IOSR Journal of Computer Engineering (IOSR-JCE)
e-ISSN: 2278-0661,p-ISSN: 2278-8727, Volume 22, Issue 5, Ser. I (Sep. – Oct. 2020), PP 36-42
www.iosrjournals.org

Iot Based Smart Stick Used For Visually Impaired People by Using Image Processing

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Abstract:
Nowadays, the innovations are trying to make the visually challenged people can be able to travel anywhere without anyone's help. In our proposed system, it helps people to find and recognize the objects free paths in both indoor and outdoor places. The major advantage of this system is that it provides the detail information about images in the path. The information detected by the system is transmitted to the user and auditory communication methods. In this existing system, this device which can be acts as to detect the obstacles andsteps by a white cane device. The proposed model will be low cost and as a low power embedded device for object detection and identification. An image sensor captures there cognition in environments that are known and unknown to the user.

Keywords: *IOT, Object detection, Optical Character Recognition (OCR), Natural Language Processing (NLP), Support Vector Machine (SVM), Object recognition.*

Date of Submission: 10-09-2020 Date of Acceptance: 25-09-2020

I. Introduction

Independence is most required thing to achieving objectives, dreams, and fulfilling their goals in life. But visually impaired peoples are dependent with some other while in their routine life. Visually impair/blind persons find themselves demanding the hazardous paths to go out separately. There are millions of visually impair or blind people in this world who are for all time needing help from others. For many years the normal walking stick becomes a well-known characteristic to blind person's navigation and later hard work has been made to recover the walking stick by adding remote sensors. Blind populace has big troubles when they walk on the street or stairs using a typical walking stick, but they have sharp hepatic sensitivity.

The electronic walking stick will help the blind person by if a more efficient and convenient means of life. Moving during an unknown environment becomes a real challenge for the blind or impaired people. Persons who go out of the house with the white stick frequently use well-known routes and difficulties with new ones. Moreover, many people simply afraid of being helpless in constant movement of people, vehicle and other road users. It is therefore advisable to offer new solutions for the problems with existing technologies. This paper proposes the design and develops a transportable stick for blind people/impair people for suitable use and navigation in open and private places. The most important drawbacks of these aids are the necessary skills and training period, range of motion and small information that they convey. There has been a creation of a lot of Electronic Travel Aids and they have been implemented to help the blind navigate separately and safely. Many high-level technological solutions have been introduced in recent times to help blind persons navigate independently.

However, in the assessment of other technologies, many blind guidance systems use ultrasound because it is not prone to environmental noise. The major reason why ultrasonic is well-liked is that is knowledge is comparatively less classy, and also ultrasound emitters and detectors are light sufficient to be used without the need for complex circuitry. Apart from starting the old direction-finding aids, a blind aid system can add a new measurement of Real-space help and vision along with dedicated obstacle detection circuitry. Thus a system that can facilitate aid to the blind is the need of the hour. The System will distinguish the obstacle and convert it into human understandable commands like obstacle detected, move left, move right. , etc. Which are already planned to the system according to situation and condition to make blind people easy and efficient to move from source to desire destination? Extract text from wavfile. The main aim of an ASR system is to exactly and suitably transform a speech signal into a text message record of the spoken words independent of the speaker the device used to record the speech (i.e. the microphone). This process starts when a speaker decides what to say and actually speaks a sentence. The software then produces a speech waveform, which embodies the words of the sentence as well as the irrelevant sounds and pauses in the spoken input. Next, the software attempts to decode the speech into the best approximation of the sentence. It converts the speech signal into a

progression of vectors which are measured throughout the duration of the speech signal. Then, by a syntactic decoder, it generates a valid series of representations. The major goal of ASR research is to allow a computer to differentiate in real- time, with 100% exactness, all words that are reasonably spoken by any person, independent of terminology size, noise, speaker individuality or accent. Nowadays, if the system is educated to learn an individual speaker's voice, then much larger vocabularies are probable and accuracy cannot be lesser than 90%.

