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Ultrasonic Blind Stick with GPS Tracking System and Vibration Feature

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ABSTRACT

God has gifted five important sense organs to lead a convenient life. Of which vision plays a very important aspect of our life. But there are many people who lack this visualizing ability. In recent survey it is clear that out of 39 million blind people across the globe 12 million blind people are from India. The blind people use conventional white cane to move from one place to another. These blind sticks are capable of finding obstacle when the stick touches them physically. Hence blind people face a major problem when they walk on stairs using white cane. Using advanced technology we propose an ultrasonic blind stick with GPS tracking feature along with vibration for blind people for their more convenient means of life. Here in this project we have designed the blind stick with five important advanced features. The blind person can sense the object before the stick touches the object physically using ultrasonic sensor. The blind person can know whether there is water in front of him/her which is one of the important features. Also the person can know whether there is light or darkness around them. If the person loses the stick it can be found by using RF remote. Since we are using vibration motor there are various patterns of vibration along with different beep signals for individual features. The most important feature is that we are using GPS tracking system so that the person can be found whenever he/she is in trouble or being lost.

Keywords: Ultrasonic sensor, LDR, Atmega328 Microcontroller, RF Module, GPS and GSM Module.

I. INTRODUCTION

The most common tool that the blind currently use to navigate is the standard white cane. We decided to modify and enhance the walking cane, since blind are only able to detect objects by touch or by cane. The user sweeps the cane back and forth in front of them. When the cane hits an object or falls off of the edge of a stair, the user then becomes aware of the obstacle – sometimes too late. We accomplished this goal by adding ultrasonic sensors at specific positions to the cane that provided information about the environment to the user through audio feedback. The main component of this system is the Radio-Frequency module which is used to find the stick if it is misplaced around. The main aim of this project is to contribute our knowledge and services to the blind people by providing an electronic walking stick for their more convenient means of life. Blind stick is an innovative stick designed for visually disabled people for improved navigation. Here, we propose an advanced blind stick that allows visually challenged people to navigate with ease using advanced technology.

II. METHODOLOGY

1. The system uses ultrasonic sensor (HC-SR04) to sense objects within certain range (1cm to 15cm) of the person and there will be a beep sound of particular type to signal obstacles.
2. We are using the concept of short circuit to detect water in front of the person. As soon as the wires of the system dip in water, the system signals the blind person by different beep pattern with increase in frequency.
3. The light sensor (LDR) gives the information to the blind person if there is light or darkness so that the person can know if it is night or has entered a very dark room, so that he/she gets a beep sound of different frequency.
4. If the blind person loses the stick, the person can use an RF remote so that the stick starts beeping with a different pattern with increase in the counts and the person can find it.
5. The most important feature of the system is that the system allows the blind person to send a message with his or her GPS location to the caretaker in case of trouble or being lost.

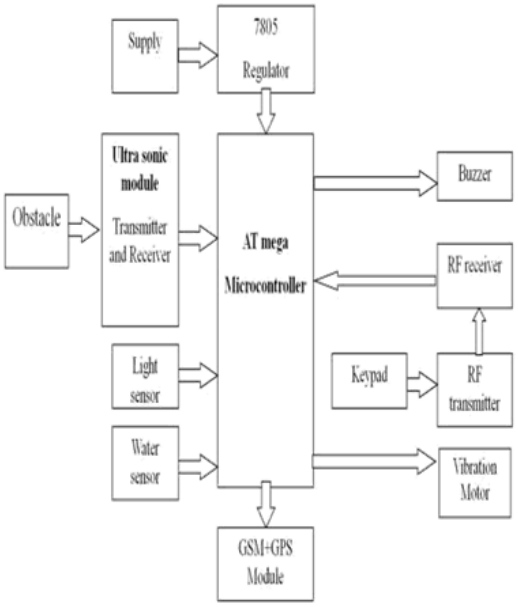

Figure 1. Block diagram

A. POWER SUPPLY

The circuit uses standard power supply comprising of a step-down transformer from 230V to 12V and 4 diodes forming a bridge rectifier that delivers pulsating dc which is then filtered by an electrolytic capacitor of about 470µF to 1000µF. The filtered dc being unregulated, IC LM7805 is used to get 5V DC constant at its pin no 3 irrespective of input DC varying from 7V to 15V. The input dc shall be varying in the event of input ac at 230volts section varies from 160V to 270V in the ratio of the transformer primary voltage V1 to secondary voltage V2 governed by the formula V1/V2=N1/N2. As N1/N2 i.e. no. of turns in the primary to the no. of turns in the secondary remains unchanged V2 is directly proportional to V1.Thus if the transformer delivers 12V at 220V input it will give 8.72V at 160V.Similarly at 270V it will give 14.72V. Thus the dc voltage at the input of the regulator changes from about 8V to 15V because of A.C voltage variation from 160V to 270V the regulator output will remain constant at 5V.

B. VOLTAGE REGULATOR 7805

A voltage regulator is a three-terminal positive regulators that are available with several fixed output voltages, making them useful in a Wide range of applications. Each type employs internal current limiting, thermal shutdown and safe operating area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 1A output Current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.

