IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 6, May 2023

Blind People Monitoring System for Visually Impaired

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Abstract: Visual impairment is one of the issues that several millions of people suffer from. They go through a lot of difficulties even to complete the basic chores. Even in their own home or office the struggle to navigate from one place to another without being dependent on anybody. As per the data from WHO(world health organisation) there are around 250+ million people with visual disablement out of which nearly 35+ million are totally blind which constitute a huge part of the population. Visually impaired people or in other words especially abled people are the ones who face a lot of difficulties even to accomplish their daily routine chores. Most of them even though they don't want, have to rely on other people for some kind of help. There are thousands of technologies being developed or have been developed for the assistance of these people. Computer vision being one of these technologies is providing the most promising solution Blind people find hard time navigating around the street. Due to their inability to see world ,they are often in danger of getting hit by obstacle and vehicle..

Keywords: Providing the Smart Blind Stick by Adopting the IOT Technology

I. INTRODUCTION

1.1 Background

Visual impairment is one of the issues that several millions of people suffer from. They go through a lot of difficulties even to complete the basic chores. Even in their own home or office the struggle to navigate from one place to another without being dependent on anybody. As per the data from WHO(world health organisation) there are around 250+ million people with visual disablement out of which nearly 35+ million are totally blind which constitute a huge part of the population.

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Blind people find hard time navigating around the street. Due to their inability to see world ,they are often in danger of getting hit by obstacle and vehicle.

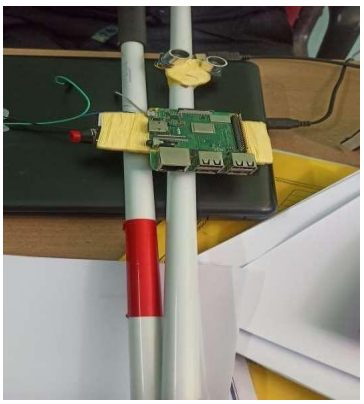

Fig 1. Smart blind stick

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Problem Definition

There are lots of strategies or ways that have been adopted by visually impaired people to address this hassle of theirs. A traditional approach that has been used for years by the visually impaired humans is using dogs that could help so as to navigate through their paths. One more traditional methods use stick to find obstacle ,these sticks are used to find the obstacle in front. User gets to know the obstacle in front of him when the stick touches the obstacle. But it cannot detect without object contact with the obstacle which sometimes is dangerous since we have to detect object bit farther away. Also blind people cannot read normal books since they cannot see ,they can only understand special books which are designed to blind but the problem is not every book is designed for blind people.

Objectives

1: To build a device which is able send live location of the user when emergency button is pressed
2: To build a device which recognized the objects Infront of the camera and say the name of object in the earphones
3: The device should be able to detect obstacle using ultra sonic sensor
4: The device should be easy to manufacture and affordable to everyone

II. LITERATURE SURVEY

Paper [1] Multi-Functional Blind Stick for Visually Impaired People Publisher: IEEE

One of the biggest problems faced by the visually impaired is navigating from place to place, be it indoors or outdoors. Further, the adverse conditions of the roads make it even more difficult for them to walk outdoors. They have to be alert at all times to avoid consequences like colliding with stable or moving obstacles, ascending or descending staircases, slipping down wet terrain. Also, at times they may be in distress and might want to send an alert message to their relatives or friends about their whereabouts. These problems of blind people can be addressed with the intervention of technology. The proposed solution employs the Internet of Things (IoT) paradigm to provide a medium between the blind and the environment. Several sensors can be used to detect anomalies like obstacles, staircases and wet terrains respectively. The prototype discussed here is a simple, sophisticated and affordable smart blind stick equipped with various IoT sensors and modules. Also, this solution provides a way to send a message about the whereabouts of the user to the concerned people. Adding to the above, a software application is designed to help the acquaintances of the blind to manage the stick's configuration ex: add or delete phone numbers to which alert messages have to be sent. Misplacing the stick indoors can also be a substantial issue. This solution also addresses this problem.
https://ieeexplore.ieee.org/document/9137870

Paper [2] Ultrasonic Blind Stick for Completely Blind People to Avoid Any Kind of Obstacles Publisher: IEEE

The ability to live without being controlled by any action, judgment and any outside factors including any opinions and regulations is defined by the term Independent. But in reality physical movement for travelling or simply walking through a crowded street pose great challenge for a visually impaired person. Also they must learn every detail about the home environment such as placement of tables; chairs etc. to prevent injury. Because of this disability they have to sacrifice their independence in daily living by depending on the sighted people in every busy place like bus, footpaths, railway stations etc. This paper aims to design an artificial navigating system with adjustable sensitivity with the help of ultrasonic proximity sensor and a GPS module to assist these blind persons to walk fearlesssly and independently in both indoor and outdoor environment. This system can detect any type of upcoming obstacles and potholes using the reflection properties of ultrasound. Attachment of the system to the clothes, shoe, body area and as well as to the walking stick make its utilization more versatile and reliable.
Published in: 2018 IEEE SENSORS https://ieeexplore.ieee.org/document/8589680

Paper [3] Ultrasonic Sensor Based Smart Blind Stick Publisher: IEEE

This paper presents design and implementation of an ultrasonic sensor based walking stick for visually impaired person. An ultrasonic sensor module, HC-SR04 is used for obstacle detection in the path of the blind person and a buzzer is

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used to make the person alert. The proposed system is implemented using PIC microcontroller 16F877A. Blind persons can use this walking stick for safe navigation. It can detect obstacle within 5 to 300 cm range of distance.
Published in: 2018 International Conference on Current Trends towards Converging Technologies (ICCTCT)
https://ieeexplore.ieee.org/document/8551067

