SMART NAVIGATION SYSTEM FOR VISUALLY IMPAIRED PEOPLE

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ABSTRACT:

Visually challenged people always depend on others and assistive technologies for their navigation. Nowadays, many assistive devices are present such as assistive cane, Electronic Travelling Aid (ETA), etc. These devices have many disadvantages such as high cost. Some of them uses guide dogs which requires many years of guidance and they are also very costly. These technologies are not convenient and feasible for the blind people. The main purpose of this project is to provide low cost and secure navigation device for the blind people .This system provides obstacle detection using ultrasonic sensor and outdoor navigation using Global Positioning system (GPS).User will give the desired destination using keypad. Then this system gives voice instruction to reach the destination. Obstacles present in the path are detected in the head, waist and ground level using ultrasonic sensor. The presence of obstacle is indicated to the user through the pre-recorded voice which is stored in the SD card.The main aim of this project is to integrate all the above mentioned functions and provide it as a low cost and portable navigation module to the blind people.

Keywords: Ultrasonicsensor, Global Positioning System (GPS), Keypad, SD card module, Arduino Pro Mini, RFmodule, Outdoor Navigation.

I. INTRODUCTION:

According to the survey, the count of visually impaired people is 285 million, 39 million are blind and 246 million having low vision. However, number of blind people over 60 years are increasing by 2 million per year. So the usage of navigation and orientation device is increased. Visually impaired people require assistance in their daily life. The main problem faced by the visually impaired people is outdoor navigation. For this problem, they use assistive canes for obstacle avoidance, Electronic Travelling Aid (ETA), guide dogs for finding way, etc. There are several technologies present in today's life but they are limited in their capabilities.

Smart canes can detect obstacles in the ground and middle level but it cannot be used to detect obstacles in the head level and it cannot be folded when it is not used. Guide dogs does not show correct path always and it also needs to be trained for more days to guide the blind people. Electronic canes are also present which uses laser technology. But it has the disadvantages that it cannot detect the obstacles which are made up of glass and it is costly. Other navigation systems are vision based navigation system which are implemented by using image processing technique. Some of the vision based navigation systems are VOICE, SVETA, etc. This technology requires computer so

the setup of this navigation system becomes bulky.

The most commonly used electronic navigation aids are ultrasonic aids, NAV belt, etc.Eventhough there is a presence of electronic aids they can detect obstacles either in the ground level or in the middle level not both. The main aim of this project is to detect obstacles in the ground, middle and ground level. It also provides guidance to the blind people using Global Positioning System (GPS).Ultrasonic sensors are used for obstacle detection. They are placed in the head and walking stick to detect all obstacles. The presence of obstacle is conveyed to the user through the microphone which is a pre-recorded voice stored in a SD card.The instructions to reach the desired destination is also given through the speaker. This system provides more efficient navigation device for blind people.

II. RELATED WORK:

In [1],N.Rama Murthy and P.N.Sudha proposed to detect ground, waist and head level obstacles and the presence of obstacle is reported to the user using pre-recorded voices which makes use of APR9600.It also detects pits in the ground. MurielPinto, Rose Denzil Stanley, Sheetal Malagi, K.Veena Parvathi and M.K.Ajithanjaya Kumar proposed [2] the feature of Smart cane for visually impaired people. This system is used to detect obstacles and to provide direction information. It consists of buzzer and motors to indicate the presence of obstacles. PS-GSM module is used to provide direction information and send that information to the saved number in the system.In [3], Tejal Chandekar, Ranavikrant Chauhan, Rajanigandha Gaikwad and Hrushikesh Gosavi presented the use of smart shoes which is used to detect the obstacles present in the path which makes use of sensors mounted on the shoe. It gives notification of the presence and position of obstacle to the user. The blind people require smart phone which provides direction in the audio form to the user by connecting with Google API maps.

