Blind Assist Stick Using Microcontroller

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Abstract: *A Blind person needs to know the obstacle or anything that is in their way. Traditionally they uses a simple stick to sense the front things. Visually impaired persons have difficulty to interact and feel their environment. They have little contact with surrounding for which We have made the blind Assist stick using microcontroller by which we can determine the distinguish Object, wall or inclined surface which is in front of the person.*

Keywords: AT89s52, Ultrasonic Sensor, IR sensor, APR33A3

1. Introduction

Physical movement is a challenge for visually impaired persons, because it can become tricky to distinguish where he is, and how to get where he wants to go from one place to another. Over the last decades, research has been conducted for new devices to design a good and reliable system for visually impaired persons to detect obstacles and warn them at danger places. There are some systems which has some deficiencies.

We have made the blind Assist stick using microcontroller. We have used ultrasonic and IR sensor as distance measuring Unit. And we are using very basic push button logic with foil for water sensor. To analys the input we have taken AT89S52 and to give output as Audio we are using APR33A3 and speaker. Since there is only one option to tell a visually disabled person about their path.

2. Methods and Materials

Hardware:
The components used are as follows.

Microcontroller: AT89s52
A microcontroller is a compact integrated circuit designed to govern a specific operation in an embedded system. A typical microcontroller includes a processor, memory and input/output (I/O) peripherals on a single chip. The **AT89S52** is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry-standard 80C51 instruction set and pinout. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with in-system programmable Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications. The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry.

Ultrasonic Sensor (HC SR-04): The Ultrasonic sensor module is a convenient way for measuring distances from objects. This module has a lot of applications such as parking sensors, obstacle and terrain monitoring systems, industrial distance measurements, etc. It has a stable performance and high accuracy ranging from 2cm to 450cm with a resolution of 0.3 cm. The module sends an ultrasonic signal, eight pulses of 40kHz square wave from the transmitter; the echo is then picked up by the receiver and outputs a waveform with a time period proportional to the distance.

IR Sensor
An infrared sensor is an electronic device, that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measures only infrared radiation, rather than emitting it that is called as a passive IR sensor. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations. These types of radiations are invisible to our eyes that can be detected by an infrared sensor. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, The resistances and these output voltages, change in proportion to the magnitude of the IR light received.

APR33A3 (Audio module) :
The aPR33A series are powerful audio processor along with high performance audio analog-to-digital converters (ADCs) and digital-to-analog converters (DACs). The aPR33A series are a fully integrated solution offering high performance and unparalleled integration with analog input, digital processing and analog output functionality. The aPR33A series incorporates all the functionality required to perform demanding audio/voice applications. High quality audio/voice systems with lower bill-of-material costs can be implemented with the aPR33A series because of its integrated analog data converters and full suite of quality-enhancing features such as sample-rate convertor. This module records the audio in recording mode and then in play back mode it provides output in form of playback

Software
The software part is done as follows. The program is written in embedded C [Muhammad Ali Mazidi 2013] .The program written is converted into hex file using Keil μvision. This

hex file is written into IC AT89S52 by the process called burning through development software called USB asp-IC Programmer for 89s51.

3. Results and Discussion:

3.1 Working

Water sensing – it just a open circuit joined to an input pin when water will flow between two foiled sheets, circuit will be closed and pin will become high and Microcontroller gives output to relay

Depth sensing – if the IRD (depth measuring IR) does not detects anything then Microcontroller gives High out to relay.

Wall sensing – if the IRD (depth measuring IR) does not detects anything then Microcontroller gives High out to relay.

Small object – if ultrasonic sensor gives value of distance less predetermined value then Microcontroller gives output to buzzer unit.

Audio module Input – audio i.e. APR33A3 needs grounding trigger to give respective output so to give that we have connected common port of relay to APR input and the normally off pin to ground so if the relay gets triggered then the APR33a3 gets trigger.

