Ocular Wearables

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Abstract— The aim of this project is to investigate the development of a navigation aid for blind and visually impaired people. It is supported a microcontroller with artificial speech output. This aid is moveable and provides data to the user concerning urban walking routes to imply what choices to create. On the opposite hand, and so as to scale back navigation difficulties of the blind, associate obstacle detection system mistreatment ultrasounds and vibrators is adscititious to the present device. The proposed system detects the nearest obstacle via sensor systems and sends back vibro-tactile feedback to inform the blind about its localization.

Keywords: Navigation, Microcontroller, Ultrasounds, Vibrators

I. INTRODUCTION

The development and application of technology for orientation and quality contains a long history covering the postwar amount. Although some early endeavors envisaged systems which can replace the cane or dog guide, additional modern efforts have targeted on devices and systems designed to supplement and provide a support system for these basic mobility tools. Mobility aids like walking stick and guide dogs square measure still utilized by the blind even these days.

With the advances of technology, some different types of electronic travel aid have been developed to support the mobility of the blind. Most of the normally used electronic travel aids use ultrasound. All such devices use the principle of reflection of the high frequency unhearable beam, and square measure out there in numerous models. These devices square measure wont to explore for obstacles before of the visually handicapped person, and they operate in a manner similar to a flashlight, which has very narrow directivity.

The motivation of this project was to develop a transportable navigation aid for blind pedestrians. The most wide used primary quality aid these days is that the long cane. This has many limitations like a spread restricted to the length of the cane, usually one pace sooner than the user, difficulties detecting overhanging obstacles, and difficulties storing in public places. In this project, the suggested navigation system involves Arduino with vibration output. It is a self -contained portable electronic unit. It can supply the blind person with assistance about walking routes by using vibrations to point out what decisions to make.

The projected obstacle detection system is employed in sensing the encompassing setting via unhearable sensors and causation vibro-tactile feedback to the user of the position of the nearest obstacles in range with the help of a vibration motor.

II. COMPONENTS

A. Software

1) Android studio

Android Studio provides the quickest tools for building apps on each style of mechanical man device. World-class code written language, debugging, performance tooling, a versatile build system, and a moment build/deploy system all permit you to specialize in building distinctive and high-quality apps.

Android Studio is that the official integrated development setting (IDE) for Google's golem computer code package, engineered on JetBrains' IntelliJ plan computer code and designed specifically for robot development. It is available for download on Windows, macOS and Linux based operating systems. It is a replacement for the Eclipse mechanical man Development Tools (ADT) as primary IDE for native mechanical man application development.

2) Android IDE

Simple, clear programming setting - The Arduino software package (IDE) is easy-to-use for beginners, yet flexible enough for advanced users to take advantage of as well For lecturers, it's handily supported the process programming setting, thus students learning to program in this setting are aware of however the Arduino IDE works.

Open supply and extensile software package - The Arduino software package is revealed as open supply tools, available for extension by experienced programmers. The language is dilated through C++ libraries, and people wanting to understand the technical details can make the leap from Arduino to the AVR C programming language on which it's based. Similarly, you'll add AVR-C code directly into your Arduino programs if you wish to.

B. Hardware

1) Arduino Pro mini

The Arduino professional mini may be a microcontroller board supported the ATmega328. It has fourteen digital input/output pins (of that six will be used as PWM outputs), six analog inputs, Associate in Nursing on-board resonator, a push button, and holes for mounting pin headers. A six-pin header will be connected to Associate in Nursing FTDI cable or Spark-fun break board to produce USB power and communication to the board. The Arduino professional mini is meant for semi-permanent installation in objects or exhibitions. The board comes while not pre-mounted headers, permitting the utilization of assorted kinds of connectors or direct fastening of wires. The pin layout is compatible with the Arduino mini.

2) IR Reflectance Sensor

The TCRT 5000 is a small IR reflectance sensor. This detector is commonly employed in line following robots as a result of, if it can sense if a surface is white or black. There are four pins on the TCRT 5000 - two control the IR emitting

LED while the other two are the collector and emitter of a phototransistor. The IR diode incorporates a grievous bodily harm forward current of 50mA and operates at 940nm.