In [4], Harsha Gawari and Prof.Meeta Bakuri speaks about the GPS based navigation system for the visually challenged people. The purpose of this paper is to guide the visually impaired people using GPS module and voice recognition technique. It also detect the obstacle on the path and alerts the user through the audio signal.Dr.X.Anita, R.Abirami and M.Epsi Vennila proposed [5] a smart navigation system which is used to detect the traffic signals. With the help of this hand held device, they can easily cross the roads without any external help. Ultrasonic sensor is used to detect the obstacle and the alert information is given to the user through the earphone. Anand Noorithaya, M.Kishore Kumar and Dr.A.Sreedevi [6] designed a cane which is used as a travelling aid for visually impaired people. It consists of ultrasonic sensor to detect the obstacles and gives audio instruction to the user about the presence of obstacle. It also detects the pits on the path. In [7], T.Gowthaman, R.Indhujah and K.Sowmya presented a paper about the smart cane which is used for navigation in indoor and outdoor navigation. The smart cane consists of camera to capture the obstacle and send it to PC to analysetheobstacle. The information about the obstacle type and the distance at which the obstacle is present is intimated to the user in the form of audio.

M.K.Pushpa, M.ShanmugaPriya, T.G.Nandhini, C.K.Shilpa and Sunitha proposed [8] a

navigation system which consists of Ultrasonic sensor and RF module. Ultrasonic sensors are used to detect the obstacles and gives the distance information.RF transmitter is used to intimate the traffic signal information and also gives information about the bus route to the user. In [9], Maher M.Abd El-Aziz and Wael M. Khalifa presented a paper about smart wearable system for the blind people. Ultrasonic sensors are placed on the hat and the pen. This system includes GPS-GSM module to identify the location and then deliver the location of the user to their preferred mobile number.

