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Annexure I

1. Project Title: SMART WALKING STICK FOR BLIND PEOPLE

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1. Abstract & Objective

1.1 Abstract

The objective of this project is to help the blind people because mobility of blind people is always a great problem. The mobility of blind people in unknown environment seems impossible without external help, because they don't have any proper idea about their surroundings. So, we are developing a smart walking stick which helps them to know about their surroundings and also guide them during travelling.

Ultrasonic sensor and water sensor used in this system is to know about the surrounding conditions of the blind people and they are connected as an input to the microcontroller. These sensors are used to detect the obstacles and presence of water in front of them and give input to the microcontroller. The microcontroller compares the input levels taken from the sensors with the reference levels and provides the information to the user through voice and vibration. In these keypad is used to select the desired location.

GPS receiver is used to track the position of the human and given to the level converter; the level converter is used to change the logic of the signal from the GPS receiver which is acceptable by the embedded system. Zigbee provide two friendly modes of communication - a simple serial method of transmit/receive or a framed mode providing advanced features. These modules can communicate point to point in a mesh network. . By using the keypad we can set the position of the destination. The voice module and speaker is used to produce the voice if the human goes out of the desired path.

1.2 Motivation

The mobility of blind people in unknown environment seems impossible without external help, because they don't have any proper idea about their surroundings. So, we are developing a smart walking stick which helps them to know about their surroundings and also guide them during travelling.

Main aim of our project:

1. Blind people finding of way through a complex environment

2. The orientation and navigation for these people in unknown environment seems possible

3. Blind peoples are fearless or comfortable about independent mobility or travel

1.3 Objective

The main objective of this project is to design a smart walking stick that alerts visually impaired people over obstacles and water in front could help them in walking with less accident. It outlines a better navigational tool for the visually impaired. It consists of a simple walking stick equipped with sensors to give information about the environment. GPS technology is integrated with pre-programmed locations to determine the optimal route to be taken. The user can choose the location from the set of destinations stored in the memory and will lead in the correct direction of the stick.