Smart walking stick is particularly planned to detect obstacles which may help the blind to navigate care-free. The audio communication will keep the user alert and considerably reduce accidents. A voice-enabled automatic switching is also included to help them in private space as well. This system presents a concept to make available a smart electronic aid for blind people, both in public and private break. The proposed system contains the image acquisition, NLP, OCR, and SVM. The proposed system detects the obstacle images which are current in outdoor and indoor with the help of a camera. The Stick procedures the distance between the objects and smart walking stick by using an ultrasonic sensor. When any objects or objects come in a variety of an ultrasonic sensor then the headphone tells the name of objects which are in front of the stick. The smart walking stick is a simple and merely mechanical device to detect the obstacles in the surroundings. This device is heaviness and convenient. But its, vary is limited due to its own size. It provides the greatest travel aid for the person. The blind person can move from one place to another separately without the help of the others. The main aim of the system is to provide the information for blind persons which gives a sense of vision by as long as the information about their environment and objects around them.

The proposed system tries to offer a vision to the user so we need to think and process the image ahead as well. The image is detected using image sensors (cameras). The image management here is done in order to detect the objects present ahead and also to detect the indoor objects. It keeps the image dataset which consists of 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 dispensation. The image is processed and classified using the OCR classifier. Classifiers are the object property files that explain an object in the real world. An OCR like feature considers neighbouring rectangular regions at a specific location in a detection window, sums up the pixel intensities in each region and calculates the difference among these sums. This difference is then used to classify subsections of an image.

1.1 Motivation:

The blind people's life behaviour is greatly limited by the loss of eyesight. They can only walk-in set routes that are significant in their lives, with blind direction-finding tools and accumulate memories in their long-term examination. This situation has resulted in many difficulty encounters in a trip of the blind incorporated walking on the road and looking for usual life-arena. Several devices have been urbanized for mobility and direction-finding help of the blind and are characteristically known as travel aids or blind and are characteristically known as travel aids or blind mobility aids. Here it causes some more intentions to make this proposed system.

1.2 Contributions

The some of the major contributions are discussed below:

- To simply the corporeal movement of visually impaired persons.
- To put back the conservative walking cane with a smart walking stick that identifies the objects.
- To make the blind being safe while they are walking.
- To design a smart stick for a blind being using the ultrasonic antenna at distance range 2cm to 4cm using proteus simulation.

Physical movement is a challenge for a visually impaired person. The conservative walking stick used by them very imperfectly in its range of discovery and it is only used to detect the object which is near to the user. The drawback of the conservative cane, however, is its stoppage to detect obstacles outside of its arrival. That is the user has to tap the position of the object to notice the obstacle. The visually challenged people can avoid the thing better if the walking stick can create. Vibration and audio sound warming when there is an object in the exact range of distance.

1.3 Existing Techniques:

The existing techniques where used with the different applications and devices. Thus the devices are specialized with the heterogeneous features.

Blind Cane:

1) Recognition of obstacles up to knee level.
2) Does not protect from obstacles at torso and face level.
3) Prone to injuries.

Trained Guide Dogs:
1) 1% usage.
2) Expensive to Train Dogs.
3) Training period on an average 6 months.
4) Difficulty in dog up-keeping costs and lifestyle changes.

Human Guide:
1) Dependency.
2) Feeling of being a burden.

The main disadvantage of the existing techniques is only detect the obstacles and steps itself. There is no alternate path. GPS can't attach in little sensor support in these fields and it having limited and fixed route to follow daily routine.

II. Related Works

A. Wearable Computing Technologies

R.K.Katzschmann [5] presented ALVU (Array of Lidars and Vibrotactile Units), a contactless, perceptive, hands-free, and prudent wearable device that allows visually impaired users to detect low- and high-hanging obstacles, as well as physical confines in their immediate environment. The solution allows for safe local navigation in both limited and open spaces by enabling the user to discriminate free space from obstacles. The device accessible is collected of two parts: a sensor belt and a haptic strap. The sensor belt is an array of time-of-flight distance sensors worn around the front of a user's waist, and the pulses of infrared light provide dependable and exact measurements of the distances among the user and surrounding obstacles or surfaces. The haptic strap communicates the considered distances through an array of vibratory motors worn around the user's upper abdomen, providing haptic feedback. The linear shuddering motors are united with a point-loaded pre-tensioned applicator to transmit isolated vibrations to the user. We validated the device's capacity in a general user study entailing 162 trials with 12 blind users. Users exhausting the device successfully walked through hallways, avoided obstacles, and predicted staircases.

