Electronic Assistive Aid for Visually Impaired People Using Arduino

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ABSTRACT

This paper describes that the with the scope of electronics increasing day by day, the need for utilizing these advanced technologies to make human lives simpler is becoming more and more necessary. The demand for using these technologies to make lives easier for disabled people is also increasing. This has prompted many new areas of research and one of the areas is electronic mobility aid for blind people. There are a few smart systems available in the market which uses electronic sensors mounted on the cane but those systems also have certain disadvantages. The Electronic Guide is a device to assist visually impaired people with obstacle free path-finding. The highlight of the Electronic Guide system is that it provides simplified information on the surrounding environment and deduces priority information without causing information overload. The priority information is provided to the user through audio feedback mechanisms. The proof-of-concept device consists of a Arduino with ultrasonic sensors, infrared sensor, fire sensor, GPS, GSM and a power supply. The evaluation results show that Electronic Guide is a useful aid in the detection of obstacles, wet floors, and ascending staircases and its performance is better than that of a white cane.

Keywords: - *electronic mobility*, *electronic guide, Arduino, GPS, GSM*

1. INTRODUCTION

The ability to navigate from place to place is an integral part of daily life. Most people would acknowledge that vision plays a critical role, but would have great difficulty in identifying the visual information they use, or when they use it. Although it is easy to imagine getting around without vision in well-known environments, such as walking from the bedroom to the bathroom in the middle of the night, few people have experienced navigating large-scale, unfamiliar environments non-visually.

Imagine for example, being blindfolded and finding your train in New York's Grand Central Station. Yet, blind people travel independently on a daily basis. To facilitate safe and efficient navigation, blind individuals must acquire travel skills and use sources of non-visual environmental information that are rarely considered by their sighted peers. How do you avoid running into the low-hanging branch over the sidewalk, or falling into the open manhole.

When walking down the street, how to identify have reached the post office, the bakery, or friend's house is quite difficult for blind people. The purpose of this chapter is to highlight some of the navigational technologies available to blind individuals to support independent travel. Our focus here is on blind navigation in large-scale, unfamiliar environments, but the technology discussed can also be used in well-known spaces and may be useful to those with low vision.

2. ELECTRONIC AID

The Navigational Guide is a novel electronic device to assist visually impaired people with obstacle free path-finding. The highlight of the Navigational Guide system is that it provides simplified information on the

surrounding environment and deduces priority information without causing information overload. The priority information is provided to the user through vibration and audio feedback mechanisms. It also guide for fire detection, current passing and GPS detection.

The block diagram for the proposed system is shown in fig -1. An efficient modified Navigational Guide obstacle detection and navigation assistance system for visually impaired people. From the existing Navigational Guide detector, we are implementing the some of the features for the welfare of visually challenged peoples. The extra features are added with the Navigational Guide detector is the vibration sensor, water sensor, temperature sensor and voice alert.

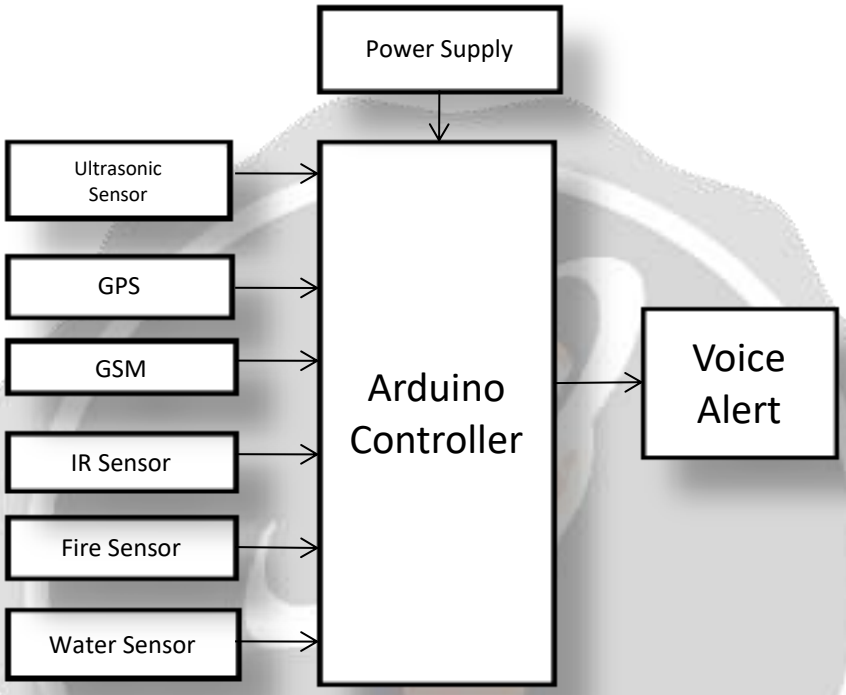

Fig -1: Block Diagram of Proposed system

Here in the Electronic Guide system system the voice alert mechanism is used to alert the individual by audio feedback mechanism when it senses the obstacles or any other stuffs infront of the blind. Then the fire sensor is used to sense and detect the fire alert or some other precautions from the overheated elements is before the person then it should be alert the person with the voice alert. And we also adding an another important features is water sensor. The water sensor is used to detect the water on the floor which may cause the blind people to fall down, and causes some danger health issues. A voice alert is used in the system to instruct the blind, when if the obstacles are detected then the person need to be taken some actions to avoid the obstacles. So the voice alert used to give some instructions like take right, left, move behind etc.

