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SMART GLASS FOR VISUALLY IMPAIRED PEOPLE

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Abstract: Generally, visually challenged people tend to have difficulties in traveling and managing many kinds of challenges in their routine life. Mostly, wooden sticks are used to sense barriers and obstacles next to them. As a result, visually impaired people cannot know exactly what kind of challenges they face and must thus rely entirely on lead sticks and training to navigate safely and in the right direction. This project focuses on the development of a guidance system that uses smart glass paired with a sensor to continually capture images from the environment by the user wearable smart glass. The smart glass is equipped with a processor to process the captured images and objects will be detected to inform the user about the results of the image and the user would have a much more comprehensive view of the method. This system allows visually impaired people to measure distance to the obstacle, but it also can inform about what the obstacle is. This smart glass can sense the distance from the obstacle and produce a warning to alert the user in advance. This application is developed to provide such a speech-based interface for the user. Here camera-based text reading framework is used, which helps visually impaired people to read texts in natural scenes, product labels etc. Recognized texts are output to the visually impaired people in speech. Experimental result shows that proposed method offers better performance in text recognition[8].

Keywords: Image Recognition, Smart Glass, Visually Impaired Peoples, Recognize Obstacles, OCR, OpenCV.

I. INTRODUCTION

As per the recent survey of World Health Organization [WHO], globally, at least 2.2 billion people have a near or distance vision impairment. At least 1 billion – or almost half of these cases, vision impairment could have been prevented or has yet to be addressed. Visually impaired people face number of visual challenges every day. In our day-to-day life, text information is present everywhere. It is very difficult for visually impaired person to recognize text from the documents, natural scene images, posters, product labels, medicine bottles etc. Most of the time visually impaired or blind people rely on other people for help. Here, proposed system helps visually impaired person to detect text on documents, various objects which helps them to become self-dependent. Optical character recognition is used to extract the text from images. But OCR works well with simple backgrounds, standard fonts, well organized characters.

Generally, visually challenged people tend to have difficulties in travelling. Mostly, wooden sticks are used to sense barriers and obstacles next to them. in our proposed system the distance of the obstacle is detected using the HC-SR04 Ultrasonic sensor which intimates the distance of the obstacle well in advance to the visually challenged person compared to traditional cane. Visually blind people need to wear the proposed wearable smart glasses and holding the proposed intelligent walking stick; thus, the front obstacles can be detected by wearable smart glasses and to remind visually impaired/blind people by intelligent walking stick. It is really hard for a blind person to go out alone and there are not so many available products that can assist them. However, Researches have been going on for decades for developing an effective device for visually impaired people[5].

Most of the time visually impaired or blind people rely on other people for help. Here, proposed system helps visually impaired person to detect text on documents, various objects which helps them to become self-dependent. Optical character recognition is used to extract the text from images. But OCR works well with simple backgrounds, standard fonts, well organized characters. Using pyttsx3 the text is converted to voice and is announced to the visually impaired person.

For the algorithm implementation OpenCV library has been used which was developed to provide assistance in building system requires images processing. OpenCV library file has many built in packages that provide assistance in the object recognition and performs operation separately taking up less processing time and providing increased efficiency OpenCV library files requires only small amount of processors speed when incorporated with raspberry Pi[2].

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II. OBJECTIVES

1. Smart glass is an assistant for visually impaired which narrates the description of scene.
2. To detect the object using pi camera attached to raspberry pi with the help of OCR.
3. To make information available to the person using auditory translation system.

III. METHODOLOGY

The image processing method includes the image capturing and image to text conversion. The image processing is done with the optical character recognition method. The optical character recognition is a method that captures or scans the images and has an ability to convert the image into readable or text format which can be processed further. The image captured with OCR can be of any resolution. The image processing method includes capturing of static image with the help of camera. The camera works as an eye for the raspberry pi. The camera can be connected to the raspberry-pi with the help of Cable. We have used a raspberry pi camera to capture the image. After the successful connection the image is captured with the help of tesseract OCR software. We are using tesseract OCR which is raspberry pi compatible and can understand primarily English language. The teserract-ocr is library and is open source. The Tesseract-ocr is command line OCR which captures the image on the press of button. The image can be saved in .jpeg or .png format. With the help of tesseract OCR library of python, the captured image is converted to the text format in the raspberry pi and saved with the same name as an image. The converted text is provided to TTS system which converts the text to the voice format.

The inbuilt camera captures the images of the text. The quality of the image captured depends on the camera used. We are using the Raspberry Pi's camera which 5MP camera with a resolution of 2592x1944. Image pre-processing: This step consists of colour to gray scale conversion, edge detection, noise removal, warping and cropping and thresholding. The image is converted to gray scale as many OpenCV functions require the input parameter as a gray scale image. Noise removal is done using bilateral filter. Canny edge detection is performed on the gray scale image for better detection of the contours. The warping and cropping of the image are performed according to the contours. This enables us to detect and extract only that region which contains text and removes the unwanted background. In the end, Thresholding is done so that the image looks like a scanned document. This is done to allow the OCR to efficiently convert the image to text. Image to text conversion shows the flow of Text-To Speech[6]. The first block is the image pre-processing modules and the tesseract OCR. It converts the pre-processed image, which is in .png form, to a .txt file.