III. BLOCK DIAGRAM:

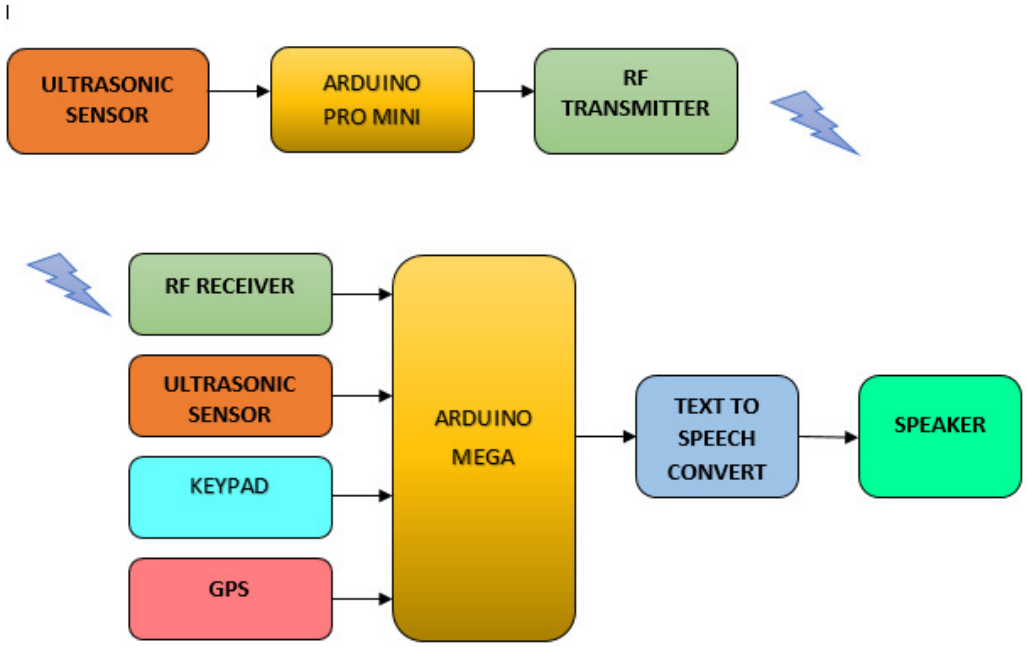


Fig: 1.Block diagram of our proposed system

IV. SYSTEM DESCRIPTION:

The fig (1) shows the complete block of our proposed system. The block diagram explains about the setup placed on the hat and the walking stick module. The walking stick module consists of GPS receiver which is used to guide the user to reach the desired destination. Ultrasonic sensor is placed on the hat to detect the head level obstacle and the presence of obstacle on the path is intimated to the user through the speaker. Another Ultrasonic sensor is placed on the walking stick to detect the obstacle at the waist level and GPS receiver also attached to the walking stick to guide the blind people. User can select the destination using keypad from the predefined path.SD card module is used to store the pre-recorded voice.RF module is used to transmit the data coming from the sensor placed on the hat to the receiver placed on the walking stick. Componentsused in our proposed system are,

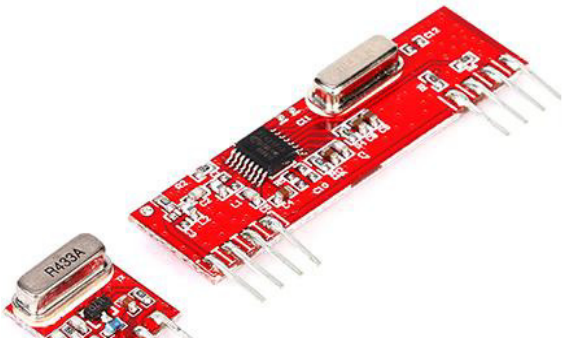
A.ULTRASONIC SENSOR

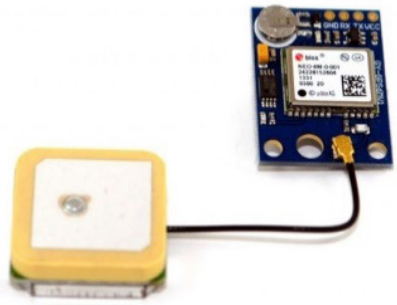
Ultrasonic sensor is used to measure the distance of an object by generating sound waves. By considering the time taken between the sound waves generated and the sound waves get reflected back to the sensor, it is easy to calculate the distance between the sensor and the object. Ultrasonic sensor is sensitive to temperature and humidity. Some objects cannot get detected by the ultrasonic sensor because of the object's absorbing property.

Fig: 2.Ultrasonic Sensor

B.RF MODULE:

RF module consists of an RF transmitter and RF receiver. Both transmitter and receiver operates at the frequency of 433MHz.The frequency range changes between 30KHz-300GHz.RF module operating range is 200ft.In this module, digital data is represented using Amplitude Shift Keying(ASK) method. An RF transmitter transmits the serial data through the antenna to the RF receiver. Transmission takes place at the speed of 1Kbps-10Kbps.





module. The message is displayed in the NMEA format which is the most common format used by all GPS receivers. The requirement of power for this GPS module is very low.

Fig:4.Ublox NEO 6m GPS module

V. FLOW DIAGRAM:

D.TRANSMITTER SECTION:

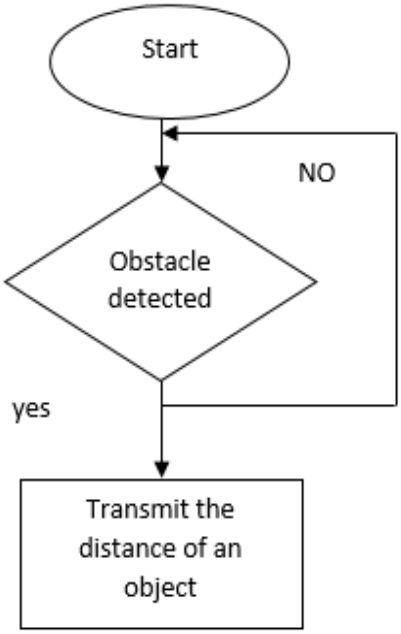


Fig:5-Flow diagram of Transmitter Section.

