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RESEARCH ARTICLE

A SURVEY ON RASPBERRY PI BASED READER AND SMART ASSISTANCE FOR VISUALLY IMAPIRED PEOPLE

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ABSTRACT

The paper propose a survey conducted on the various methodologies and electronic system used to guide the blind people. Addressing the issues of People with Visual, Hearing and Vocal Impairment through a single aiding system is a tough job. Many modern day researches focus on addressing the issues of one of the above challenges but not all. The work focuses on finding a unique technique that aids the visually impaired by letting them hear what is represented as text and it is achieved by the technique that captures the image through a camera and converts the text available as voice signals. The paper provides a way for the people with Hearing impairment to visualize / read which is in audio form by speech to text conversion technique and we also provides a way for the vocally impaired to represent their voice by the aid of text to voice conversion technique. All these three solutions were modulated to be in a single unique system.

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INTRODUCTION

Over 285 million people are visually impaired worldwide and 39 million of them being blind and 246 million have low vision, 90% of the world's visually impaired live in developing countries. The blind traveler should depend on any other guide like blind cane, people information, trained dogs, etc. but in today's fast people are busy in their own life and business hence they are not finding time to help others. Even though there are many electronic aided system present in market to help the blind people to live independently it may be expensive because of this we are proposing a system with low cost and many advantages where a middle class person can buy this device. A Smart assistance system concept is devised to provide a smart electronic aid for blind people. Blind and visually impaired people find difficulties in detecting obstacles during walking in the street. The system is intended to provide artificial vision and object detection, real time assistance via GPS by making use of Raspberry Pi. The system consists of ultrasonic sensors, GPS module, and the feedback is received through audio, voice output works through TTS (text to speech). The proposed system detects an object around them and sends feedback in the form of speech, warning messages via earphone, alerts with vibrators in waist level and also provides navigation to specific location through GPS. The aim of the overall system is to provide a low cost and efficient navigation and obstacle detection aid for blind which gives a sense of artificial vision by providing information about the them, so that they can walk independently.

RELATED WORKS

Smart stick for the blind and visually impaired people: Blind people face many types of hurdles in doing their everyday routine works. The visually impaired find difficult in travelling from one place to another such as travelling in bus, train, or crossing roads etc. They depend on others to do their daily works. This paper proposes a smart stick which guides the user by sensing obstacles in the range of stick. The obstacles are detected using the ultrasonic sensors installed on the stick. The microcontroller retrieve the data and it is passed to the vibrators which indicate the user about the obstacles on the way.

Advantages

- They are efficient and low cost
- The high frequency, sensibility and penetrating power of the sensor makes it easy detect objects.
- This smart stick is a simple, cheap, easy to handle electronic

Disadvantages

- The sensors can detect objects only at certain ranges.
- Objects or any obstacles near the head cannot be detected.
- The size of the stick is large which makes it difficult to use

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Autonomous walking stick for the blind using echolocation and image processing: This paper presents a smart walking stick which helps the visually impaired to identify the obstacle and provide assistance to reach their destination. This works based on the technology of echolocation, image processing and navigation system. A lot of research has been done to help the visually impared people. Many walking sticks and systems are there which helps the user to move around but none of them provide runtime navigation along with object detection and identification alerts. The objects are detected using ultrasonic sensors .Image sensor identifies the objects in front of the user and for navigation by capturing runtime images and by using GPS and maps the user is navigated to their destination.

Advantages

1. This uses two sensors (ultrasonic sensor and image sensor) which gives continuous information to the smart phones.
2. The image sensor takes photo every 2seconds to identify static and dynamic objects.

Disadvantage

1. GPS does not have high accuracy.
2. The charge capacity of the device needs to improved.

Date of Conference: 14-17 Dec. 2016

Date Added to IEEE Xplore: 04 May 2017

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A Text Reader for the Visually Impaired using Raspberry Pi: The visually impaired people find it difficult to read the text in their day today life. This paper is based prototype which helps the user to read text in english. It involves extraction of text from the image and converting the text to translated audio output in the languages mentioned above. This is done using Raspberry Pi 3 and a camera module with the concepts of Tesseract OCR [Optical Character Recognition] engine and Google Speech API [Application Program Interface] which is the textual input to speech engine. The model is programmed using Python language.

