SELF ASSISTIVE DEVICE FOR VISUALLY CHALLENGED USING SONAR, GSM, GPS

[1.] M. Suresh, [2.]Ch. Ravisankar

1. Assistant Professor, School of Electronics and Electrical Engineering,

Lovely Professional University, Phagwara, Punjab, India.

2. Assistant Professor, School of Electronics and Electrical Engineering,

Lovely Professional University, Phagwara, Punjab, India.

Abstract:

Vision, Gifted by god to human being for sense, we can see the beauty of nature with the help of our eyes, things that happen in everyday life. But some unfortunate people lack that ability to experience these things. During their day-to-day tasks they face several issues. The person with visual impairment will rely on senses other than sight, such as hearing and feeling of touch to guide him.

To minimize the difficulties faced by blind humans, a project has been designed, which will give direction to Visually Impaired people to reach their destination. The agenda of this project is to provide the self-assistance for the visually impaired persons. If in case the user fall in a critical position, the sensors connected with microcontroller will senses the situation. We implemented a wrist mounted system (Gauntlet) for visually impaired users which allows them to detect and avoid obstacles and allows the user to point the device in any direction. [1]
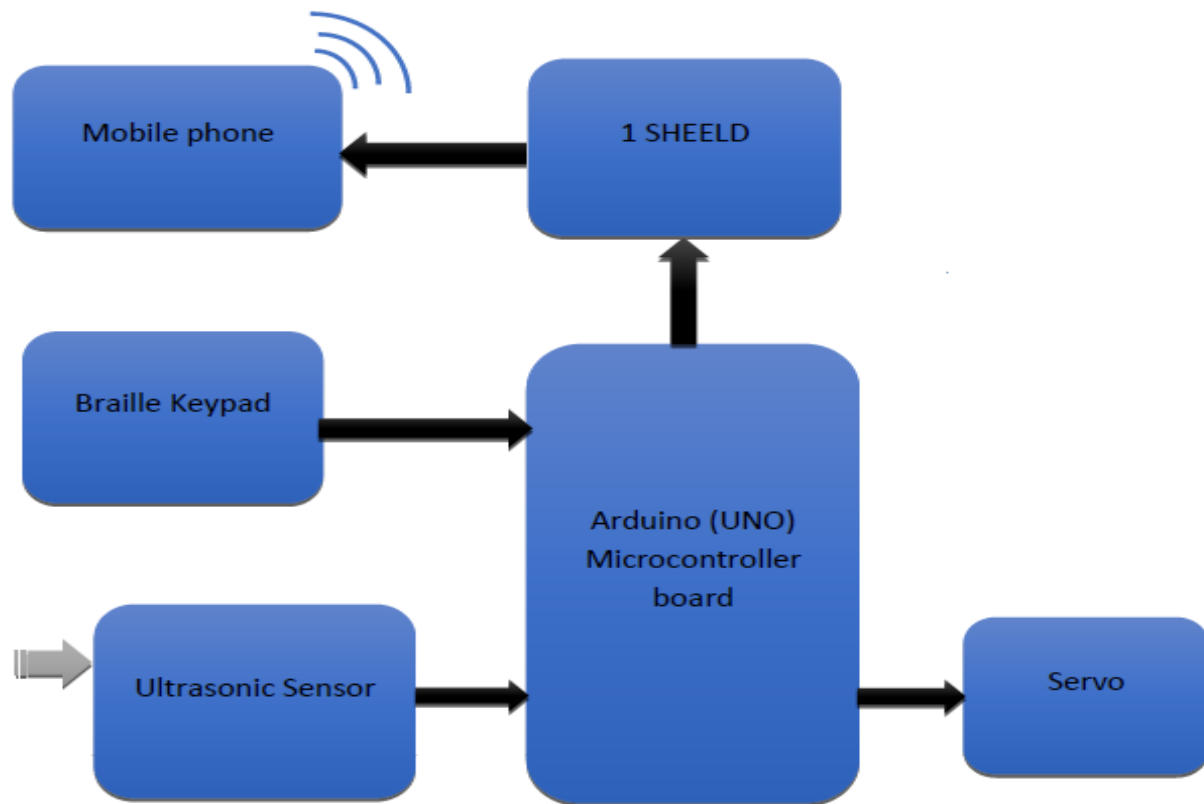
This system is depend on an ultrasound sensors which can read data, when objects detected in the environment by estimating of the ultrasound signal, the device detect obstacles and determine which directions should be avoided by giving a tactile feedback using servomotors. This system also consists of a Braille keypad with a panic button which when pressed sends the message of his current GPS coordinates to their Family person and also there are two buttons in the keypad which when pressed speaks the time and date for the user. Additionally we have a device control which will be operated by using Braille keypad, the device control section of the microcontroller is connected with devices as per our need devices may be lights, fans, and can also be used to lock and unlock the door, and for this we are using the GSM (Global System for Mobile Communications) module.