3) Ultrasonic Range Finder

Ultrasonic sensors measure distance by using ultrasonic waves. The device head emits Associate in Nursing inaudible wave and receives the wave mirrored back from the target. Ultrasonic Sensors live the gap to the target by activity the time between the emission and reception. An optical device encompasses a transmitter and receiver, whereas an ultrasonic sensor uses a single ultrasonic element for both emission and reception. In a reflective model inaudible device, a single oscillator emits and receives ultrasonic waves alternately. This enables miniaturization of the sensor head.

4) Vibration motors

These little circular motors have offset weights that build them vibrate after they spin. They're normally called "pager motors" or coin vibrator because they're the type found in pagers and cell phones that have a "vibrate" feature.

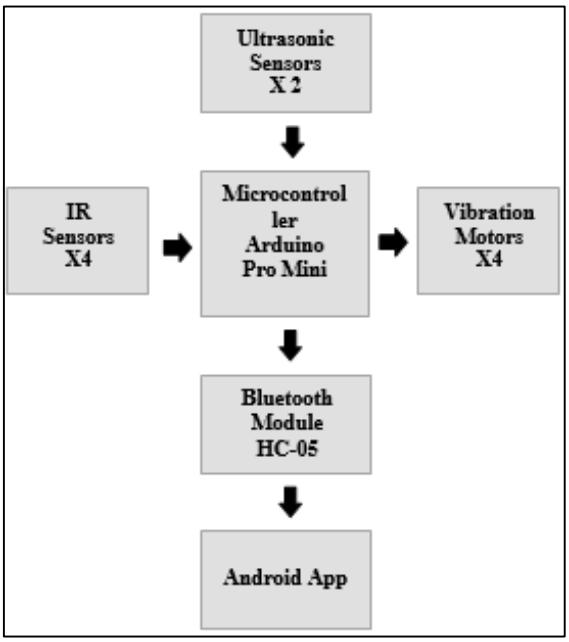
5) Bluetooth Module

HC-05 module is a simple to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. Serial port Bluetooth module is totally qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband. It uses CSR Bluecore 04-External single chip Bluetooth system with CMOS technology and with AFH(Adaptive Frequency Hopping Feature). It has the footprint as small as 12.7mmx27mm. Hope it will simplify your overall design/development cycle.

6) Resistor

A resistance could be a passive two-terminal electrical part that implements resistance as a circuit part. In electronic circuits, resistors area unit wont to cut back current flow, change signal levels, to divide voltages, bias active parts, and terminate transmission lines, among different uses.

III. BLOCK DIAGRAM



IV. WORKING

Four IR sensors are connected in parallel. The pin numbers 2 and 4 are connected to the ground. The pin number 1 of all the sensors is connected to the VCC of the Arduino. The pin number 3 0f the sensors is connected to A0, A1, A2 and A3 terminals of the Arduino respectively. One of vibration motor input is connected to the pins 3,5,6 and 9 of the Arduino and the other is grounded. The GND pin of Arduino and the RAW pin is connected to a 9V battery. The VCC and GND pins of the Ultrasonic sensor is connected to the VCC and GND of Arduino. The ECHO pin is connected to pin numbers 2 and 10. The TRIG pin is connected to 4 and 11.

An Android Application is designed to manage the two modes provided by the device. The modes are:

A. Navigation Mode

In this mode a blind person is navigated through different environments with the help of vibrations as a feedback.

B. Shape Detection Mode

In this mode differentiation between black and white is possible. The edge detection enables a blind person to detect black and white areas by receiving a tactile feedback via the means of a vibration motor. This would help them distinguish between black or dark and white or light areas and with practice can help them read signs.

V. CONCLUSION

The projected navigation aid has been developed so as to boost the freelance quality of blind people. The technique renowned in craft navigation utilized in this study has reduced errors caused by the measuring device and double integration. In addition, the use of the footswitch is highly advantageous because without it, drift errors due to the accelerometer and double integration would be considerably greater in magnitude and would reduce the effective vary of the electronic travel aid.

Although the system detects the closest obstacle, it cannot solve the blinds' final drawback of the setting perception. It has limits due to the characteristics of the ultrasound reflections such that many objects can barely be detected, which have very small or soft surfaces. The results obtained are encouraging and further testing on more blind people shall be implemented in the near future. We hope that this aid are a good, low-priced answer for reducing navigation issues for blind users

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