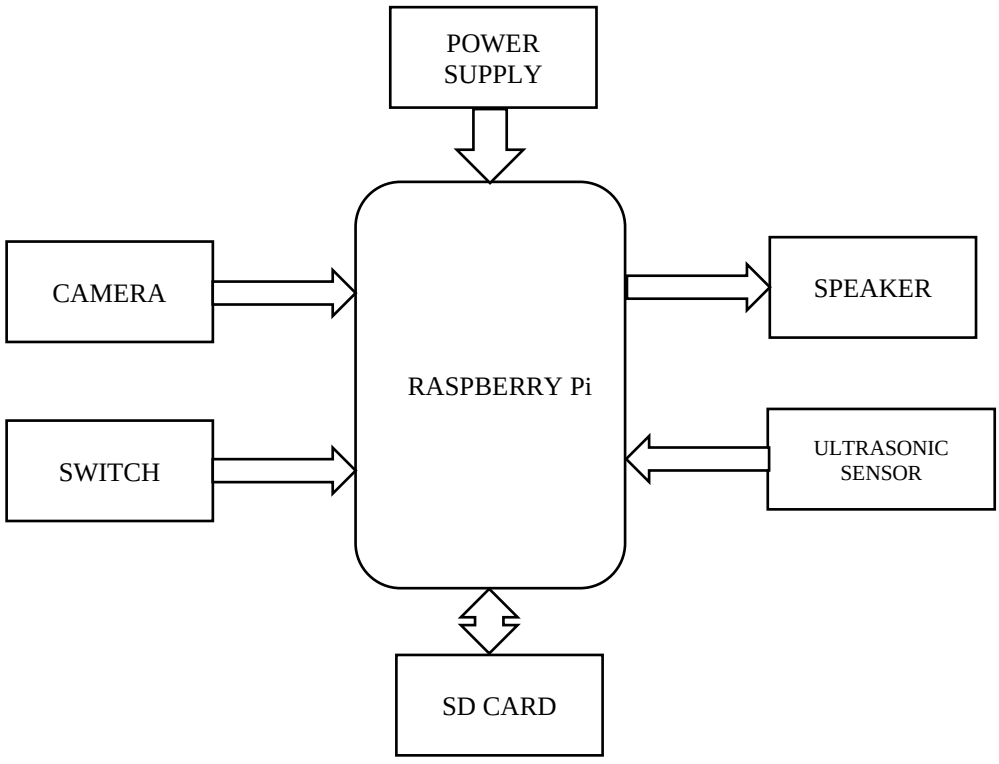

Figure 1: System Block Diagram

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Text to speech conversion the second block is the voice processing module. It converts the .txt file to an audio output. Here, the text is converted to speech using a speech synthesizer called Festival TTS. The Raspberry Pi has an on-board audio jack, the on-board audio is generated by a PWM output. A smart ultrasonic glass for blind people comprises of a pair of wearable glasses, ultrasonic sensors for detection of obstacles in the way of blind man, information from the sensor about the obstacle distance and processes the information according to the coding done and sends the output through the earphones, power supply is given to the Raspberry Pi which distributes the power to different components[1]. The sensor is mounted in between of the top bar and bridge present in glasses. All the components are connected to the Raspberry Pi using male to female jumpers and the power is given to the Raspberry Pi using a 5v battery.

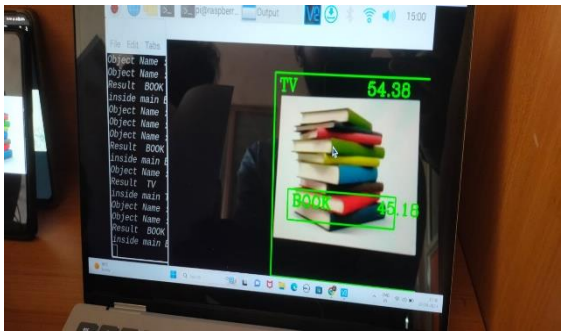
The best sensors that can be used will be ultrasonic sensors because ultrasound is a strong point, the energy consumption of slow wave propagating in the medium relatively far distance. Therefore, often it is used to measure the distance over big length. At the same time, ultrasound for the object in the dark, dust, smoke, electromagnetic interference, toxic and other harsh environments have a certain ability to adapt, with a wide range of applications. We have developed an intelligent assistance system for visually impaired and blind individuals, which integrates a wearable smart glass and an intelligent walking stick. The smart glasses are equipped with image and ultrasound sensors that can recognize color-coded markers and detect obstacles in real-time, allowing for distance detection of up to 200 Cm. While previous works for visually impaired individuals have focused on indoor environments, our system can be used both indoors and outdoors. Additionally, our system provides a comprehensive range of safety functions, including fall and collision announcements and obstacle detection, making it a complete interoperated aid suite for visually impaired and blind individuals[7].