Keywords:

GPS, GSM, SONAR, HC-04,1Sheeld

Introduction:

Blindness is a disease which affects many people all over the world. Lot of navigation systems and tools are existing for blind person's individuals. Main requirements of the system is identifying obstacles. Additionally this system gives them access to control the home appliances which may prove to be difficult for them in some situations.

Block Diagram:

Fig: Block Diaggram of the proposed System

Components required for the System:

- Arduino microcontroller board(UNO)
- Servo motor
- Ultrasonic sensor(HC SR04)
- 1 Sheeld Bluetooth module
- Keypad
- GSM module

While assembling these components we can build a device that warns the blind person if there is an obstacle ahead in his way and by pressing the buttons on keypad he can control the devices in home such as light, fan and can also lock and unlock his door.

Arduino Microcontroller Board (Arduino UNO):

The Arduino Uno is a microcontroller (µ.c.) based development platform board (Hardware) which can be programmed with the help of a programming language (Software) known as Arduino integrated development environment (Arduino IDE). [2] [9]

The Arduino Uno is a µ.c. development board where the µ.c. IC (Integrated Chip) name is ATmega328P. It has fourteen digital data, six basic data sources, a quartz crystal of 16 MHz, a USB connector, a power jack to power up the module, and a reset catch. This board can be directly connected to a working system with the Universal Serial Bus connector for uploading the program as well as to supply the board or it can be powered with a household Alternating Current to Direct Current connector or a battery to start work with it, just after uploading program/code through USB connector.
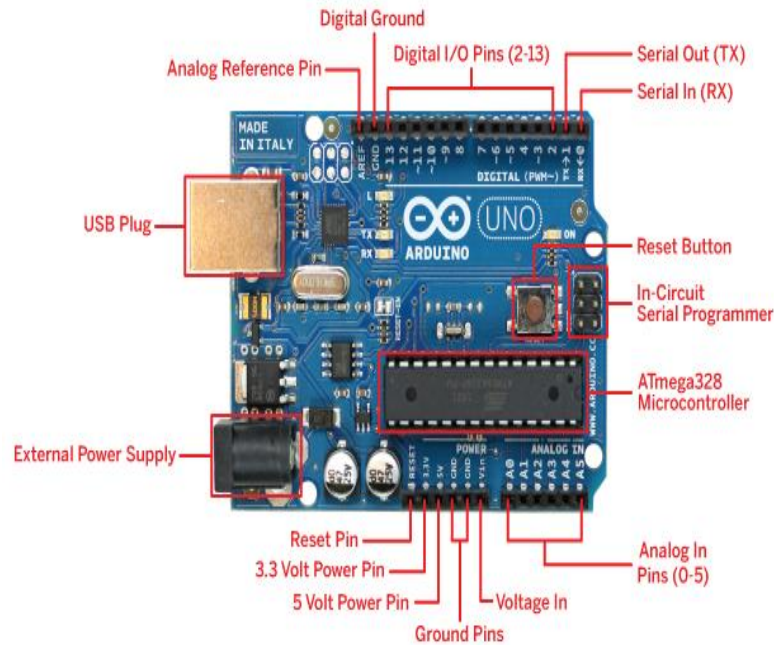
Fig: Arduino UNO

This board and Arduino Software (IDE) are the Arduino reference variants. There are many types of Arduino boards, of which Uno board is the first of its kind, as well as the reference model especially for the beginners of Arduino programming/projects.

