IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

ISO 3297:2007 Certified ⧖ Impact Factor 7.39 ⧖ Vol. 11, Issue 6, June 2022

DOI: 10.17148/IJARCCE.2022.11666

Electronic Smart Jacket For the navigation of deaf-blind people

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Abstract: Evolution of technology has always been endeavored with making daily life simple. One of them is the visually impaired who have to rely on others for travelling and other activities. This paper aims at providing one such theoretical model which incorporates the latest technologies to provide efficient and smart electronic aid in the jacket and stick to the blind. We have used ultrasonic range finder circuit for detection. Panic situations will be sent as an SMS alert to registered mobile numbers. The basic objective of the system is to provide a convenient and easy navigation aid for unsighted which helps in artificial vision by providing information about the environmental scenario of static and dynamic objects around them. According to World Health Organization (WHO) study, 90% of the info to the human brain is sent through eyes alone. In this paper, we proposed an efficient, reliable and low-cost wearable jacket for the people suffering from visual impaired. A smart jacket is designed by embedding the sensor on the jacket that enables the user to detect an obstacle and safely navigate. The smart jacket requires low power hence can be used for real time navigation for visually impaired people.

Keywords: Smart jacket, SMS, Navigate, Obstacle, Sensor

I. INTRODUCTION

Vision is one of the most important senses of as most of the information humans gets from the environment is via sight. WHO reported that in august 2014, about 285 million people suffer from lack of vision. It is estimated worldwide: 39 millionaire blind and 246 million have less vision. Around 90% of the visually impaired live in low income conditions. 82% of people living with blindness are around 50 and above. The number of people visually impaired from infectious diseases has reduced in the last 20 years according to global estimates work. 80% of the visual impairments can be prevented or cured.The basic problem which every blind person faces is with regard to commutation and navigation in daily life. The most basic tools for them are walking cane and guide dogs and also on kindness of fellow commuters. The most commonly used tool is still the blind stick. It suffers from drawbacks like lots of practice, range of motion, less reliability in terms of dynamic hurdles and also range detection. We will try to modify this cane with electronic components and sensors. In addition we have used ultrasonic which help in obstacle detection and on hurdle recognition will ring the speaker for different durations to indicate different distances. We wish at presenting an inexpensive and light weight and accurate model which helps in effortless navigation for the blind. But still there are many people who are not able to see what is around. With around 35 million people having impaired vision, 15 million are alone from India. These blind people are constantly dependent on an assistive device like white cane, guide dogs or other individual to navigate from one location to other. The problem increases when moving from one location to another. Thus we propose an aid for the blind which will help them to carry out daily chores with ease without depending on other individual.This will be a promising aid for support and encouragement to the blind as they struggle for an independent life. This aid is used to help the blind to move as confidently as sighted people. This microcontroller does all the work of detecting signals from different sensors. An ultrasonic sensor is used to detect the solid obstacle. The obstacle within a range of 90cm will be detected. This sensor sends input waves, these waves fall on the surface of solid obstacle and is reflected back to ultrasonic sensor and thus the obstacle is detected. The person can avoid the obstacle by sensing the vibration. Thus this Jacket allows the blind person to travel independently without any help. The jacket also allows the blind person to identify the water. The system also allows the blind person to travel from one source to a destination avoiding all the obstacles.

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II. PROBLEM STATEMENT

1. The blind traveler is dependent on other guide like white cane, information given by the people, trained dogs etc.
2. Many virtually impaired people use walking stick or guide dogs to move from place to place.
3. When a visually impaired person uses a walking stick, he waves his stick and finds the obstacle by striking the obstacles in his way.
4. Whatever the disadvantages are present with the previous system will be overcome with this concept by using advanced technology.

The system proposed is more and more adopted in a wide range of applicative scenarios. Deaf-blindness is a rare condition in which an individual has combined hearing and vision loss. A person can avoid the obstacle by sensing the vibration. Jacket allows the person to travel independently without any help. The system allows the person to travel from one source to a destination avoiding all the obstacles.

III. LITERATURE SURVEY

An efficient and economical device would be highly significant for visually impaired people
[1]Visually impaired people usually use a white cane or a guide dog for navigating outdoor. Even though a cane is a simplest device, but it can only detect obstacle through making contact with the object. A guide dog is useful for important tasks such as dodging obstacle and simple navigation however is not entire satisfactory, because a blind person assisted by a guide dog is still not fully in-depended.