2. Block Diagram & Technical Specifications

2.1 Block Diagram and Working:

2.1.1. Block Diagram:

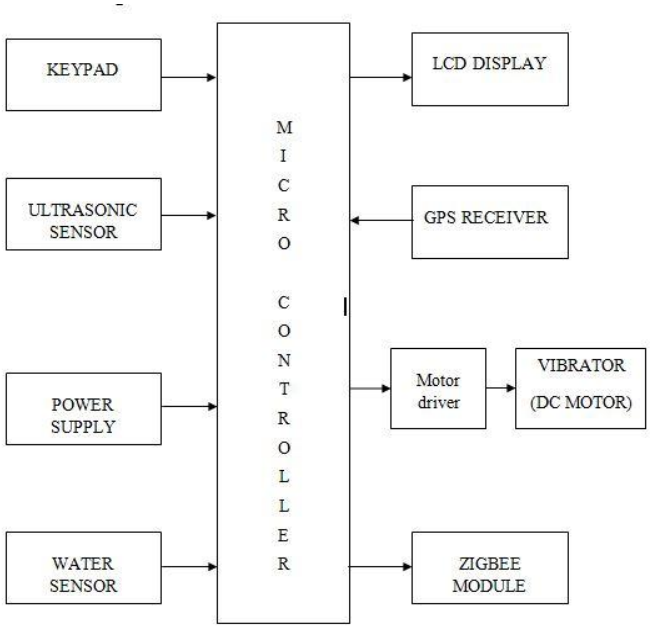


Figure 2.1.1 Block Diagram of Transmitter section in Smart walking stick

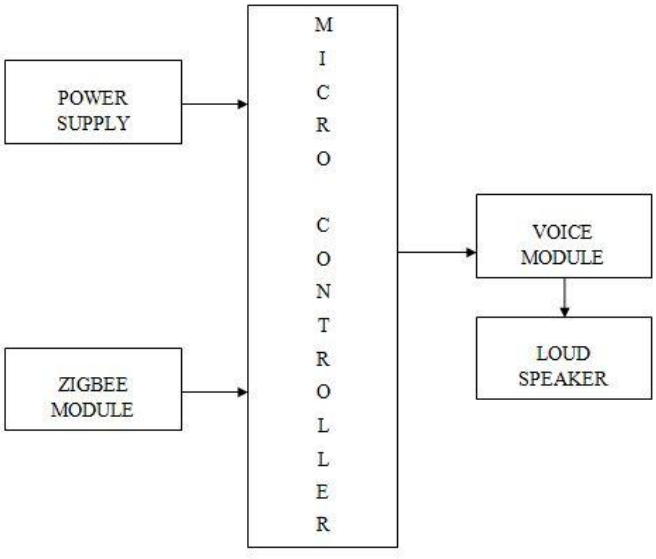


Figure 2.1.2 Block Diagram of Receiver section in Smart walking stick

2.1.3. Working:

The sensors and GPS receiver acts as an input to the Microcontroller. The proposed device uses ultrasonic sensor and it can detect any object that lies on the ground, situated a distance of certain meters from the user. The minimum size of the object that can be detected should not be less than 3 cm width (or diameter). In operation a beam of ultrasound of 40 KHz frequency is transmitted at a regular interval in the forward direction. The ultrasound will be reflected from a nearby object, if any. The sensor will then detect the presence of any object that lies within that meters by detecting the reflected sound beam. The time intervals at which the transmitter will transmit ultrasound depend on the walking speed of the user. For water indication electrodes are fitted at the bottom of the stick these electrodes are sensing water and conveying information to blind people. The GPS based blind device with user input interfacing get alert the blind person when reaches destination by voice .It consists of microcontroller and GPS and one voice module to generate the voice. The Micro controller is the heart of the device. It stores the data of the current location which it receives from the GPS system. So that it can make use of the data stored to compare with the destination location of the user. Zigbee is a specification for a suite of high-level communication protocols used to create personal area networks built from small, low-power digital radios. Zigbee is based on an IEEE 802.15.4 standard. Though its low power consumption limits transmission distances to 10–100 meters line-of-sight, depending on power output and environmental characteristics, Zigbee devices can transmit data over long distances by passing data through a mesh network of intermediate devices to reach more distant ones. Keypad is used to set the position of the destination. The voice module and speaker is used to produce the voice if the human goes out of the desired path. Power supply present in the system is used to give power to all the units present in the system.

In our project we are using LPC2148 microcontroller, AT89S52 microcontroller, APR9600 voice module, LS20030 GPS receiver, Tarang4 Zigbee module, HC-SR04 Ultrasonic sensor, water level indicator circuit as Water sensor, 10 rpm dc motor as Vibrator to vibrate the stick, Keypad and power supply from 12v battery. Microcontroller is a single chip that contains the processor (CPU), non-volatile memory for the program (ROM or flash), volatile memory for input and output (RAM), a clock and an I/O control unit and time. It is designed for a small set of specific function to control a particular system. The reason of using microcontroller is has the ability to store and run unique program.

Ultrasonic sensor is used to detect the obstacles that lie on ground, situated a distance of certain meters from the user.The output of sensor converted to digital that easy connecting with microcontroller. The Microcontroller uses the ADC pin for reading input from ultrasonic sensor.The 10 bit ADC used to read input from ultrasonic sensor . Basic clocking for the A/D converters is provided by the VPB clock. A programmable divider is included in each converter, to scale this clock to the 4.5 MHz (max) clock needed by the successive approximation process. A fully accurate conversion requires 11 of these clocks.

Water sensor is used to sense any water present in the path. Water sensor is connected to any port of microcontroller because we are using transistor with electrodes as a water sensor. Here transistor acts as a switch, whenever electrodes sense the presence of water the transistors activated and convey the information to the Microcontroller.

GPS is used to track the position and alert the blind person, when reaches the distination. GPS Receiver is an UART module, we need to interface at UART port of Microcontroller. Since the voltage levels are different, we need to use a voltage converter which converts RS 232 voltage levels to TTL and vice-versa.

DC motor is used as a vibrator. It used to alert the blind person. DC motor is not directly connected to microcontroller due voltage level. It connected to Microcontroller through relay. Here relay acts as a switch whenever it sense any input to Microcontroller then relay gets activated and make DC motor to activate.