Servo Motor:

Servos (likewise RC servos) are little, modest, mass-created servomotors or different actuators utilized in applications, for example, mechanical technology, CNC hardware or mechanized assembling. They are not a particular class of engine in spite of the fact that the term servomotor is regularly used to allude to an engine reasonable for use in a shut circle control framework. [3]

Servo engines are commonly a gathering of four things: a DC engine, an outfitting set, a control circuit and a position-sensor (typically a potentiometer).

Fig: Servo motor

Ultrasonic Sensor (HC-SR04):

The HC-SR04 ultrasonic sensor user the concept of sound signal to determine distance of an object. It offers non-contact range detection with high accuracy and stable readings in an easy to use package. It can detect obstacles ranging from 2cm to 400cm or 1 to 13 feet. The sensor looks like the figure. [4]

Fig: Ultrasonic sensor HC-SR04

1Sheeld:

The **1sheeld**, you connect one shield on the top of your Arduino board. The 1shield acts as a wireless medium between your Arduino and your handset for data transferring to your phone, you've got an app running that can quickly switch **1sheeld's** behavior from shield to shield GPS , Ethernet, liquid crystal display (LCD), or bread boarding (prototyping). Several shields can also be made do it yourself. [5]

Fig: 1sheeld Bluetooth module

GSM Module:

GSM is a cellular network, it uses to get message from the bind person to the relatives in emergency situations. It helps the blind persons escape from dangerous situations.

Fig: GSM Module

LED:

A light-emitting diode is a semiconductor diode that emits light when applied in the device's forward direction, as in the simple LED circuit. One type of electroluminescence is the effect. [10]

LEDs are widely used on electronic devices as indicator lights, and increasingly in higher-power applications such as flashlights and area lighting.

LCD:

A liquid crystal display, level display gadget composed of number of shading. Each pixel consists of a segment of fluid stone precious atoms suspended between two straight terminals, and two polarizing channels, the extremity tomahawks opposite each other. Without the fluid gems between them, light going through one would be hindered by the other. [6]

A program must interface with the outside world using gadgets for info and yield that legitimately discuss with an individual. An LCD show is one of the most well-known gadgets joined to a controller. Probably the most well-known controller related LCDs are showcases of 16X1, 16x2 and 20x2.

Methodology:

