Ultrasonic Blind Walking Stick.

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Abstract: The Blindness is frequently used to describe severe visual impairments with or without residual vision. The application of ultrasonic ranging scheme for producing electronic walking stick for the blind is a technological advancement. There is a great dependency for any type of movement or walking within area or out of the particular area, they use only their natural senses such as touch or sound for identification or walking . To overcome all these problems of blind people, we aredeveloping a project by using simple available technologies. This walking stick for blind people has multiple sensors, with the help of which it has been possible to enhance more features to the walking stick. The features are to detect the obstacle for collision avoidance, it detects the object in directions up, down and front. The other sensor placed near bottom tip of the walking cane to find the pits on the ground. We integrate these sensors to the voice record and play chip. In this project, sensors play a key role to detect the objects in all directions and thus help blind people to be independent.

Keywords: Ultrasonic sensors, intelligent stick, Microcontroller

I. INTRODUCTION:

According to the World Health Organisation(WHO) statistics, around 30 billion people are blind on the earth. This project proposes to design and develop a portable unit (stick) for them for easy usage and navigation in public places.The blind stick is integrated with ultrasonic sensor along with light and water sensing. Our proposed project first uses ultrasonic sensors to detect obstacles ahead using ultrasonic waves.On sensing obstacles the sensor passes this data to the microcontroller. The microcontroller then processes this data and calculates if the obstacle is close enough. If the obstacle is not that close the circuit does nothing. If the obstacle is close the microcontroller sends a signal to sound a buzzer. It also detects and sounds a different buzzer if it detects water and alerts the blind. One more feature is that it allows the blind to detect if there is light or darkness in the room.The system has one more advanced feature integrated to help the blind find their stick if they forget where they kept it. A wireless RF based remote is used for this purpose. Pressing the remote button sounds a buzzer on the stick which helps the blind person to find their stick. Thus this system allows for obstacle detection as well as finding stick if misplaced by visually disabled person.

II. OBJECTIVE:

The main objective is to help visually challenged people to navigate with ease using advance technology. In this technology controlled world, where people strive to live independently, this project proposes an ultrasonic stick for blind people to help them gain personal independence. Since this is economical and not bulky, one can make use of it easily.

III. LITERATURE SURVEY

S.Gangwar (2011) designed a smart stick for blind which can give early warning of an obstacle using Infrared (IR) sensors. After identifying the obstacles, the stick alerts the visually impaired people using vibration signals. However the smart stick focused only for obstacle detection but it is not assisting for emergency purposes needed by the blind. And also the IR sensors are not really efficient enough because it can detect only the nearest obstacle in short distance.

S.Chew (2012) proposed the smart white cane, called Blind spot that combines GPS technology, social networking and ultrasonic sensors to help visually impaired people to navigate public spaces.The GPS detects the location of the obstacle and alerts the blind to avoid them hitting the obstacle using ultra-sonic sensors. But GPS did not show the efficiency in tracing the location of the obstacles since ultra-sonic tells the distance of the obstacle .

Benjamin etal (2011) had developed a smart stick using laser sensors to detect the obstacles and down curbs . Obstacle detection was signalized by a high pitch “BEEP” using a microphone. The design of the laser cane is very simple and intuitive.The stick can only detects obstacle, but can not provide cognitive and psychological support. There exists only beep sound that triggers any obstacle and there is no any assistance to direct them.

Central Michigan University (2009) developed an electronic cane for blind people that would provide contextual information on the environment around the user. They used RFID chips which are implanted into street signs, store fronts, similar locations, and the cane reads those and feeds the information back to the user . The device also features an ultrasound sensor to help to detect objects ahead of the cane tip.

Mohd Helmyabd Wahab and Amirul A. Talibetal (2011) developed a cane could communicate with users through voice alert and vibration signal) . Ultrasonic sensors are used to detect obstacle in front, since ultrasonic sensors are good in detecting obstacle in few meters range and this information will be sent in the form of voice signal. This voice signal is send via speaker to the user. Here blind people might find it difficult in travelling without any emergency alert rather than having only ultrasonic sensors.

Alejandro R. Garcia Ramirez and Renato Fonseca Livramento da Silvaetal (2012) designed an assistive technology device called the electronic long cane to serve as a mobility aid for blind and visually impaired people .The author implements the cane with an ergonomic design and an embedded electronic system, which fits inside the handle of a traditional long cane. The system was designed using haptic sensors to detect obstacles above the waistline. It works in such a way when an obstacle isdetected; the cane vibrates or makes a sound. However this system only detects obstacle above the waistline.

Joao José, Miguel Farrajota, Joao M.F. Rodrigues (2011) designed a smart stick prototype. It was small in size, cheap and easily wearable navigation aid. This blind stick functions by addressing the global navigation for guiding the user to some destiny and local navigation for negotiating paths, sidewalks and corridors, even with avoidance of static as well as moving obstacles .