Training and maintenance of specialized dogs are very expensive. [2] Currently 3-5% of blind people have access to guide dogs. The latest low cost smartphone devices, small and low cost embedded microprocessor and various low cost sensor system together makes it expedient to augment an affordable, wearable, smart device to help blind people to “sense”, “hear’, and “comprehend” these surrounding hence aiding them to navigate and reducing their problems. [3] To solve the problems of visual impaired people researcher has developed and tested electronically wearable jacket that includes an ultrasonic sensors and GPS to detect an obstacle and safely navigate. The overall system is light weight and includes a power bank up to 6 hours of navigation making it truly wearable.

Many researchers have developed system that can assist blind people in finding obstacle to easily navigate.[4] The user will get notification by a vibrator. The problem of white cane “many notifications will be sent to the user and the result leads to fatigue”. A.S.M yasin.et.al . [5] proposed a smart vision prototype which is a navigational aid for detecting paths as well as obstruction avoidance for indoor and outdoor situations. V.weiss et.al

[6] developed a digital system for visually called smart walker. Smart walker uses radio, Global Positioning System, Earphone, a keyboard & gives warning during dangerous situation. [7] presented their device for supporting the visually impaired person with greater obstacle avoidance and accident prevention system. [8] presented steering device which uses uses digital image processing for providing navigational assistance for blind people. [9] developed RFID based navigation system, user need to carry RFID sensor along with RFID tags. [10] combined RFID & robust technology to assist.Visually impaired with indoor navigation. [11] developed RFID based assistant to blind people for searching & retrieving medicine at home. R.Tipu

[12]developed an intelligent smartphone based warning and obstacledetection.Blind Aid Shoe has been a popular project with constant enhancements and modifications. This system works with GPS, artificial vision system, obstacle detection and audio circuit. This project is fitted with a camera on the persons head; the camera will use an algorithm to detect obstacles. The model also includes ultra-sonic sensors to detect the obstacles. GPS system helps in reaching required destination. International Journal of Latest Trends in Engineering and Technology (IJLTET) Vol. 3 Issue 3 January 2014 108 ISSN: 2278-621X.Subsystems are connected with microcontroller which executes and coordinates the operations.

The system is low cost. The accuracy is high. But, the design complexity is high. [13]Similar study for unsighted uses pulse echo technique for provides a warning sound when detecting the obstacles. This technique is used by the United States military for locating the submarines.

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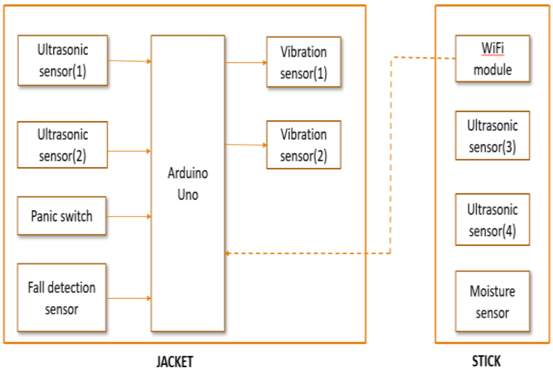
The pulses are of ultrasound range from 21 KHz to 50 KHz when hit the hard surface they tend to generate echo, But the power requirement is high. [14]. another study done by (Sung,Young, Kim and IN, 2001) .Keeping in mind the ease of use and simple design with low cost we have proposed our model. We have incorporate android application for ease of user. The buzzer duration and stick vibrations, keep the blind person updated at all times. The Google maps based sound navigations very accurate and reliable, but cannot be used in places like closed buildings for navigation, but obstacle will be detected. We can also save locations which are frequent like office, bus stops, home. Hence, our model is cheap, easy to use and has a simple design with a scope of incorporate new technologies.

Generally, individuals rely primarily on vision to know own position and direction in the environment. Humans recognize things in the surroundings with their relative location and motion. Those tasks are often termed as 'wayfinding'. The image so formed by virtue is termed as 'cognitive collage'. In this paper, a navigation system that identifies direction and distance of the obstacles around the blind is proposed. This will help the blinds to be better aware of their surroundings and have a better cognitive image of it.

Over last few decades, some similar systems have been developed [15] Eyer on man (by Tactile Navigation Tools) and The Third Eye Nowadays there are many technologies, things and smart devices [16] for the visually impaired people for the navigation, but most of them have certain limitations and problems for the blind people. They are not feasible for many from cost and ease of operation prospective also.

From literature review, it is clear that the remote guidance system is very difficult to carry and thus the wearable jacket is more optimized version [17] . Emphasis of this paper is to provide a cost efficient and easy-to-use navigation tool.