The assistive device is placed on the wrist of the blind person so that he carry the device very freely as if he is carrying a watch. The front part of the device consists of the ultrasonic sensor which detects any obstacle that comes in front of the sensor .This detection of the obstacle through the sensor will take place by the principle on which the sensor works that is it will emit the sound waves and if any obstacle comes in front of sensor the sound waves will hit the obstacle and the echo will reach back to the sensor. [7]
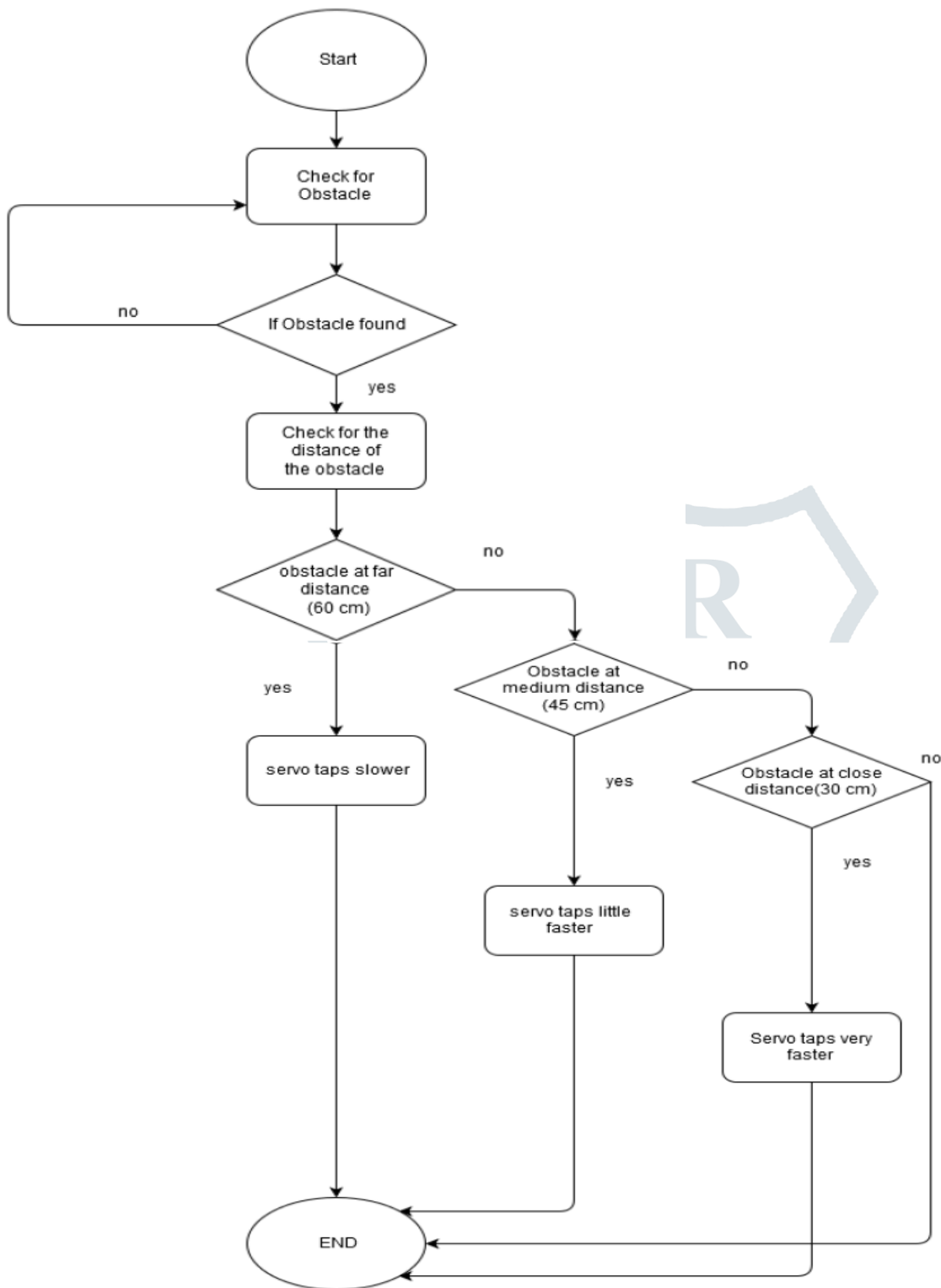
Fig: Flow diagram for obstacle detection and avoidance system

The echo will be useful for calculating of the distance between sensor and obstacle. Thus the sensor will calculate the distance this is the first step that the sensor will perform. This is similar to Doppler Effect that we know. The second step is that the blind person should know "How much far the obstacle is?" For this we have taken the maximum distance of the detection of any obstacle at 60cms (far case) .Now we divided the maximum distance into three parts of distance detection at 60cms,45cms,30cms as far distance, medium distance and close distance respectively. This as process is handled by the ARDUINO micro controller which we have used for this project. [8] [11]

The third part of our project is that "How the blind person get the response from the sensor"? Up to now we had detected the obstacle through the sensor and now we had to send the response of the sensor the obstacle is there in front to the blind person. For this purpose we have used the two servo motors which will tap to the hand of the blind person according to the response of the sensor. As we had mentioned earlier that we had divided the maximum detection path of the sensor into three accordingly the servo motors will tap to hand that means if the obstacle is at 60cms the servo motor will tap slowly and if the obstacle is at 45cms the servo motor will tap some fast

and if the obstacle is at 30cms the servo motor will tap very fast that make into sense that the obstacle is very close to the person so, that he has to take the diversion in his path. This all process is handled by the microcontroller ARDUINO.