Zigbee is used to transmit the digital data. It connected to Microcontroller through RS232 which converts voltage levels to TTL and vice-versa.

Voice module is directly connected to ports of AT89S52. Voice module acts external interrupt to the microcontroller.

2.2 Technical Specifications:

2.2.1. Arm Controller:

Arm is a 32-bit Reduced Instruction Set Computer (RSIC). Instruction set architecture named as Advanced RISC machine and, before that Acorn RISC machine. The ARM architecture mostly used 32-bit instruction set architecture.

Features

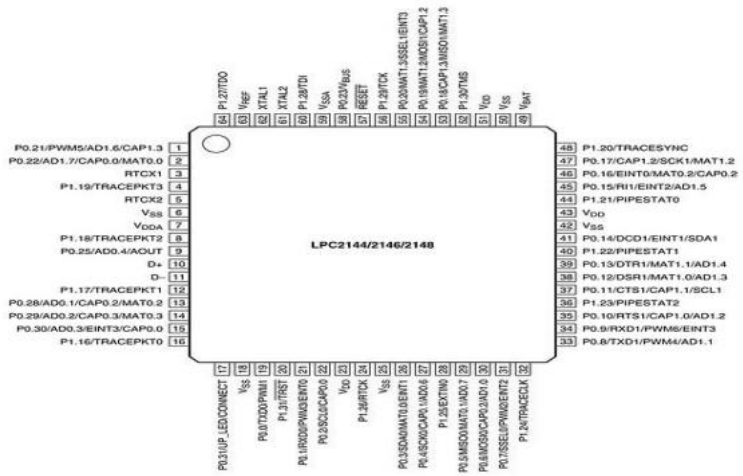
- 32-bit RSIC processor core (32-bit instructions)
- 37 pieces of 32-bit integer registers (16 available)

- Pipelined (includes 3 stages)
- Cached (depending on implementation)
- Von Neumann-type bus structure (ARM7) and Harvard (ARM9)
- 8 or 16 or 32-bit data types
- 7 modes of operation
- Simple structure and reasonably good speed to power consumption.•

LPC2148 is the heart of system. Used in all three modules. It controls all the functions. It is the widely used IC from ARM-7 family. It is manufactured by Philips and it is pre-loaded with many inbuilt peripherals making it more efficient and a reliable option for the beginners as well as high end application developer.

It has the following features:

- 8 to 40 kB of on-chip static RAM. 32 to 512 kB of on-chip flash program memory.
- 128 bit wide interface/accelerator enables high speed 60 MHz operation.
- In-System/In-Application Programming (ISP/IAP) via on-chip boot-loader software
- Single flash sector or full chip erase in 400 ms and programming of 256 bytes in 1ms
- Total 64 I/O pins



2.2.2. 89S52 Processor Architecture:

The microcontroller development effort resulted in the 8051architecture, which was first introduced in 1980 and has gone on to be arguably the most popular micro controller architecture available. The 8051 is a very complete micro controller with a large amount of built in control store (ROM & EPROM) and RAM, enhanced I/O ports, and the ability to access external memory.

The maximum clock frequency with an 8051 micro controller can execute instructions is 20MHZ. Microcontroller is a true computer on chip. The design incorporates all of the features

found in a microprocessor CPU, ALU, PC, SP and registers. It also has the other features needed to, make complete computer ROM, RAM, parallel I/O, serial I/O, counters and a clock circuit.

- 8K Bytes of In-System Reprogrammable Flash Memory
- Endurance: 1,000 Write/Erase Cycles
- Fully Static Operation: 0 Hz to 33 MHz
- Three-level Program Memory Lock
- 256 x 8-bit Internal RAM
- 32 Programmable I/O Lines
- Three 16-bit Timer/Counters
- Eight Interrupt Sources
- Programmable Serial Channel
- Low-power Idle and Power-down Modes

2.2.3. Serial Communication

RS232 (Recommended standard-232) is a standard interface approved by the Electronic Industries Association (EIA) for connecting serial devices RS232 is a serial communications standard which enables data to be transferred in serial from between two devices. Data is transmitted and received in serial _bit stream' from one point to another. Standard RS232 is suitable for data transfer to about 50m, although special low-loss cables can be used from extended distance operation. Four parameters specify an RS232 link between two devices.