B. Range Based Techniques

Electronic travel aids are used for detecting obstacles, identifying forces, and, usually, obtaining useful information from the environment, thus enabling safe and effective management of the environment. A drawback is perverted codification, which may lead to usability concerns. B.Ando, [10] introduced a haptic device expected to offer the user with information on the occurrence of obstacles inside the environment. The haptic boundary is intended to replicate the stimuli provided by a traditional white cane, without any contact with the environment. A prototype, implemented through a short cane with an embedded smart sensing approach an active handle, is obtainable. Twenty-five blindfolded normally sighted users participated to measure system performance in detecting obstacles and accurately assigning their position by the haptic interface. With deference to detecting obstacles and their positions, the average values of the sensitivity in the case of left, centre, and right positioned obstacles are 0.735, 0.803, and 0.830, while the specificity principles are 0.924, 0.835, and 0.827, respectively.

C. Image processing

C.Ye, S.Hong [14] presented a new robotic routing aid, called Co-Robotic Cane (CRC). The CRC uses a 3D camera for both pose inference and object appreciation in an unknown indoor situation. The 6-DOF pose inference method determines the CRC's pose change by an ego motion estimation method and the iterative closest point algorithm and reduces the pose integration error by a pose graph optimization algorithm. The pose inference method does not require any prior knowledge of the surroundings. The object recognition technique detects indoor structures such as stairways, doorways, etc. and things such as tables, computer monitors, etc. by a Gaussian Mixture Model-based pattern gratitude method. Some designs/obstacles (e.g., stairways) can be used as navigational waypoints and the others for obstacle avoidance. The CRC can be used in moreover robot cane (active) mode or white cane (passive) mode. In the active mode, it guides the user by steering itself into the wanted direction of travel, while in the passive mode it functions as a computer-vision-enhanced white cane. The CRC is a co-robot. It can detect human target and use the intent to select an appropriate mode routinely.

III. System Model

In our proposed model, it is able to detect the obstacles having a height below knee-level. It transmitting the alert information to the user by two facilities has vibration and audio message. Vibration strength and audio track depends on distance and position of the obstacle that senses the person. Object Character Recognition (OCR) is used to capture the image and it will be converted to text. Then the text can be

converted into the speech by using Natural Language Processing (NLP) techniques.
The main advantage of our work is as follows:

- It can be detect more distant obstacles and easy to recognize the destination.
- Having feature to left and right turn alarm signal.
- Simple to use and low cost.
- It can detect the digs and water present in the ground. Device can be converted easily.
- Fewer accidents will be accrued from blind people.

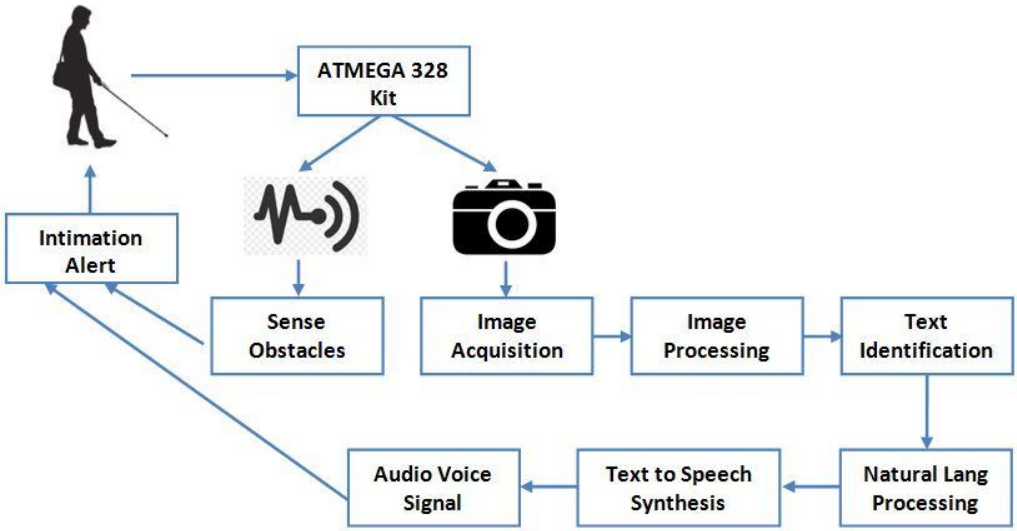


Fig.1. System Architecture

Device Initialization Module:

In this module, we initialize the board is equipped with sets of digital and analog input/output (I/O) pins and using sensors to analyze the signals. A buzzer or beeper is a signalling device, used to alert the user. Sensors measure the distance to the target by measuring the time between the emission and reception. Here the Bluetooth connected camera device also placed in the right position to capture the flat straight images. The image acquisition takes place the major role in this embedded device kit. The camera device can be triggered with the hand button through Bluetooth device.

Image acquisition and pre-processing:

Whenever the obstacle is detected on the way through sensor, Camera gets triggered to capture the object which is on the way. The captured image is sent to cloud to identify the type of the object. Sensors are setup for the detection of obstacles and any other object crosses in front of the user, using sensor.

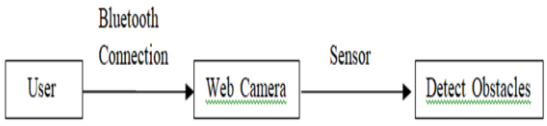


Fig.2. Image acquisition

Image Enhancement and Feature Extraction:

In this module we connect to the cloud to upload the object (obstacles) details to detect the type of object and compare the objects. Cloud Connect allows connecting to any one of the many cloud service providers. A separate database is designed, where the definition of the objects are found.

Text Identification Using OCR:

The images which were sent from the camera are compared with the images stored in the dataset using the image processing. These values are continuously compared with the already stored value in the server. In this module the image which is captured using camera is converted into a text using OCR.

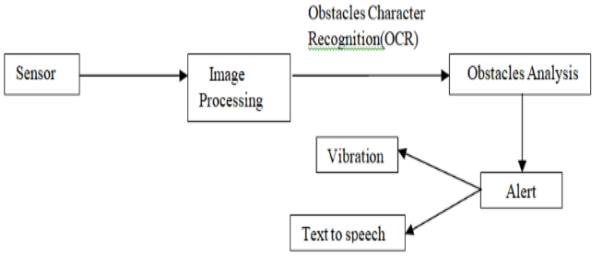


Fig.3. Identify the text

Text To Speech Synthesis:

The system is suitable for both indoor and outdoor environment. The text that converted from the image can be converted into the speech by using Natural Language Processing (NLP) techniques. The information or alert regarding obstacles is given through voice alerts and through vibrations. This module helps to alert visually impaired persons from obstacles.

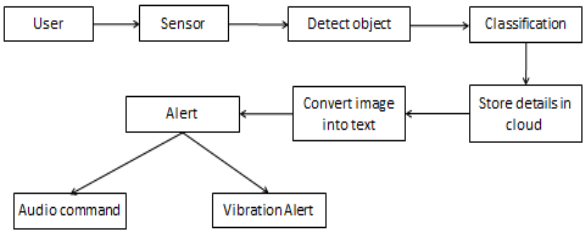


Fig.4. Text synthesis

IV. Results And Discussions

Here, it is planned to implement the system in real time environment has shown in figure 5. Nano Arduino Kit with ATMEGA 328 surface mountable device has been used for the implementation of this novel system in real time. Here 13 digital IO pins and 6 analog IO pins have also been used for this proposed work. This real time system which also connected with the obstacle sensor such as crystal oscillator 16MHz and Camera device can be used. The oscillator senses the obstacles in the foot path of the blind person and intimate with the buzzer sound.