Advantages

1. It is easy to use.
2. It is compact and user friendly.
3. This prototype is highly advantages when compared to braille.

Disadvantages

1. The camera is fixed and it's not movable.
2. The prototype is still to be perfected to produce even more clear output with correct regional accent.

Date of Conference: 15-16 feb. 2018

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Visual assistance for blind using image processing: The Visually impaired people goes through lot of challenges in their daily life and they will be dependent regarding reading and writing. Many technologies have been developed to assist visually impaired people. This paper is proposed to help the visually impaired people. The main aim is to create a wearable visual aid for visually impaired people in surroundings by identifying the objects and signboards. **.** Raspberry Pi is used to implement artificial vision using python language on the Open CV platform.

Advantages

1. It is user friendly
2. they can be independent because it helps them to navigate in his/her surroundings by detecting obstacles.

Disadvantages

1. This system requires time to process which does not make the system to be running/ functioning in real time.
2. This has drawbacks such as requirement of several sensors, system not being portable and fail to do real time processing.

Date of conference: April 3-5, 2018

Date Added to IEEE Xplore: 08 November 2018

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Assistive infrared sensor based smart stick for blind people: The Visually challenged people need some support to feel safe while travelling. This paper creates a smart stick which improves the mobility of both blind and the visually impaired people. This uses different technology such as ultrasonic, infrared and laser. This proposes a cheap, user friendly, fast response, light weight and low power consumption, smart stick based on infrared technology. A two infrared sensors can detect stair-cases and other obstacles presence in front of the user, within a range of two meters. This results in good accuracy and the stick is able to detect all of obstacles and alerts the user about the detected obstacles through earphones by sending speech warning message.

Advantages

1. The use of two infrared sensor helps in detecting both low level obstacles and high level obstacles.
2. This is user friendly and responses fast.
3. It consumes low power and has high accuracy.

Disadvantages

1. Even when obstacles were detected and the appropriate messages were heard by them as they reported although some were not taking enough space away from the obstacle. Therefore, they sometimes touched the obstacle edge so these instances were considered as unintended error.
2. The Infrared sensor cannot detect obstacles beyond 200cm.

Date of Conference: 28-30 July 2015
Date Added to IEEE *Xplore*: 03 September 2015

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Smart Specs: Voice Assisted Text Reading system for Visually Impaired Persons Using TTS Method: It is observed that they find it difficult to do their day today life activity and it is important to take necessary measure with the emerging technologies to help them to live the independently. To motive support them. This paper have proposed a smart spec for the blind persons which can perform text detection thereby produce a voice output. This can help the visually impaired persons to read any printed text in vocal form. A specs inbuilt camera is used to capture the text image from the printed text and the captured image is analyzed using Tesseract-Optical Character recognition (OCR). The detected text is then converted into speech using a compact open source software speech synthesizer, eSpeak. Finally, the synthesized speech is produced by the headphone by TTS method.

Advantages

1. The device is compact.
2. It is user friendly with high accuracy rate and high performance.
3. This is an economical as well as efficient device for the visually impaired people

Disadvantages

1. The bandwidth of Raspberry Pi is very limited
2. less efficient
3. The SD card size is not large enough so the card will not be able to hold all pictures that are being captured by camera port.

Date of Conference: 16-18 March 2017

Date Added to IEEE *Xplore*: 02 November 2017

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Embedded assistive stick for visually impaired persons: In this paper smart stick is designed and executed to help blind people to walk independently and easily. Here the ultrasonic sensors are used in the system, Firstly it is set at 30 degree angle in the stick so that if there is a hole or staircase in front of blind people it helps them in avoiding from falling. Secondly it is placed on the top of the stick which results in knee above obstacle detection. To measure the degree of water and soil moisture in forward facing a moisture sensor is implemented in down the stick and if a person forgets his stick, he can easily find his stick by pressing the switch of the remote which consists of transmitter and receiver. The stick is implemented practically using single wheel leg blinding cane, Arduino microcontroller three ultrasonic sensors RF modules, also two buzzers and vibrators are used in stick.