2.2.4 Global positioning system (GPS):

The Global Positioning System (GPS) is a space-based satellite navigation system that provides location and time information in all weather conditions, anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites.

The most essential function of a GPS receiver is to pick up the transmissions of at least four satellites and combine the information in those transmissions with information in an electronic almanac, all in order to figure out the receiver's position on Earth.

A GPS receiver must be locked on to the signal of at least three satellites to calculate a 2D position (latitude and longitude) and track movement. With four or more satellites in view, the receiver can determine the user's 3D position (latitude, longitude and altitude). Once the user's position has been determined, the GPS unit can calculate other information, such as speed, bearing, track, trip distance, distance to destination, sunrise and sunset time and more. With this information and its built-in clock, the receiver can give you several pieces of valuable information

2.2.5 LS2030:

LS20030 are complete GPS smart antenna receivers, including an embedded antenna and GPS receiver circuits, designed for a broad spectrum of OEM system applications. 66 channel GPS SMD type receivers MC-1513 that use Media Tek chip solution. The GPS smart antenna will acquire up to 66 satellites at a time while providing fast time-to-first-fix, one-second navigation update and low power consumption. It can provide superior sensitivity and performance even in urban canyon and dense foliage environment. Its far-reaching capability meets the sensitivity requirements of car navigation as well as other location-based applications.

Figure : LS20030 GPS Receiving Module

2.2.6 Zigbee:

The explosion in wireless technology has seen the emergence of many standards, especially in the industrial, scientific and medical (ISM) radio band. There have been a multitude of proprietary protocols for control applications, which bottlenecked interfacing. Need for a widely accepted standard for communication between sensors in low data rate wireless networks was felt. As an answer to this dilemma, many companies forged an alliance to create a standard which would be accepted worldwide.

Figure: ZigBee chip

2.2.7 Ultrasonic sensor:

Ultrasonic signals are like audible sound waves, except the frequencies are much higher. Our ultrasonic transducers have piezoelectric crystals which resonate to a desired frequency and convert electric energy into acoustic energy and vice versa.

Ultrasonic sensor types:

An object passing anywhere within the preset range will be detected and generate an output signal. The detect point is independent of target size, material, or degree of reflectivity.

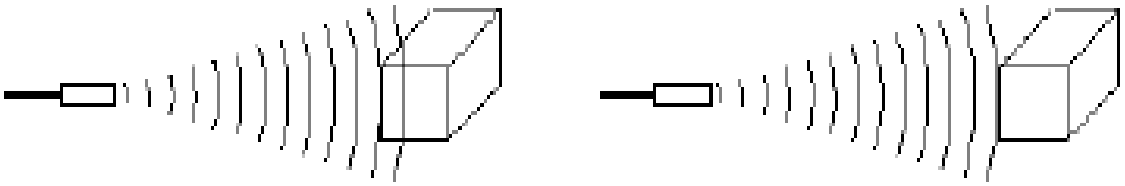


Figure : Objected detected – YES **Objected detected – NO**

Precise distance(s) of an object moving to and from the sensor are measured via time intervals between transmitted and reflected bursts of ultrasonic sound.

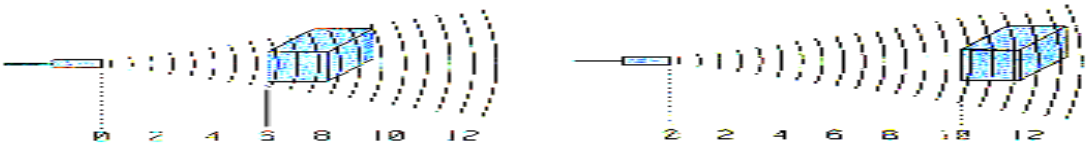


Figure: Ranging Measurement of ultrasonic sensor

2.2.8 Keypad:

A keypad is a set of buttons arranged in a block or "pad" which usually bear digits, symbols and usually a complete set of alphabetical letters. If it mostly contains numbers then it can also be called a numeric keypad. Keypads are found on many alphanumeric keyboards and on other devices such as calculators, push-button telephones, combination locks, and digital door locks, which require mainly numeric input.

