ELECTRONIC WALKING STICK FOR BLIND PERSON

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Abstract

The electronic walking stick helps blind people to perform navigation and to do their work easily and comfortably. In normal stick, the detection of the obstacle is not done and normal stick is not efficient for visually impaired persons. Because the blind person does not know what type of things or what type of the objects come in front of him or her. The person cannot recognize what is the size of that object and how far is he/she from the object. It is difficult for blind person to move here and there. In electronic walking stick, the object is detected with the help of a camera and also it measures the distance between objects by using ultrasonic sensor. If any obstacle comes in front of blind person, he/she can know about the obstacle by hearing the sound generated by the head phone. The system is very useful for people who are visually impaired and are often need help from others.

INTRODUCTION

Visually impaired persons have difficulty to interact and feel their environment. They have little contact with surroundings. Physical movement is a challenge for visually impaired persons, because it can become tricky to distinguish obstacles appearing in front of them, and they are not able to move from one place to another.

They depend on their families for mobility and financial support. Their mobility opposes them from interacting with people and social activities. In the past, different systems are designed with limitations without a solid understanding of the non-visual perception. Researchers have spent the decades to develop an intelligent and electronic stick to assist and alert visually impaired persons from obstacles and give information about their location. Over the last decades, research has been conducted for new devices to design a good and reliable system for visually impaired persons to detect obstacles and warn them at danger places.

Electronic walking stick is specially designed to detect obstacles which may help the blind to navigate care-free. The audio messages will keep the user alert and considerably reduce accidents. A voice enabled automatic switching is also incorporated to help them in private space as well. This system presents a concept to provide a smart electronic aid for blind people, both in public and private space The proposed system contains the ultrasonic sensor, water sensor, voice play back board, raspberry pi and speaker. The proposed system detects the obstacle images which are present in outdoor and indoor with the help of a camera. The Stick measures the distance between the objects and electronic walking stick by using an ultrasonic sensor. When any objects or obstacles come in range of an ultrasonic sensor then the head phone tell the name of obstacle which is in front of the stick. The smart walking stick is a simple and

purely mechanical device to detect the obstacles on the ground. This device is light in weight and portable. But its range is limited due to its own size. It provides the best travel aid for the person. The blind person can move from one place to another independently without the others help. The main aim of the system is to provide a efficient navigation aid for the blind persons which gives a sense of vision by providing the information about their surroundings and objects around them.

LITERATURE SURVEY

Nowadays, the wearable health monitoring system is the main application of Internet of things [1]. Likewise lots of wearable devices are designed for visually impaired people. Few systems are discussed here. In [2], sensor assisted stick for the blind people describes about a wearable equipment which consists of a light weight blind stick and the obstacle detection circuit based on a sensor. It is mainly developed to help the blind person to move alone safely from one place to another and to avoid any obstacles that may be encountered. The device detects the fixed as well as moving objects and thus it may help to avoid accidents. The main component for the working of this system is the infrared sensor which is used to scan a predetermined area around the blind person by emitting-reflecting waves.

The reflected signals are received from the objects are used as inputs to the microcontroller and then used for determining the direction and distance of the objects around the blind person. The main objective of this is to provide an application for blind people to detect the obstacles in various directions, detecting pits and manholes on the ground to make free to walk. In [3], an innovative stick is designed for the visually disabled people for their easy navigation. The blind stick is able to detect the water by integrating with ultrasonic sensor. In this system, the ultrasonic sensors are used to detect obstacles by using ultrasonic waves. By sensing the obstacles the sensor passes the received data to the microcontroller. The microcontroller processes the data and calculates if the obstacle is close enough to the person. If the obstacle is not close to the microcontroller, the circuit does not do anything. If the obstacle is close enough to the microcontroller, it sends a signal to buzzer. The system also detects water and provides different sounds and alerts the blind person.

In [4], multitasking stick is designed to indicate safe path to visually disable people. The micro-controller based automated hardware allows a blind person to detect obstacles in front of them. The hardware part consists of a micro-controller which was incorporated with an ultrasonic sensor, voice play back module and additional equipment. The ultrasonic waves are used to detect the obstacles. The temperature sensors are provided to detect the fire or high temperature area. The presence of water is detected using the current sensing principle. The acknowledgement from the sensing obstacle is received through the voice play back module. The system is provided with RF module to find the misplaced stick. These features allow the blind people to move from one place to another independently and easily.

In [5], object detection for Markerless Augmentation using Haar Training deals with providing object recognition algorithms which will help and guide the

users of their respective devices by helping them with a better understanding of an unknown device in order to set up its working. Real-Time object detection and recognition of the object using the device's camera. Haar cascade classifier files were created by performing haar training on the object and its ports images, for detection purposes. This work extends Viola Jones Algorithm's rapid object detection framework in two important ways: Firstly, their basic and over-complete set of Haar-like feature is extended by an efficient set of 45° rotated features, which add additional domain-knowledge to the learning framework and which is otherwise hard to learn. These novel features can be computed rapidly at all scales in constant time. Secondly, a new post optimization procedure for a given boosted classifier that improves its performance significantly [6]. The prototype implementation has been applied to several practical applications such as image search, rapid object recognition and augmented reality applications. The project is an android application to ensure better portability.