Shruti Dambhare and A.Sakhare (2011) designed an artificial vision and object detection with real-time assistance via GPS to provide a low cost and efficient navigation aid for blind which gives a sense of artificial vision by providing information about the environmental scenario of static and dynamic objects around them .

“Project Prakash” is a humanitarian mission to help the blind children especially by training them to utilize their brains to learn a set objects around them. In , the stick has a ping sonar sensor to sense the distant objects. It also has a wet detector to detect the water. The micro-controller used is PIC microcontroller. The microcontroller circuit is on the outside of the stick but is protected with a code so its security cannot be breached.

Voice operated outdoor navigation system for visually impaired persons done by Osama Bader ALBarrm International Journal of Latest Trends in Engineering and Technology . Uses a stick equipped with ultra-sonic sensors, GPS and audio output system. The stick contains GPS along with a SD memory card which used to store different locations .The user can use voice commands to input the desired location This system will also provide the speed and the remaining distance to reach the distention.

IV. BLOCK DIAGRAM:

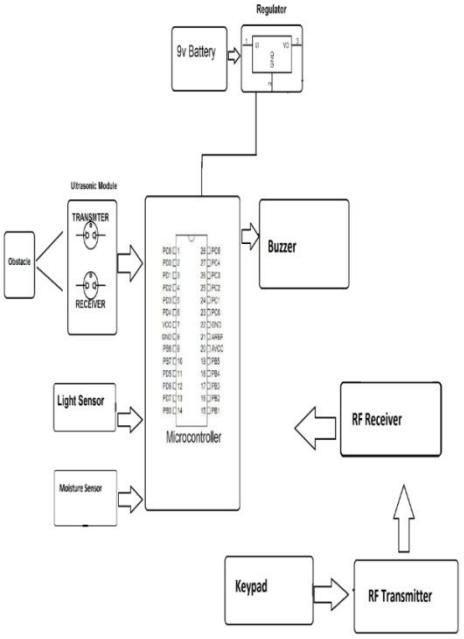

Figure1: Block Diagram of System

V. METHODOLOGY:

In this system the ultrasonic sensors are used to sense the obstacle (if there is any). The sensors are set a threshold limit if any obstacle is found within that range it gives beep speech through speaker. Obstacles found in different directions are indicated with different pattern beep and speech (Top, Middle, Pit and Water) to identify them easily.The ultrasonic sensors emit soundscapes with frequency lying in ultrasonic spectrum (>20kHz), which is inaudible to human ears. The sound waves hits the obstacle and bounces back to detectors. The ultrasonic sensor is used for detecting objects/obstacles which are in front whereas the two IR sensors are used to detect the obstacles on the sides. After the collection of data the calculations are done according to the formula : uS / 58 = centimeters or uS / 148 =inch. Once the distance of the obstacle is calculated then the conditions are checked. The signal is then send to microcontroller to operate a buzzer.

The microcontroller reads the distance of the obstacle using sensor and also commands the buzzer. The buzzer beeps once for left side obstacle, twice for front obstacles and thrice for right obstacles. The vibrator is also connected in parallel with the buzzer for vibration sensation.

The light sensor is gives a feedback about the environment. That is it informs the user if it's day or night or if a particular place is dark or bright. The moisture sensor is used to detect water pits or any puddles if present. All these signals are then sent to the microcontroller which in turn sends signal to the buzzer thereby alerting the user.

The main component of this system is the Radio-Frequency module which is used to find the stick if it is misplaced around. The transmitter keeps on sending signals upon pressing a key. These signals are received by the receiver which then sends signals to the microcontroller which in turn causes the beeping of the buzzer.

VI. ADVANTAGES

- The system can be used both indoor and outdoor navigation.
- Blind person's location can be tracked whenever needed which will ensure additional safety.
- Detects obstacles and alerts the blind person through vibration alert and speech output.

VII. DISADVANTAGES

- The system developed here is a moderate budget navigational aid for visually impaired people.
- Minimisation in cost leads to compensation in performance.

VIII. APPLICATIONS

- Some more applications like vehicle detection, slippery floor, on-coming vehicle detection and fire or smoke alarm can also be included.
- One more application is for the family members to gain access to the blind person's location through the server whenever needed.
- Also, use of RFID tags will transmit the location information automatically to the PCB unit when the intelligent stick is in its range.

IX. FUTURE SCOPE

The system can be supplemented with actual GPS MODULE used in cars and we can provide a vibrator for the partially deaf person. It can be further enhanced by using VLSI technology to design the PCB unit. This makes the system further more compact. A wall following function can also be added so that the user can walk straight along a corridor in an indoor environment.

X. CONCLUSION

All the studies which had been reviewed show that, there are a number of techniques for making a ultrasonic blind walking stick for blind people. The advantage of the system lies in the fact that it can prove to be a very low cost solution to millions of blind person worldwide. The smart white cane is a practically feasible product and convenient to carry around like any other walking stick. This could also be considered a crude way of giving the blind a sense of vision.

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