MAVI-A DEVICE TO ASSIST MOBILITY FOR VISUALLY IMPAIRED

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ABSTRACT:

In this paper, we provide an assistive aid for mobility of visually impaired people. There are many devices available in the market serving for the blind people but it is not affordable for all the people. The main aim of the project is to design an embedded device, so that a better living is provided for visually impaired. This project provides face detection and recognition along with obstacle identification. By using these features, obstacles are identified and voice command is established. This will pave way for the growth of visually challenged people in their professional sectors.

Keywords-Face detection and recognition, obstacle identification, voice command establishment

I. INTRODUCTION

According to World Health Organization (WHO) fact sheet of 2017, nearly 39 million people of the total world's population are visually impaired. It is quite difficult to bring back the vision for these visually impaired people using vision replacement surgeries. Therefore, there is a necessity to support these visually impaired in their routine activities. This paved way for the development of wearable devices that prevailed for the better living of the blind people. In the initial days, canes were preferred by the blind people to detect the obstacles in their surrounding areas. But the size of the obstacles was not determined using canes. An immediate requirement to overcome the problem faced by the visually impaired people lead to the development of low cost affordable devices. Our project provides a prototype of such wearable devices supporting for blind people. There are several assistive systems available today but they have certain issues reducing the feasibility for the visually challenged persons. In previous approaches, such wearable devices were meant only for the detection of obstacles whereas in our prototype, we have implemented face recognition technologies and also voice command for the desired devices control. Obstacle detection is also implemented in our project which assists the visually impaired people of the impending danger in the surrounding ambience. Voice command is established to denote the upcoming obstacles to the visually impaired people. The solution to the problems faced by the visually impaired people in this society can be reduced by our project. From the below given statistical diagram, the number of visually impaired people globally is taken into consideration.

STATISTICS OF VISUALLY IMPAIRED PEOPLE:

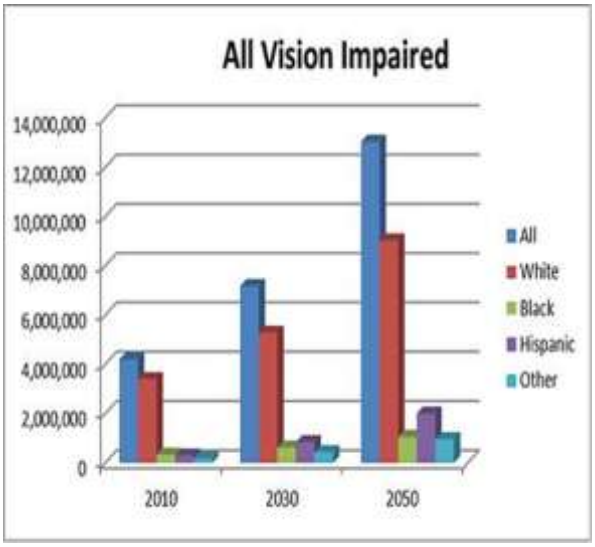


Fig. 1. Example for Statistics of visually impaired

II. RELATED WORK

1. Advanced augmented white cane with obstacle height and distance feedback. This article was published in the year 2014. The white cane is a

III. PROPOSED SYSTEM

widely used mobility aid that helps visually impaired people to get adapted along with the ambience. Previously used white canes determined

the ground level obstacles at a range of 1.2m but head level obstacles were not determined. In this device, head level obstacles are easily determined by the device. Obstacles are detected but the type of object cannot be determined.

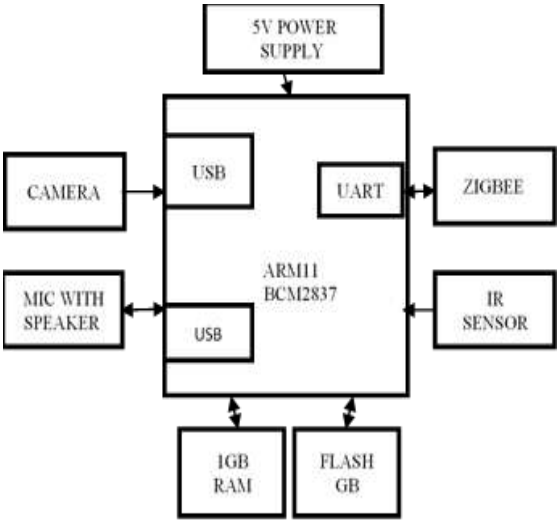
2. Assistive Infrared sensor based smart stick. In previous approaches, obstacle detection methods were too costly. Therefore to provide an alternative approach, infrared sensors are used. Light weighted stick which is cheap and user friendly that provides fast response and low power consumption, smart stick based on infrared technology has been proposed. It contains a pair of infrared sensors which can detect stair-cases and other obstacles presence in the user path, within a range of two meters. This experiment provides high accuracy and all type of obstacles are determined. It is applicable only for 2 meters.