Conclusion:

We have presented a project which helps blind people to detect any obstacle in their path safely. This aid navigates the blind people through tactile feedback and also allows the blind person to avoid obstacles by warning system using servo motors that tap in the wrist. This blind belt consists of advanced features which detects obstacles in front, pits and water stagnated/manholes on the ground. By using this system movement is easier in both indoor and outdoor environment. There is also an emergency switch in the project by which if the blind person faces any difficulty in its path we can press the switch and an "HELP" message with his GPS coordinates is sent to the authorized person's mobile who can help him. Additionally the keypad on his wrist acts as a remote to control all the home appliances and also locks and unlocks the door.

References:

[1]Indoor Navigation System For Visually Impaired Person Using GPS-Dr. Boyina.S.Rao, Ms. K.Deepa, Hari Prasanth.L, Vivek.S, Nanda Kumar.S, Rajendhiran.A, Saravana.J International Journal of Advanced Engineering Technology E-ISSN 0976-3945.
[2]The GuideCane — A Computerized Travel Aid for the Active Guidance of Blind Pedestrians by Johann Borenstein and Iwan Ulrich Proceedings of the IEEE International Conference on Robotics and Automation, Albuquerque, NM, Apr. 21-27, 1997, pp. 1283- 1288.
[3]Perceptible Path Organism In Support Of Visually Impaired People-Akella.S.Narasimha Raju, N.Nagasubrahmanyeswari International Journal of Engineering Science & Advanced Technology Volume-2, Issue-4, 932 – 940
[4] Electronic Path Guidance for Visually Impaired People Harshad Girish Lele, Viten Vilas Lonkar, Varun Vasant Marathe, 4Mrunmayi Mohan Modak Department of Electronics and Telecommunication, P.V.P.I.T., Pune. The International Journal Of Engineering And Science (IJES), Volume-2, Issue-4 2013, ISSN(e): 2319 – 1813 ISSN(p): 2319 – 1805
[5] S. SaiSanthosh, T.Sasiprabha, R.Jeberson, "BLINAV EmbeddedNavigation System for Blind People"
[6] Mahdi Safaa A., Muhsin Asaad H. and Al-Mosawi Ali I. "Using Ultrasonic Sensor for Blind and Deaf persons Combines Voice." International Science Congress Association, 50- 52, 2012.
[7] Pooja Sharma, Mrs. Shimi S. L. and Dr. S.Chatterji, "A Review on Obstacle Detection and Vision", International Journal of Engineering Sciences and Research Technology", Vol.4, No.1, pp. 1-11, January 2015.
[8] M. Naveen Kumar and K. Usha, "Voice Based Guidance and Location Indication System for the Blind Using GSM, GPS and Optical Device Indicator", International Journal of Engineering Trends and Technology (IJETT), Vol.4 No.7, pp. 3083-3085, July 2013.
[9] Dr. Boyina. S. Rao, Ms. K.Deepa, Hari Prasanth.L, Vivek.S, Nanda Kumar.S, Rajendhiran.A and Saravana. J, "Indoor Navigation system for visually impaired person using GPS", International journal of Advanced Engineering and Technology, Vol.3 No.2, pp. 40-43, April-June, 2012.
[10] Rhydo Technologies Pvt. Limited, Sim 900-RS232 and GSM/GPRS user manual, 2011.
[11] Exploring Arduino Tools and Techniques for Engineering Wizardry by Jeremy blum