2.2.9 Liquid Crystal Display (LCD):

LCD is used to display the distance from the dust level present in the bin and acknowledgement about message sent to the base station.

An LCD consists of two glass panels, with the liquid crystal material sand witched in between them. The inner surface of the glass plates are coated with transparent electrodes which define the character, symbols or patterns to be displayed polymeric layers are present in between the electrodes and the liquid crystal, which makes the liquid crystal molecules to maintain a defined orientation angle.

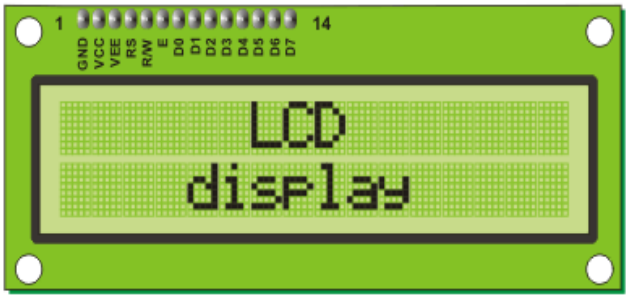


Figure : LCD display

A liquid crystal is a material (normally organic for LCDs) that will flow like a liquid but whose molecular structure has some properties normally associated with solids. The Liquid Crystal Display (LCD) is a low power device.

2.2.10 DC motor:

A DC motor in simple words is a device that converts direct current (electrical energy) into mechanical energy. In any electric motor, operation is based on simple electromagnetism. A current carrying conductor generates a magnetic field; when this is then placed in an external magnetic field, it will experience a force proportional to the current in the conductor, and to the strength of the external magnetic field.