Addition point –
- Stick must be steady so that we can get right values for depth and horizontal sensors and hence we have connected push button at the bottom of the stick, so when the stick is placed on the surface and push button will be pressed and then and only then program runs.
- We need 5V to give input to Microcontroller but IR does not gives complete 5V connection that's there is need of Relay circuit

3.2 Advantage & Disadvantage

Advantages –
1) It provides Artificial to Blind people
2) It detects water on surface
3) Gives different output for different Situation
4) Output can be in normal language so it is easy to understand

Disadvantages
1) Metal surface will detected as water
2) Only one output will given by APR33A3
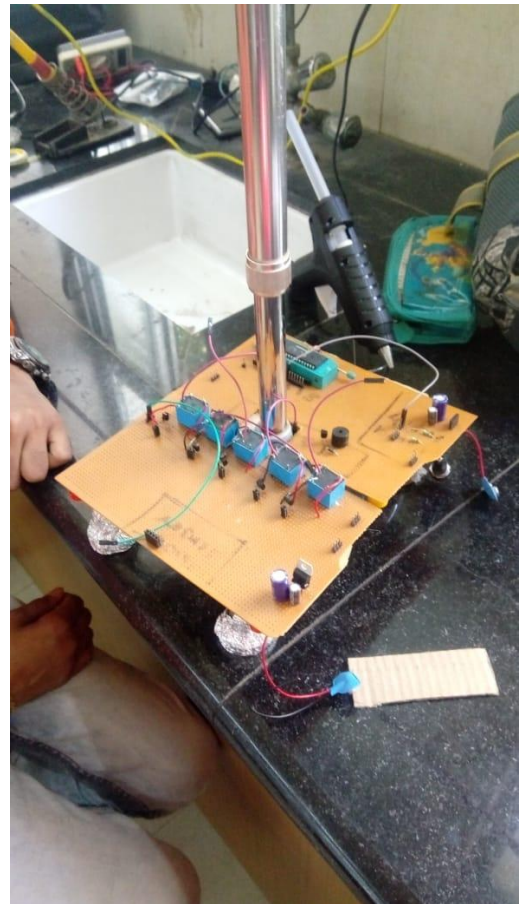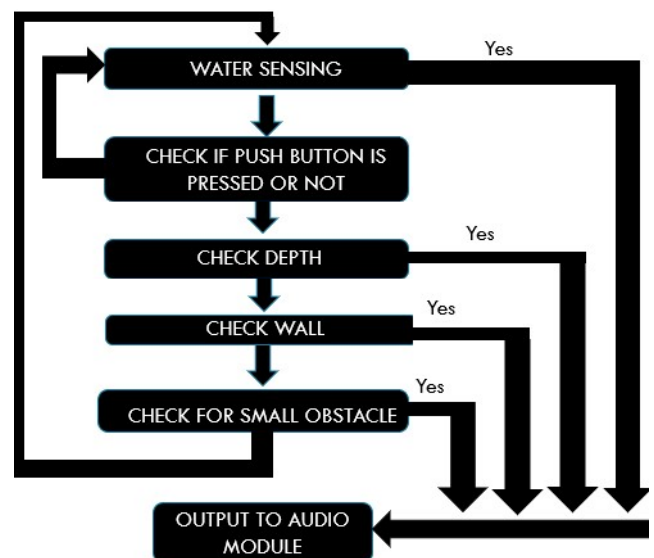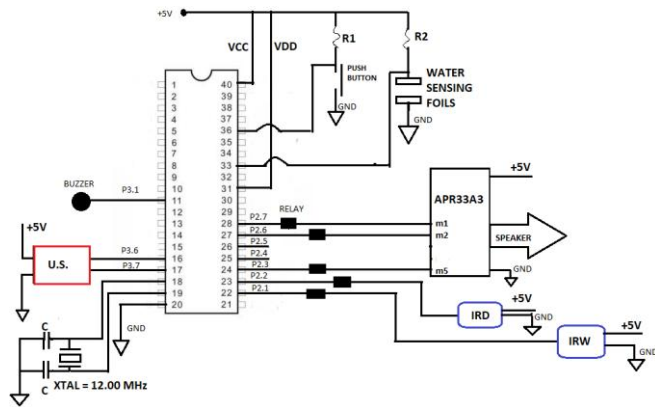3) Adds little weight to traditional blind stick

3.3 Actucal Photos of Stick

Figure 1: Assembled Stick
For code and circuit diagram visit
https://drive.google.com/open?id=1Ez0XhG5Ji72pkqlSEIIUrbCSv3cxkFxz

3.4 Flow Chart of Program

3.5 Circuit Diagram

4. Other Recommendations

Upgradation to Project

- RF Remote to find stick
- Instead of Speaker using DAC we can put Headphone jack to this

References

[1] Microcontrollers: Theory and Applications (by Ajay V. Deshmukh)
[2] The 8051 Microcontroller and Embedded Systems: Using Assembly and C
[3] (by Mazidi)
[4] https://www.youtube.com/watch?v=qSvTdQTn4Fs

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