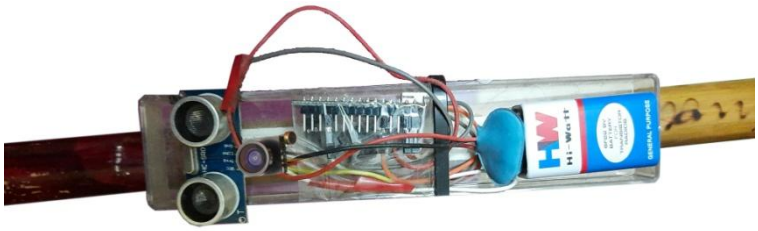


Fig.5. Walking stick embedded kit

In other hand, the device can be connected with the mobile app through Bluetooth technology. Thus the camera device capture the image and that the image can be forwarded to the mobile app. Then the image processing techniques may performed to identify the text characters or words in that image. The text can be identified in the image using Optical Character Recognition technique. Using Natural Language Processing, the semantic of the sentence can be forwarded to the speech processor. Here the Text to Speech Synthesis can be used for conversion of text to speech signal. Then the obtained audio signal may intimated to the person needed. The image processing can be done for the implementation of the image.

Fig.6.a Original image

Fig.6.b Enhanced image result

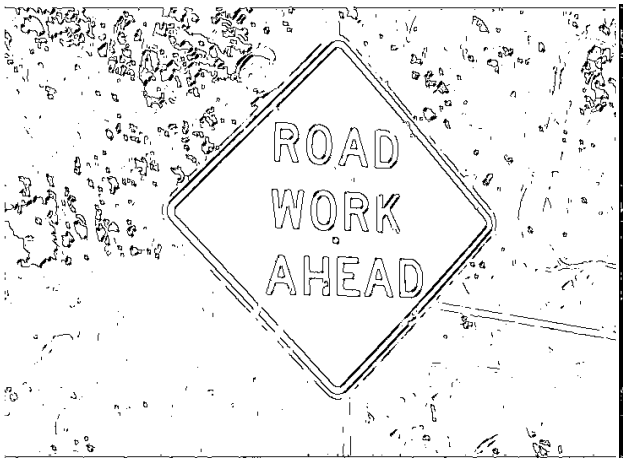
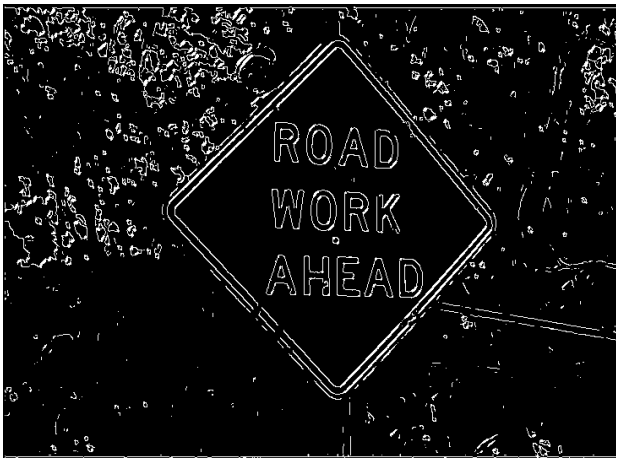


Fig.7.a Edge Identification



Fi.7.b Text Identification.

In the above diagram, the figure 6.a shows the original image obtained from the device. Then the image can be enhanced when it required making analysis. The strong and weak edges should be identified to get the text in the image. Finally the obtained text can be sent to the blind person after performing the text to speech synthesis.

V. Conclusion

The main objective of this paper to blueprint one system which becomes helpful to the visually impaired people by as long as one stick, which notice obstruction in front of the person, due to these characteristic, one smart tools for visually impaired people for under your own steam on the road or surrounding atmosphere through it we can give them rather sense of vision. Tracking, live video capturing and live video monitor is also implemented for the protection or safety purpose of the blind person. Track, live video capture, and live video monitoring are as well implement for the protection or safety cause of the blind being. GPS can help to locate the straight path from the current position of a blind person. It can also help in guide the blind human being by giving him voice-based directions for following directions. The system can also make use of a hi-fi camera and giving out units, to process the data.

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Mr. M. Kannan, et. al. "Iot Based Smart Stick Used For Visually Impaired People by Using Image Processing." *IOSR Journal of Computer Engineering (IOSR-JCE)*, 22(5), 2020, pp. 36-42.