2.2.11. Overall Schematic:

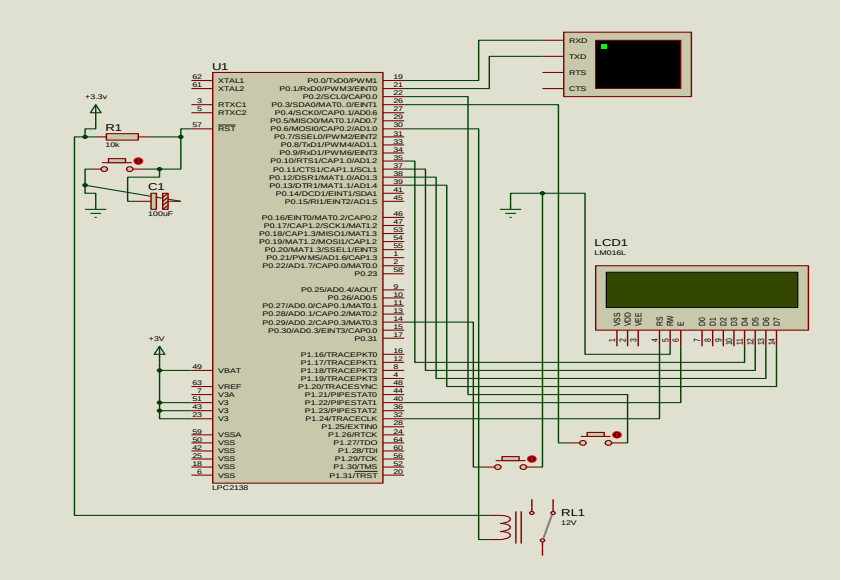


Figure: schematic diagram for Transmitter section in smart walking stick

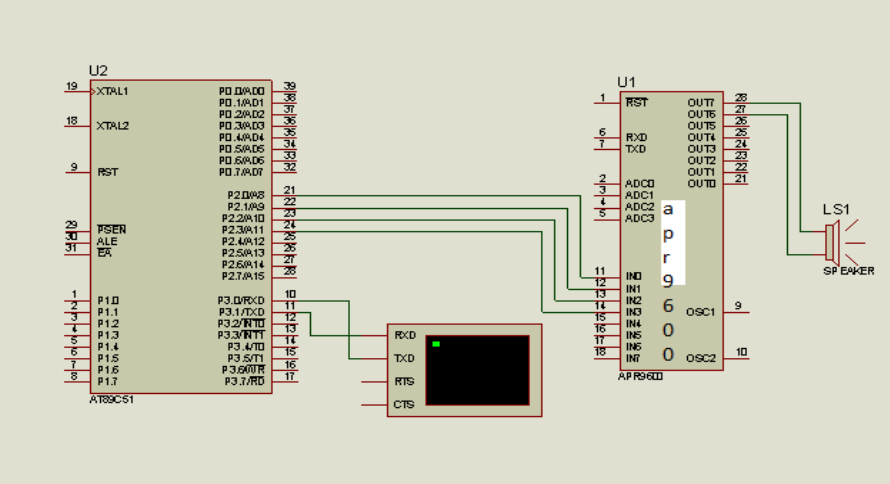


Figure: schematic diagram for Receiver section in smart walking stick

2.3 Results & Analysis:

The Figure shows the practical smart walking stick for blind people. The system consists of LPC2148 microcontroller, AT89S52 microcontroller, HR-SC(04) distance sensor, water sensor, voice module, vibrator, zigbee module and GPS module. GPS receiver module is used to receive the signals continuously from satellites, whenever the signals matches with predefined locations of microcontroller then it alert the blind person. The ultrasonic sensor and water sensor are used to

detect the obstacles and presence of water in front of the user. These sensors are used as the input to the microcontroller. The microcontroller compares the input from the sensors with the reference levels and generates the results with respect to the corresponding levels and produce output through vibrator and voice module. The primary language used in this system is embedded C. The development and simulation of the program code is done using KEIL and proteus software.

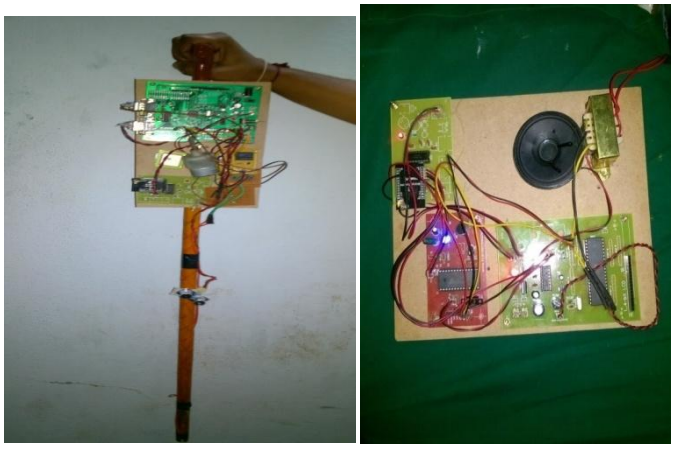


Figure : Practical Smart walking stick for blind people

5.2 LCD Results:

Figure: Lcd Displayed Values For Sensors measurements

Lcd display is interfaced with LPC2148.it shows the sensors output and condition through display and it is also shows the GPS condition when we reach the destination.

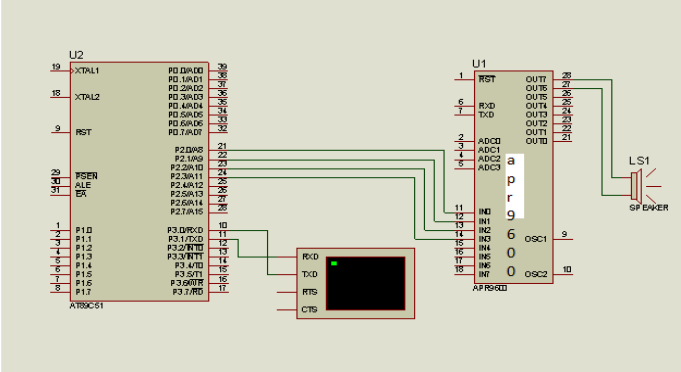


Figure: schematic diagram for Receiver section in smart walking stick

3.0 CONCLUSION

3.0 Conclusion:

From this project we can conclude that advance of technology can be also used for disabled persons around us. The main theme of the project is to support the blind people in travelling from one place to another place.

This project gives the development of an automatic system to support the visually impaired persons. Even though the project is advantageous, the main disadvantage is less accurate. In this project Sensors were used, as they are small in size and small range. Hence they are less accurate. Implementation of more and more new innovative projects with the help of technologies and new developments is possible.