An arduino controller fetches the input from all the sensors like fire, water, ultrasonic and IR sensor, when it exceeds the limit then the controller take an action to alert the person through the vibration sensor and the voice alert. So the precautions can be taken and followed by the person very ease and quick. This type of modified navigational Guide obstacle detection and navigation assistance is carried a good result for the visually impaired people.

3. RESULTS AND DISCUSSSION

The Hardware output of the assistive aid for the blind people is shown in fig -2 which consist of the sensors like ultrasonic,water,fire and the GPS for the location detection of the visually impaired people with GSM model. The hardware output is through the audio feedback mechanism.The electronic guide detects ascending staircase,

floor-level, kneelevel obstacles in the surrounding using infrared sensors placed on the hardware.We are aware that our current implementation of the electronic guide may have three limitations.

1. The first is that it is unable to sense a pit or downhill.
2. The second is that it is unable to sense downstairs.
3. The third limitation of the electronic guide is that it senses a wet-floor only after a user steps on it. Therefore, it is not able to avoid accidents that are likely to occur at the interface of dry ground and wet ground due to a slipper floor.

These limitations highlight the difficulty of constructing the logical map of the surrounding.However, a downhill can be detected using additional ultrasonic sensors facing towards the ground in the soles to give feedback on the distance.

However, the wet-floor detection system is useful to provide feedback to the user about the wet floor, so that the user steps in a way that deliberately avoids potential problems or dangers of slipping on a wet floor.The electronic guide provides feedback to the user using a wired voice alert. In case a wireless voice alert is used by the user an electromagnetic interference generated by an external source can potentially affect the feedback provided by the system to the visually impaired people.

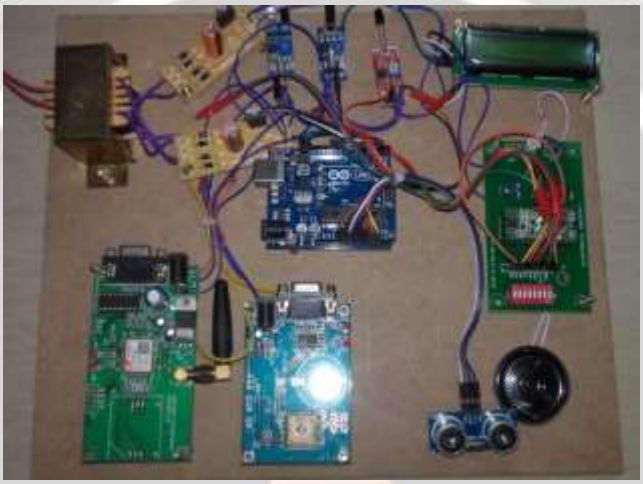

Fig -2: Hardware Output

The electronic aid provides simplified information on the surrounding environment and deduces priority information without causing information overload. The working of the electronic aid is shown in fig -3.

Fig -2: Working of Hardware

An arduino controller fetches the input from all the sensors like fire, water, ultrasonic and IR sensor, when it exceeds the limit then the controller take an actions to alert the person through the voice alert. So the precautions can be taken and followed by the person very ease and quick.

A voice alert is used in the system to instruct the blind, when if the obstacles are detected then the person need to be taken some actions to avoid the obstacles. So the voice alert used to give some instructions like obstacle detected.

4. CONCLUSION

The proposed system is based on a Navigational guidance system for Visually impaired people was presented. The approach of the system is based on the idea that a Visually impaired people or blind can be assisted by the spoken instructions from a controller by integrating various sensors like ultrasonic, infrared, conductivity ,fire and GPS for detecting the location of visually impaired people. The scenarios for the usability testing of overall system for Visually Impaired People to evaluate the usability were presented. GPS based location transformation also available to share a location by GSM for emergency situation. Due to these advantages the Navigational Guide is easy to use. Evaluation of the Navigational Guide with visually impaired people shows the effectiveness and usefulness irrespective of the number of years of blindness. In future, the proposed system can be modified using artificial intelligence techniques that would forecast the human health condition and generate alerts. The next version of Navigational Guide can use commercially available RFID readers and passive ultrahigh frequency RFID tags to detect human object interactions in the form of motion and touch. Moreover, RFID readers and tags can also be used to identify objects.

5. REFERNCES

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