IV. BLOCK DIAGRAM



1. Arduino Uno is located at the center of the block diagram forms the control unit of the entire project.
2. Once the entire unit (comprising of Arduino Uno and sensors) is worn by the patient the sensors begin to monitor the surrounding environment conditions.
3. We have used 2 ultrasonic sensors in jacket for detecting the obstacles which is at specified distance from the person.
4. We have also used 2 ultrasonic sensors in the stick which is useful to find out the potholes and the steps present in their walking path.
5. There are situations like potholes in the roads, in this cases this blind stick helps a lots to guide the person.
6. In this we will use Water level detector(Moisture detector), it is responsible for handling situations like rainy.
7. A Smart jacket is designed by embedding the sensor on the Jacket.
8. It enables the user to detect an obstacle and safely navigate.
9. The smart jacket requires low power hence can be used for real time navigation for visually impaired people.
10. Smart stick is a device for the visually impaired to guide the user to respective destination.
11. It avoids colliding with the obstacles.
12. Here we have used 2 vibration sensors which vibrates when ultrasonic sensor or moisture sensor detects objects or moisture content respectively.
13. Fall detection sensor is also used to receive a message when a person falls down without getting up within 40-45 seconds.
14. Panic switch is embedded to the jacket so a person can use it when he/she is in any danger or a panic situation.
15. Here we have also used wi-fi module which will be interfaced with Arduino.

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V. METHODOLOGY

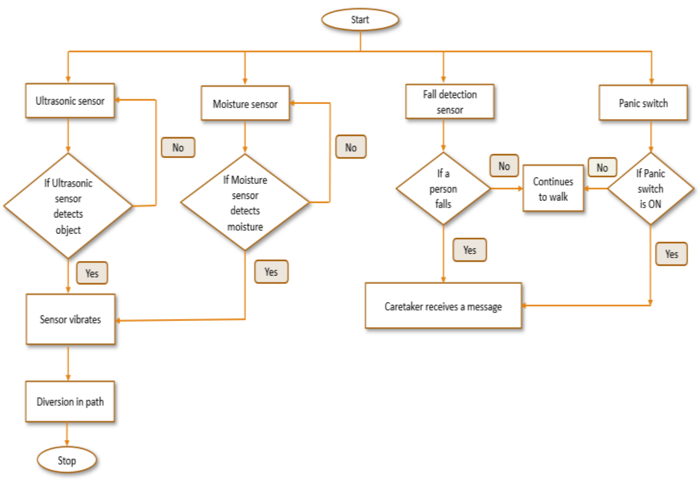
The microcontroller located at the center of the block diagram forms the control unit of the entire project. Once the entire unit (comprising of microcontroller and sensors) is worn by the patient the sensors begin to monitor the surrounding environment conditions. The output of the sensors is a voltage which corresponds to the surrounding environmental conditions. This voltage generated by the sensors is fed to the inputs of the microcontroller. In this case ultrasonic sensor input to the microcontroller. Based upon the program embedded within the controller an output is generated and transmitted to the Android based Smartphone via Bluetooth module. Ultrasonic sensor is utilized to locate the distance of any object from the blind person. This can come in hand for individuals with poor sight due to ageing factor.

We have used ultrasonic detector for detecting the obstacles which is placed at specified distance from the ground. And another one is for detecting the height. There are situations like potholes in the roads, in this cases this blind stick helps a lots to guide the person, for this we used Water level detector, it also responsible for handling situations like rainy.

There are predefined areas like school, home, office, for these there is no panic alert. Whenever the person goes unknowingly for the long distance, in such cases there is some alert will be given to the authorized person through the voice output from the android application.

Blind stick is an innovative stick designed for visually disabled people for improved navigation. We here propose an advanced blind stick that allows visually challenged people to navigate with ease using advanced technology. The blind stick is integrated with ultrasonic sensor along with water sensing. Our proposed project first uses ultrasonic sensors to detect steps or potholes 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 the vibration sensor. If it detects water and alerts the blind.



Advantages

- It saves time.
- Manual operation has been reduced to major extent.
- Less man power required.
- Efficient distribution system.
- Easy to use.

VI. CONCLUSION

The project is designed using structured modeling and is able to provide the desired results. It can be successfully implemented as a Real Time system with certain modifications.
Science is discovering or creating major breakthrough in various fields, and hence technology keeps changing from time to time. Going further, most of the units can be fabricated on a single along with microcontroller thus making the system compact thereby making the existing system more effective. To make the system applicable for real time purposes components with greater range needs to be implemented.

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