C. ULTRASONIC MODULE

Ultrasonic sensors work on a principle similar to which evaluate attributes of a target by interpreting the echoes from radio or sound waves respectively. Ultrasonic sensors generate high frequency sound waves and evaluate the echo which is received back by the sensor. Sensors calculate the time interval between sending the signal and receiving the echo to determine the distance to an object. Here it is more easy use serial ultrasonic module. It will auto output the distance information via serial port after power

on, you don't need to do any trigger and calculated, just need to read the serial pin and get the distance information.

D. RF MODULES

Radio Frequency Module is an integral part with a control module or unit and an antenna it is used for wireless identification. Main tasks of the RF module are to send an energizing signal via the antenna. The RF module delivers a digital data stream and a clock signal for further processing to its control unit or module. Furthermore a field strength dependent digital output is available for synchronization purposes. The RFM is tuned to resonance with the antenna by adjusting the inductance of the tuning coil at the RFM's output stage. RF Module can be categorized into two parts:

1. RF TRANSMITTER

This wireless data is the easiest to use with lowest cost. Use these components to transmit position data, temperature data, and even current program register values wirelessly to the receiver. These modules have up to 500 ft range in open space. The transmitter operates from 2-12V. The higher the Voltage, the greater the range. We have used these modules extensively and have been very impressed with their ease of use and direct interface to an MCU. The theory of operation is very simple. What the transmitter 'sees' on its data pin is what the receiver outputs on its data pin. If you can configure the UART module on a uC, you have an instant wireless data connection. The typical range is 500ft for open area.

2. RF RECEIVER

This receiver type is good for data rates up to 4800bps and will only work with the 434MHz or 315 MHz transmitter. Multiple 434MHz or 315MHz receivers can listen to one 434MHz transmitter or 315 MHz transmitter. This wireless data is the easiest to use, lowest cost RF link. Use these components to transmit position data, temperature data, and even current program register values wirelessly to the receiver. These modules have up to 500 ft range in open space. The receiver is operated at 5V. We have used these modules extensively and have been very impressed with their ease of use and direct interface to an MCU.

E. LDR

A photoresistor or light dependent resistor (LDR) is a resistor whose resistance decreases with increasing incident light intensity. It can also be referred to as a photoconductor. A photoresistor is made of a high resistance semiconductor. If light falling on the device is of high enough frequency, photons absorbed by the semiconductor give bound electrons enough energy to jump into the conduction band. The resulting free electron (and its hole partner) conduct electricity, thereby lowering resistance. A photoelectric device can be either intrinsic or extrinsic.

F. BUZZER

A buzzer or beeper is an audio signalling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers and confirmation of user input such as a mouse click or keystroke.

G. LED

A light-emitting diode (LED) is a semiconductor light source. LEDs are used as indicator lamps in many devices, and are increasingly used for lighting. When a light-emitting diode is forward biased (switched on), electrons are able to recombine with holes within the device, releasing energy in the form of photons. This effect is called electroluminescence and the colour of the light (corresponding to the energy of the photon) is determined by the energy gap of the semiconductor. An LED is often small in area (less than 1 mm^2), and integrated optical components may be used to shape its radiation pattern.

H. GPS MODULE

Regulated power for the SKG11B is required. The input voltage Vcc should be 3.0V to 4.2V range, current is no less than 100mA. Suitable decoupling must be provided by external decoupling circuitry (10uF and 1uF). It can reduce the Noise from power supply and increase power stability. The SKG11B is a complete GPS engine module that features super sensitivity and ultra low power. The SKG11B GPS receiver is designed for supporting the active antenna or passive antenna connected with pin RF_IN. The gain of active antenna should be no more than 35dB. The maximum noise figure should be no more than 1.5dB and output impedance is at 50 Ohm.

I. GSM MODEM

GSM (Global System for Mobile Communications) is the most popular standard for mobile telephony systems in the world. GSM differs from its predecessor technologies in that both signalling and speech channels are digital, and thus GSM is considered a second generation (2G) mobile phone system. This also facilitates the wide-spread implementation of data communication applications into the system. GSM also pioneered low-cost implementation of the short message service (SMS), also called text messaging, which has since been supported on other mobile phone standards as well. The standard includes a worldwide emergency telephone number feature. GSM is a cellular network, which means that mobile phones connect to it by searching for cells in the immediate vicinity. There are five different cell sizes in a GSM network-macro, micro, pico, femto and umbrella cells. The coverage area of each cell varies according to the implementation environment.

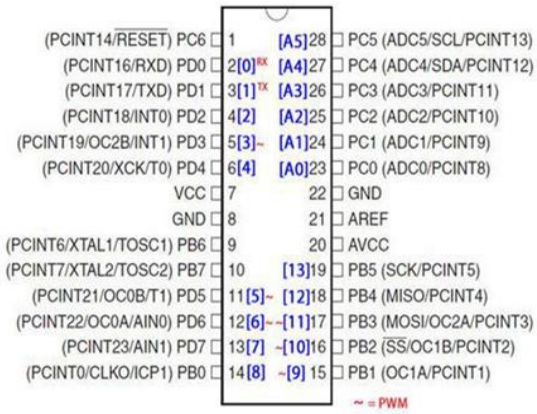

Figure 2. Pin Diagram

The Atmel ATmega328P is a 32K 8-bit microcontroller based on the AVR architecture. Many instructions are executed in a single clock cycle providing a throughput of almost 20 MIPS at 20MHz. The ATMEGA328-PU comes in an PDIP 28 pin package and is suitable for use on our 28 pin AVR Development Board.

III. REFERENCES

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