Advantages

1. It has multiple uses and applications

2. It can detect any kind of obstacles

Disadvantages

1. As it providing a greater number of features it is expensive.

Date of conference: 10-12 July 2018
Date of conference: 18 October 2018

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Blind aid stick: hurdle recognition, simulated perception, android integrated voice based cooperation via GPS along with panic alert system: In this paper the latest technology is incorporated to provide an efficient and smart electronic aid to the visually impaired people who have to rely on others for travelling and other activities. Here IR sensors and ultrasonic range finder circuit for hurdle detection are used, the main aim of this paper is to provide a easy and convenient navigation aid for unsighted which helps in artificial vision by giving information about the environmental scenario of static and dynamic objects around them. In panic situations the voice assistance to desired locations is done by sending the SMS alert to registered numbers, Bluetooth module along with GPS technology and an android application is provided for blind.

Advantages

1. It detects the hurdles
2. It is very efficient and highly smart
3. It is user friendly

Disadvantages

1. This project or system won't be helpful to deaf person
2. The head level obstacle cannot be detected

Date of conference: 27-28 Jan. 2017
Date added to IEEE explore: 15 June 2017

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Arduino based automated stick guide for a visually impaired person: In this paper a stick model is implemented which has a Global Positioning System (GPS) and a Global System for Mobile Communication (GSM) modules along with sensors like ultrasonic sensors and infrared sensors for visually impaired people to guide in their way. Whenever he feels he is lost or unsafe he can press a switch so that the current location of the person and their location will be sent to registered numbers using GSM module via short message service (SMS). Ultrasonic sensors detect the obstacles and infrared sensors are used for level detection. Both the sensors are interfaced with the vibrators.

Advantages

1. This is smart system
2. It is less expensive

Disadvantages

1. In this system the GPS is main device hence sometimes the signals can be lost by the interferences

Date of conference: 2-4 Aug. 2017
Date of Added to IEEE explore: 30 October 2017

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Blindar: An invisible eye for the blind people making life easy for the blind with internet of things (IOT): In this paper Electronic Travelling aid (ETA) called blin Dar is implemented. This is the smart guider for blind people. It is implemented using Internet of Things (IoT). It is aid to visually impaired people to walk without constraints in close as well as open environments. Here ultrasonic sensors are used to detect obstacle and pot hole within a range of 2m.the fire path is also detected by implementing MQ2 gas sensor. If person forgets his stick it is found by using transmitter and receiver module. GPS and ESP8266 module have been used for sharing the location with the cloud, Arduino Mega 2560 microcontroller is used.

Advantages

1. This system is highly efficient and reliable
2. It is fast responding and light weight
3. it is very cost effective

Disadvantages

1. Gas sensors are very sensitive for a range of gasses and are used indoors at room temperature

Date of Conference: 19-20 may 2017
Date Added to IEEE Explore: 15 January 2018

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Proposed framework

Through this survey, few faults have been observed our team has come up with few solutions to overcome these disadvantages and the main goal of our project is to provide a standard lifestyle for deaf dumb and blind peoples as normal ones. Through this device

- The visually impaired people can able to understand the words easily.
- The visually impaired people can detect the obstacle in front with The help of the ultrasonic sensors which are used in waist belt, shoes and in spectacles will detect any object or person is within its detection range at a maximum distance of 80 cm. and a minimum distance of 13 cm. in closed environments with and without light, while in open environments have a small light variation detection in the maximum distance of its range.
- Here we are using one feature called fall detection with the help of accelerometer, GPS and GSM which will also help to send the message to their family members with the location

Conclusion

The project proposed the design and architecture of a new concept of Smart Electronic Guide for blind people. The advantage of the system lies in the fact that it can prove to be very low cost solution to millions of blind person worldwide. The proposed combination of various working units makes a real-time system which assist for a blind person to read something. It can be further improved to have more decision taking capabilities by employing varied types of sensors and thus could be used for different applications.

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