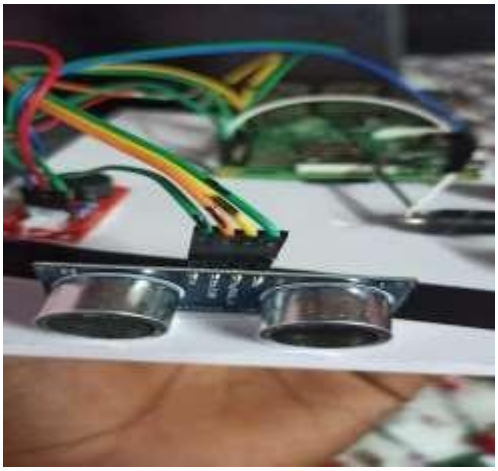

Fig 2. Ultrasonic sensor

Paper [4] Smart Walking Stick for Blind Integrated with SOS Navigation System Publisher: IEEE
Blind people face many difficulties to interact with their nearby environment. The aim of this paper is to provide a tool which will help blind people to navigate as well as sense the obstacles. We plan to propose a working model which is Walking Stick with in-built ultrasonic sensor with a micro controller system. The ultrasonic sensor is used to detect obstacles using ultrasonic waves. On sensing obstacles the sensor passes the data to the microcontroller. The microcontroller then processes the data and calculates if obstacle is close enough. If obstacle is not close enough the circuit does nothing. If obstacle is close then microcontroller sends Alert signal to the blind person. In addition we also plan to embed e-SOS (electronic Save Our Souls) system. Whenever blind person feels any discomfort while navigating then he presses an e-SOS distress call button on the stick to give a video call to his family member. The video is streamed in an Android mobile via Android application. The Android application also shows the location of the blind person to his family member. In this way, Blind person is guided to move along the path by his family member via the Android Mobile Application.
Published in: 2018 2nd International Conference on Trends in Electronics and Informatics (ICOEI)
https://ieeexplore.ieee.org/document/8553935

Paper [5] Raspberry Pi Based Smart Wearable Device for Women Safety using GPS Technology
Publisher: IEEE
Security has become a major concern for women, children and even elders in every walk of their life. Women are getting assaulted and molested, children are getting kidnapped, elder citizens are also facing many problems like robbery, etc. In this paper, a smart security solution called smart wearable device system is implemented using the Raspberry Pi3 for enhancing the safety and security of women/children. It works as an alert as well as a security system. It provides a buzzer alert alert to the people who are nearby to the user (wearing the smart device). The system uses Global Positioning System (GPS) to locate the user, sends the location of the user through SMS to the emergency contact and police using the Global System for Mobile Communications (GSM) / General Radio Packet Service (GPRS) technology. The device also captures the image of the assault and surroundings of the user or victim using USB Web Camera interfaced to the device and sends it as an E-mail alert to the emergency contact soon after the user presses the panic button present on Smart wearable device system.
Published in: 2020 IEEE International Conference for Innovation in Technology (INOCON)
https://ieeexplore.ieee.org/document/9298449

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Fig 3. Raspberry Pi III.PROPOSED SYSTEM

The proposed solution for visual impairment is by providing the system which helps in detecting the objects in front of the person and vocal output is given to the blind person so that he will know which object is in front of the person, and if the blind person is in trouble or is in any emergency satiation an SOS button is given to the blind, if the person presses the button the live location will be sent to the authorized person.

IV. METHODOLOGY

Technologies used

Our project consists of three functionality

Obstacle detection using ultra sonic sensor

An ultra sonic sensor will be connected to stick which measures the distance of object in font of it using ultra sonic echo and sends the values to the raspberry pi.Raspberry pi calculates and plays distance measurement using audio format

Object detection and output the name of object in earphone

Live video acquisition using camera is the first step. Video will be converted into frames of images which will be used to detect object in the image . The image is then pre processed to achieve required resolution using open cv library. Pre processes image will be sent to COCO dataset based object detector which detects object and announces using speaker .

Emergency alert using gps

In case of emergency user can press SOS button which will trigger alert function.Raspberry pi will fetch gps location data from gps module and send it to the family members / friends /concerned person

Fig 4.GPS tracker

Working Principles

The working principle of the smart blind stick involves the following steps:

- Sensor Detection: The smart blind stick uses ultrasonic sensors to detect obstacles in the user's path. The sensor sends out a signal and waits for the signal to bounce back. Based on the time taken for the signal to bounce back, the device can calculate the distance to the obstacle.
- Microcontroller Processing: The signals from the sensors are sent to a microcontroller, which processes the data and decides what action to take. The microcontroller can be programmed to provide audio or tactile feedback to the user to alert them of the obstacle's presence.
- Audio/Tactile Feedback: The smart blind stick can provide audio feedback in the form of beeps or voice messages to the user. It can also provide tactile feedback in the form of vibrations to indicate the direction of the obstacle.

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- GPS Tracking: The smart blind stick can also incorporate GPS tracking to help the user navigate to a specific location. The device can provide audio feedback on the user's current location and the direction they need to take to reach their destination.

V. CONCLUSION

The proposed system successfully reached on a stage where portable, affordable and accessible system using image processing and ultra sonic range finding technologies is able to help visually impaired people in navigating their way and helping them in dealing with their day to day activities with ease. By minimal use of sensors, or hardware the system not only helps the blind people avoid any obstacle it also helps alert will aid in faster reach of alert message and getting help as early as possible.

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