Smart Cane for Visually Impaired Person by Using Arduino

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Abstract: God gives best gift to human being. In which important aspect in our life is vision. But there are some people who lag this ability of visualizing these things. Global estimate of the number of visually impaired people according to World Health Organization survey made in year 2015 is 285 million people are visually impaired worldwide. The white cane is a widely used for mobility which helps visually impaired people navigates the surroundings only. Similar to a white cane guide cane also helps to blind person for detecting obstacles with one more feature that is indoor navigation. Indoor navigation is done with the help of RFID sensors. But then also Visually Impaired people face many challenges when moving in unfamiliar public places or while moving outdoor. So we are going to design a smart cane to overcome these problems. In this smart cane with ultrasonic sensor handheld will benefit the blind. This smart cane gives vibrating and voice alert to blind person when sensor detects the obstacle. With alert it gives and direction of the obstacle which avoids the major accidents of blind person. In this we are added the feature of outdoor navigation, Fall detection, tracking blind person. The device is linked with a GPS to identify the location of the blind person. Moreover, for emergency contact with family member, personal doctor and panic text message we are provide 3 buttons. In emergency with one click blind person can communicate with family member or doctor.

Keywords:- Arduino, Fall Detection, GPS, GSM, Bluetooth Module, Android.

A. Objective
The paper main objective is to provide a talkative assistance to blind people. We are going to develop a intelligent system that works efficiently good in outdoor. Current navigation device for the visually impaired focus on travelling from one location to another but only in indoor. This focuses on designing a device for visually impaired people that help them to travelling independently also it must be comfortable to use. The proposed device is used for guiding individuals who are blind or partially sighted. Moreover, it provides the voice alert to avoid obstacles based on ultrasonic sensors. An emergency button is also added to the system. The whole device is designed to be small and is used in conjunction with the white cane. It also added a feature known as fall detection. In this feature we detects the blind persons status after blind person gets fall the alert system will be sends the messages to the relatives with blind person’s location. And he can also track that person by its location gets by that alert system. An alert system for fall detection using common commercially available electronic devices to both detect the fall and alert authorities. We use a common Android-based smart phone with an integrated triaxial accelerometer. Data from the accelerometer is evaluated with several threshold based algorithms and position data to determine a fall. And when fall detection is detected the system alerts prespecified, social contacts with an informational message via SMS.

B. Scope of the paper
The scope of this system is to develop a low-cost system that assist the blind and visually impaired without the help of sighted person. The system is a GSM-GPS based so that it takes the advantage of the GSM network such as the popularity and cost-effectiveness. Additionally, GSM-GPS module have been used in different areas of human activity, such as the navigation of vehicles and navigation aids to guide visually impaired pedestrian and let them to avoid obstacles and reach their destination. RFID is

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used in indoor to assist the blind people since GPS cannot be used efficiently in indoor. Also we use GSM to send an alert message to the relative of that blind person. If blind person feels any emergency and need to talk to family member immediately then he can talk to them by just pressing a single button only. If there is any medical emergency then also blind person can talk to their respective doctors using only one button. And if any situation occurs in which he is in very panic condition and cant able to speak also then after pressing the third button he can sends the panic message to respective person with the location. By this location the relative can be able to track the person and he gets easy to reach to that blind person.

C. Problem definition

The main aim of our paper is to develop a system that helps the blind people to move independently in the unfamiliar environment and safety of the blind person. There are several methods and devices used to guide visually impaired persons.

2. Literature survey

Blind and visually impaired people are at a disadvantage when they travel because they do not receive enough information about their location and orientation with respect to obstacles on the way and things that can easily be seen by people without visual disabilities. In early days blind persons uses a human guide in which A blind person walks hand in hand with a sighted guide.