PROPOSED SYSTEM

In the proposed system, the ultrasonic sensor is used to sense the obstacle distance from the user. This reference distance can be used to decide whether the user can move or not. The ultrasonic sensors work on the basis of sound. The sound waves are transmitted ahead from the sensors towards the obstacle which can sense the distance up to a distance of 12 feet with a resolution of 0.3cm. The sensors are placed in five locations in order to cover maximum sides possible with minimum usage of the sensors. The sensors are placed in left, right, middle left, middle right and bottom respectively. Generally, the blind person cannot see the objects present on the ground. So the bottom sensor keeps track of the ground clearance providing necessary security measures. The proposed system tries to provide vision to the user so we need to consider and process the image ahead as well. The image is detected using image sensors (camera). The image manipulation here is done in order to detect the obstacles present ahead and also to detect the indoor objects. Raspberry pi keeps the image dataset which consists of lot of collected samples of the different obstacles. The images which were sent from the camera are compared with the images stored in the dataset using the image processing. The image is processed and classified using Haar classifier.

A Haar classifiers are the object property files that describe an object in real world. A Haar-like feature considers neighboring rectangular regions at a specific location in a detection window, sums up the pixel intensities in each region and calculates the difference between these sums. This difference is then used to categorize subsections of an image.

HARDWARE IMPLEMENTATION

The system consists of a walking stick including a USB camera, RF module, Rain sensor, Ultrasonic sensor, Raspberry pi and a head phone attached to it. The raspberry pi is the central controller of the system. The raspberry pi allows the ultrasonic sensor to continuously measure the distance of the obstacles appearing across it. The Ultrasonic sensor calculates the distance by using the time taken for ultrasonic waves to reach and reflect from

the obstacle. If the obstacle is within 50 meter range, then the ultrasonic sensor sends signal to the raspberry pi. Ultra sonic RASPBE RRY PI

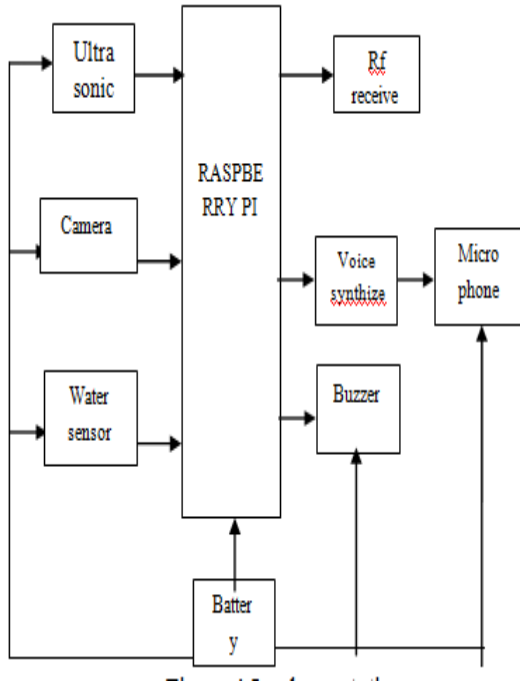

Figure.1 Implementation

Then raspberry pi enables the USB wired camera attached to it. When the camera is activated, it captures the image appeared across it. The captured image is also sent to the raspberry pi at the same time. Raspberry pi keeps the image dataset which consists a lot of collected samples of the different obstacles. The images which were sent from the camera are compared with the images stored in the dataset using the image processing. For image processing, morphology segmentation is used. A head phone is connected to the raspberry pi to give voice based communication to the user. When the comparison succeeds in finding the object, it gives the output of object name as voice through the head phone to the user.

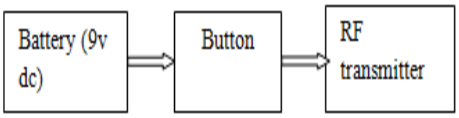

Figure.2 Transmitter block diagram

Whole of this process is programmed in Python programming language. RF module is added in the stick to find the misplaced stick. Rain sensor is used to detect the water, if rain sensor detects the water then the buzzer will be enabled. Because of these features the blind people can be able to move from one place to another independently.

SIGNIFICANCE OF THE SYSTEM

The main advantage of the system is that it helps the blind people in both indoor and outdoor, care-free navigation. The devices placed in the stick makes it comfortable and easy to handle. The smart stick helps in detecting obstacles placed at a distance in front of the user. The system is suitable for both indoor and outdoor environment. The information regarding obstacles is given through voice alerts, eliminates the difficulty of understanding vibration patterns which was used in earlier systems. The system is a moderate budget mobile navigational aid for the visually impaired.

CONCULSION

The smart walking stick, constructed with at most accuracy, will help the blind people to move from one place to another without others help. This could also be considered a crude way of giving the blind a sense of vision. This stick reduces the dependency of visually impaired people on other family members, friends and guide dogs while walking around. The proposed

combination of various working units makes a real-time system that monitors position of the user and provides dual feedback making navigation more safe and secure. The smart stick detects objects or obstacles in front of users and feeds warning back, in the form of voice messages rather than vibration. Also the incorporation of automatic room equipment switching in the stick will be useful while they are indoor. The advantage of the system lies in the fact that it can prove to be a low cost solution to millions of blind person worldwide.

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