3. Electronic aid for the mobility of visually impaired. To assist visually impaired people in a better way, this project aims to design various new implementations to provide low cost and user friendly approaches. It contains the combination of the combination of ultrasonic sensor that can measure the distance of obstacle, pressure sensor and buzzer on Arduino board so that it can provide better portability. It detects obstacles even after 2 meters. The main disadvantage is the usage of pressure sensor and ultrasonic sensor which provides less accurate results.

4. 3D object recognition using robot. This method provides the best way to identify the type of obstacle using image processing technique. It contains a camera to provide image processing and vision-pro software for object recognition. Using vision-pro, every object can be differentiated from other objects as a part of image processing. The disadvantage of this paper is its complexity and difficulties in portability. Face recognition cannot be implemented in this project. These are the existing systems available for blind people.

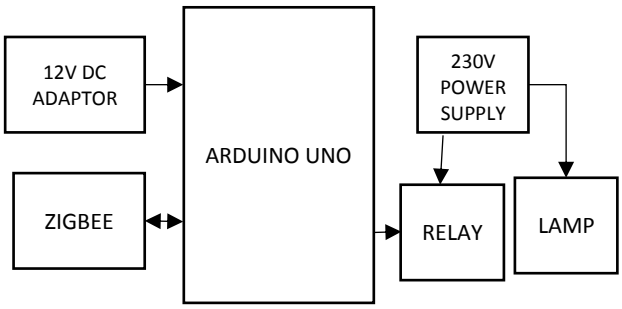
A better enhanced technology to facilitate better living for visually impaired people has been implemented in this project. The various technology used in this project are *face detection and recognition, obstacle identification and device control.* OpenCV (Open Source Computer Vision Library) is a software library which is used in computer vision and machine learning. It provides infrastructure for computer applications. It contains a library which has 2500 algorithms which are used to identify and recognize faces and detect objects and can be also used for other application. It has *python, C++ and MatLab interfaces* and supports windows, Linux operating systems. Image processing uses an algorithm to process digital images into enhanced images. Image recognition algorithm takes an image as inputs and produces output depending upon the image. The following steps are followed in image recognition algorithm: Pre-processing, Feature extraction, learning algorithm for classification, Image recognition.

A. BLOCK DIAGRAM*:*



Face detection and recognition

The above block diagram is used for face detection and recognition along with object identification. Here, the camera is used for capturing images and the captured images are compared with the library files using OpenCV algorithm. Voice output is produced with the help of electronic speak engine depending on face matching.



Device control

This block diagram is used to control various home appliances by using ZigBee transmission protocol. Thus device control is easily done by using ZigBee.

B. HARDWARE DESCRIPTION:

i) RASPBERRY PI 3:

The Raspberry pi is a low cost mini-sized computer which can be connected to any device like TV, Standard Keyboard and mouse. It is a processor whose operating speed is 1.5GHZ and the memory is very much larger compared to previously used processors. In this processors text-recognition and identification systems are integrated. The optical character reader (OCR) is used for converting captured images into text and conveys to the visually impaired people with the help of voice signals through electronic speak engine.

Fig. 3.1. Raspberrypi

ii) ARDUINO UNO:

The Arduino uno is a microcontroller board which is developed by using Arduino.cc. It can be directly connected to the computer through USB (Universal serial Bus). It can transfer using IDE (Integrated Development Environment) compatible with windows, Linux system. Arduino Uno is attached with the device that has to controlled by the visually challenged people.

Fig. 3.2. Arduino UNO

iii) CAMERA:

In this project, camera is used for capturing images like human faces for implementing face recognition. Face recognition is done by comparing with previously fetched database using OpenCV algorithm.

iv) IR SENSOR:

Infrared (IR) sensor is used for obstacle detection. It emits infrared waves via transmitter and these waves are received by the receiver. Any type of obstacle can be determined using infrared sensor.

