distance of object is measured through arduino and it triggers the servo motors.

C) Servo Motors: A servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration.[1] It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors.Its major applications are in Robotics ,Machinery etc.Thus here it indicates the user that there is object in front of the person using the help of the ultrasound sensor.

SYSTEM DESCRIPTION

The arduino drives both the servo motor and the ultrasound sensor with the distance measured of the object present in front.

The general system working is as follows:

I. The sound waves generated from ultrasound with the help of the microcontroller detects the object in front of the module and thus it provides the distance in which the object is present.

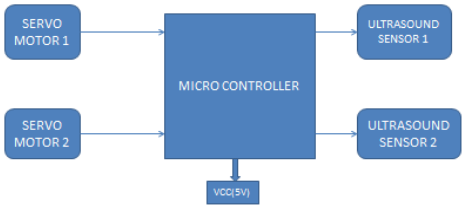
II. This data value is provided to the servo motor and thus through the microcontroller interfaced with that and indicates the presence of object.

III. Thus with help of servo motor the indication of the object is provided to the user.

BLOCK DIAGRAM

The block diagram of the whole system is given below:

BLOCK DIAGRAM



From the block diagram it is clear that the microcontroller is the major source for the servo motors and ultrasound sensors and thus the microcontroller is drived with the help of power supply of 5v.

The ultrasound sensors are given a common power supply of 5v in the bread board.

The ultrasound sensors are connected to the microcontroller ‘s respective pins

The Vcc and ground pins are connected respectively in controller pins.

The trigger pin is connected to the 2 digital pin in the microcontroller

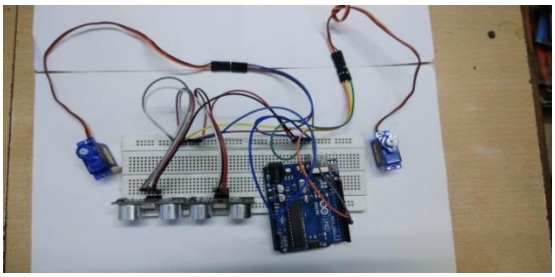
The echo pin is connected to the 4 digital pin in the microcontroller.

The servo motors are drived according to data regarding the distance of object given by the microcontroller.

The Vcc and ground of the servo motors are connected in the bread board with common connections.

The pulse pins of the servo motors are connected to the digital pins 7 and 8 of the microcontroller.

The arduino is given a power supply of 5V separately.



WORKING OF THE MODULE

1. The Ultrasound sensor is given common supply of 5v and thus the general distance measurement of object is coded as required .here the range of the distance coded is Min range -500ms Max range -14000ms.

2. The distance of the object present is measured and it is displayed digitally with the microcontroller software used.

3. Then after the distance measured is given as data to the controller it provides trigger pulse to the servo motors.

4. The servo motors are given with initial specification of coding such as the angle given when some object is close is 0 to 160 degree where the servo turns ,and when some object is far away then it turns with angle of 70 to 110 degrees.

5. A shorter return signal means an object is closer, so the servomotors apply more pressure.Thus with the pressure produced over the surface , the person can identify that there is object present infront.

FUTURE SCOPE AND CONCLUSION

The haptic gauntlet can be one of the efficient module which can be used for blindness which provides more advantages than blind stick.In future this can be used easily without any working complications .We can also increase the range of the ultrasound detection using advanced technologies. One of the advantages of this project was the use of ultrasonic sensor. This sensor was very sensitive and will trigger faster when it detect obstacles. Besides that, the cost to develop this project was low and can be used for both deaf and blind people.Thus with further advancements we can increase the performance of the system.