E.RECEIVER SECTION:

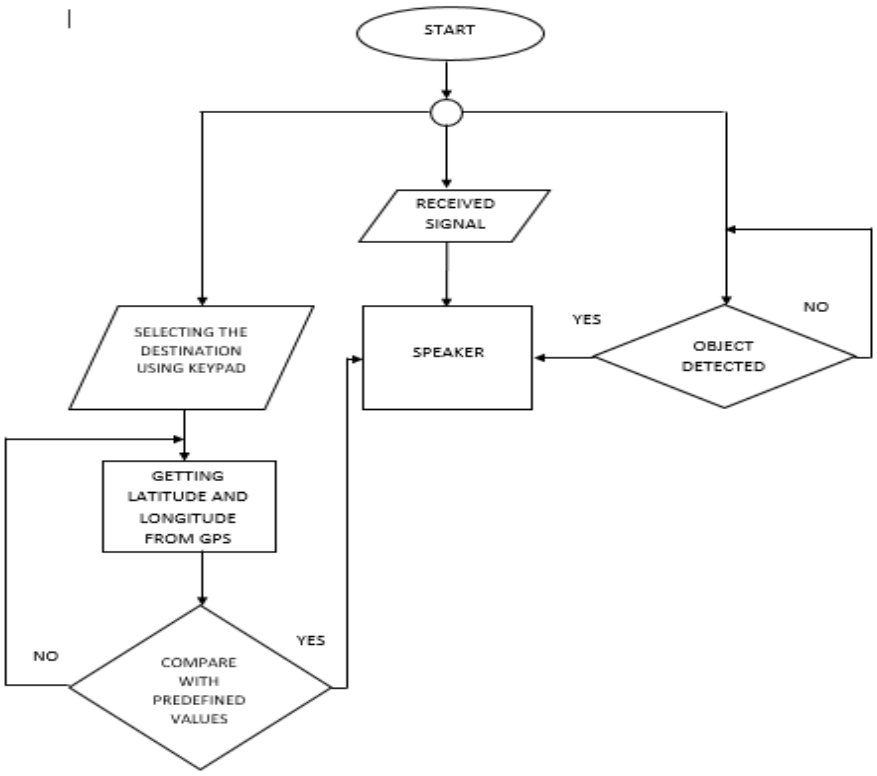


Fig:6-Flow diagram of Receiver Section

VI. WORKING:

The system consists of transmitter section and receiver section.Transmitter section comprises of Ultrasonic sensor,Arduino Pro Mini and RF transmitter.This transmitter setup is placed in the hat to detect the head level obstacle.When the obstacle is detected by the ultrasonic sensor,it transmits the distance of an obstacle to the RF receiver.Receiver section comprises of Ultrasonicsensor,ArduinoMega,GPS,Keypad,speaker.This setup is placed in the walking stick.When the sensed signal is received by the receiver,then the distance of an obstacle in the head level is intimated to the user through the speaker which is the prerecorded voice.Then the obstacle detected at the middle level is intimated to the user.User can select the destination using keypad which is predefined in the code.GPS can guide the user based on the latitude and longitude of the desired destination.SD card module is used to store the prerecorded voice.

VII. FUTURE WORK

While providing guidance to the user,this setup can't specify the direction of where they are facing.Due to this,they may be walk in a wrong direction.To rectify the direction problem,we are in the process of using direction sensor which can intimate the direction of the user.Speakers can be replaced with earphone for the conveniency of the user.

VIII. CONCLUSION:

The proposed system provide a smart navigatonal setup for the visually impaired people.With the help of this setup,they can easily navigate without any external help from others.Since it is cost efficient even common people can easily afford this navigational setup.

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