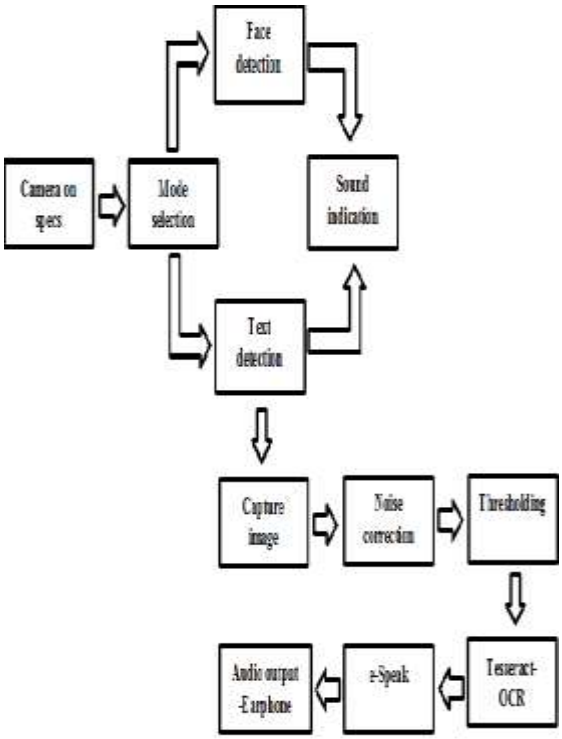
v) ZIGBEE PROTOCOL:

Zigbee is a high level communication protocol which is commonly used in home automation. It is represented by using IEEE 802.15.4. The transmission rate of zigbee protocol is 250Kbps. The maximum data transfer can occur upto a distance of 100m. Therefore, it acts as an alternative for bluetooth. Easy transmission can be obtained using this protocol.

vi) MICROPHONE WITH SPEAKER:

Using microphone, voice input or sound waves can be converted to corresponding electrical form. These electrical waves are transmitted via Zigbee protocol to the arduino uno, thereby contolling the device. Speaker is used to provide voice command for updating the visually impaired people regarding face recognition and matching. These are the main important components used for providing a better standard of living for these visually impaired people

C. SEQUENCE DIAGRAM:



- Initially the camera is positioned to capture the images. This is considered as the first phase for image recognition.
- The camera is placed in such a way that face detection occurs. Noise is also considered as a parameter during capturing of images. Arranging of frames is done using Mode selection.
- Thus the image is captured and noise correction is done depending on the identified noise.
- The Optical Character Reader (OCR) is used for converting the captured images into text conveys to the visually impaired people with the help of voice signals through e-speak engine.

IV. RESULTS

Face detection and recognition, obstacle detection along with desired device control is implemented in our project. Initially obstacle is placed in front of the kit and voice command is established to indicate the blind people regarding the obstacle. The overall efficiency of the Infrared (IR) sensor is explained with the below graph.

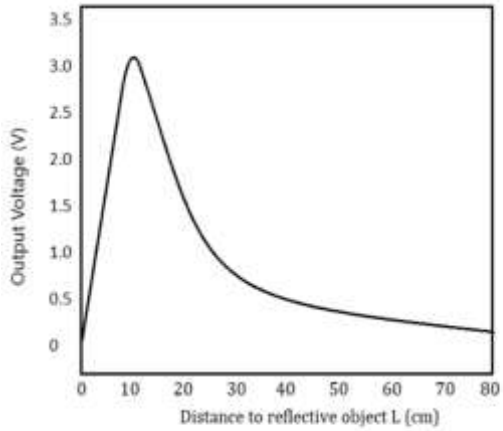


Fig. 5.1. IR sensor efficiency

Along with obstacle detection, face recognition and face detection using image processing is also implemented in our project.

V. CONCLUSION AND FUTURE WORK

Our paper provides a better living for the visually impaired people by suggesting Face recognition and voice command establishment, obstacle detection along with desired device control as a part of this project. Future work can be implemented by enhancing the technologies used and also by reducing the complexities of the algorithm. Along with obstacle detection, Obstacle identification can also be implemented.

VI. REFERENCES

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