Advantage/Disadvantage: The most obvious, but in practice not a permanent solution for aiding the blind in mobility and navigation. A blind lacks privacy and can have a feeling of being a burden to his or her guide. After that the conventional ways is guide dog which only helps to avoid obstacles not to know what they are. Researchers put in their effort and designed a number of Electronic Travel Aids (ETA). This section contains a review on devices developed so far. White cane is regarded as world’s most widely used navigation aid for blinds. White cane can detect obstacles present on the ground, pits, puddles, uneven surfaces and also steps [1]. White canes are made up of very light materials and provide an ease of carrying it as it is foldable and easily fits into ones pocket [2]. As a result, the initial cost for white cane is very less. Apart from this device several other devices have been developed over the years and are still developed for a better support to the blind people. Few of the devices are discussed below.

2.1. C-5 Laser Cane

It was introduced in 1973 by Benjamin [5]. It is based on optical triangulation with three laser diodes and three photodiodes, as receivers. The Laser Cane can detect obstacles at head-height, drop-offs in front of the user, and obstacles up to a range of 1.5 m or 3.5 m ahead of the user. There are several disadvantages attached with use of a laser cane [7]. The use of laser cane can be harmful if proper precautions are not taken and can affect the eyes of an individual without any proper eye wear. The photodiodes used at the receiving ends are most likely to respond to various ambient sources, the sun light etc. Moreover, in hot and smoky areas the efficiency of the cane droops drastically [1].

![Figure 2.1: Protection zones of C5 Cane](image)

2.2. Sonic Torch

It is a battery operated hand held device basically operates by transmitting the ultrasound in the forward direction and receiving the reflected sound beam from the nearest object [4].

2.3. Mowat Sensor

It is a commercially available hand-held ultrasonic-based device that informs the user of the distance to detected objects by means of tactile vibrations [4]-[5]. The frequency of the vibration is inversely
proportional to the distance between the sensor and the object.

2.4. Sonic Path Finder

It alarms the blind when detecting the obstacle by the acoustic difference. However, it does not provide the accurate path and the position of an obstacle [4]-[5].

2.5. Meldog

It uses the artificial intelligence, unlike in the sonic pathfinder. It can provide the accurate position of an obstacle using the ultrasound and laser sensors [3]. But, in general, it is relatively large and heavy.


It is a portable device equipped with ultrasonic sensors and a computer. It produced a 120o-wide view of the obstacles ahead of the user (similar to a radar screen image). This image was then translated into a series of directional (stereophonic) audio cues through which the user could determine which directions were blocked by obstacles.

3. Design

4. Result

4.1 Obstacle Detection

When any obstacle detected our system convey the vocal message like obstacle detected at right, front, left.

4.2 Fall Detection

When person gets fall down at with high velocity the system sends fall detection message relatives as well as family doctor of stick holder as shown in figure 4.2 Fall Detection.
4.3 Panic Alerts

In some situations person feels that he/she in insecure environment, then we provide one feature as a switch, person who is in danger, he/she just have to press that switch then automatically message will generate and receive by responsible persons or their relatives as shown in figure Panic Alerts.

4.4 Stair Detection

In this, we provide some additional feature. When person walks on straight road if he/she finds some difficulty or steps then it automatically tells appropriate message.

4.5 Calling Switches

We are providing different two kinds of buttons. One button is directly call to the family. And another one is used to call Doctor. This feature is very useful because it directly contact to the family and doctor. If any problem comes then this feature is very beneficial.

4.5.1 Switch one

When stick holder press the switch one then by using Android phone the system will help to call a family person which we save through our android application.

4.5.2 Switch two

When stick holder press the switch two then by using Android phone the system help to call a family doctor which we save through our android application.
4.6 Outdoor Navigation

By using Google map we can provide the outdoor navigation to the stick holder and navigate person where he/she wish to go. Persons wishes to go particular place he/she has to put current location and destination. On which our system can navigate vocally and denote the directions, where to turn and where to stop when rich the Destination.

Figure 3.6.1: Outdoor Navigation.

4. Conclusion

We designed a System for visually impaired person in order to increase safety as well as freedom to move outdoor without help of sighed person. We provide three switches, two for emergency calling to family and doctor. And one for panic message with location. We also provide feature of fall detection, when person gets falls down then system sends message to family member and doctor with its location.

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6. References