IV. RESULTS AND DISCUSSION

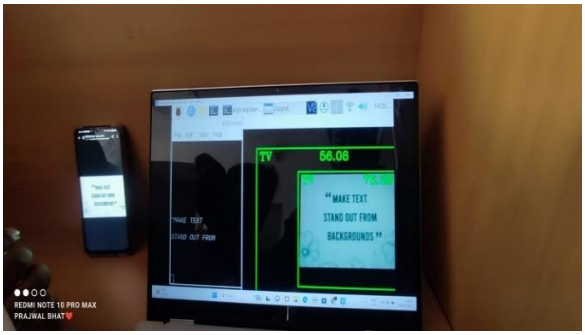
The current proposed system consists of ultrasonic sensor which measures the distance of the obstacles and the distance is narrated to the person through eSpeak via earphones. The Pi Camera captures the images continuously, these images are compared with the images present in database. If it matches with any of the person's image in database, then the name of the person is converted to voice and is intimated to the visually impaired person via earphones. So, the visually impaired person can know if there is any known person in front of them or at a distance.

In case, if any ticket, book or any paper consisting of some text is placed in front of the smart glass then, the text will be extracted from the input dynamic image. Then that text will be converted into speech, through speaker that text will be announced.

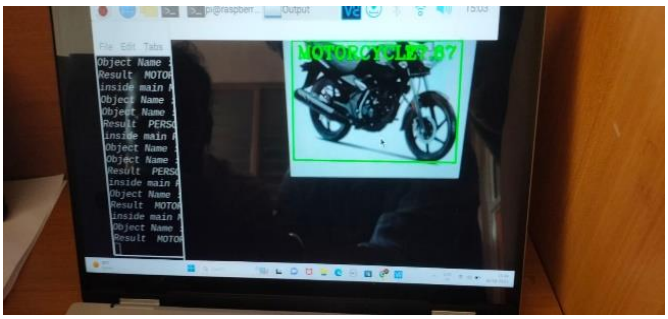
Figure.2: Snapshots of the system processing outputs (a) Books, (b) Text Identification, (c) Object Detection



(a)



(b)



(c)

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V. CONCLUSION

Technology played a very important role in our life. We use it almost everywhere and every time. The distinct and quick development that we discover each day proof for us that there is no point to give up and struggle with our obstacle in life. Technology offers us a lot of significant solutions to our problems and disapplies. Our role is to use it properly to reach the success level that benefits individual, society and whole country as well.

VI. FUTURE WORK

The video detection part can be integrated with video detection technology that can recognize objects, people, and text in the user environment can help the user to identify and navigate their surroundings more easily. The text to speech part could also be developed according to the futuristic pace. Instead of using the pre-trained models we can train the model by ourselves. The model can be trained to recognize objects which are frequently encountered by the user. Thus, it can be customized for the specific needs of the user and ensure safer navigation.

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***Abstract*— This device includes a pair of glasses and an obstacle detection module fitted in it in the center, a processing unit, an output device i.e. a beeping component, and a power supply. The Obstacle detection module and the output device is connected to the processing unit. The power supply is used to supply power to the central processing unit. The obstacle detection module basically consists of a ultrasonic sensor, processing unit consist of a control module and the output unit consists of a buzzer. The control unit controls the ultrasonic sensors and get the information of the obstacle present in front of the man and processes the information and sends the output through the buzzer accordingly. These Ultrasonic Smart Glasses for Blind people is a portable device, easy to use, light weight, user friendly and cheap in price. These glasses could easily guide the blind people and help them avoid obstacles.**

Keywords*— *Smart Glasses; Ultrasonic Sensors; Blind People

Introduction (*Heading 1*)

I. INTRODUCTION

In this protocol when find object but distance greater than 3 miter then it not sense, if distance less than 300 cm then it sense and create sound. The same approach is also used in many applications. One is Giving blind people the great accessibility to their environment is the objective of the smart glass system[1]. The key function of the another system is to enable the user in perceiving social signals during a natural dyadic conversation[2].The third system is a design, fabrication, assembly, and characterization of a fully-integrated single-chip glass BGA package at 40/80 μm off-chip I/O pitch with multilayered wiring and through-package-vias (TPVs) at 160 μm pitch[3]. The ClimaWin project's main goals are to improve both indoor air quality and the energy efficiency of new and refurbished buildings, through the use of novel green smart windows[4].Another one is an indoor navigation wearable system based on visual markers recognition and ultrasonic obstacles perception used as an audio assistance for blind people[5].There was a solution for the blind people to walk safely by detecting obstacle and generating corresponding alert signal according to the distance of the obstacle[6]. The Microsoft Kinect camera enables a mobile robot to do essential tasks like localization and navigation [7].There is a design of a small portable electronic cane utilizing Polaroid's Ultrasonic Ranging Unit intended to supplement or replace the traditional long cane is presented [8]. An intelligent assist blind glass system, comprising a wireless transmission module, a high-definition camera, an infrared sensor, an eyeglass frame, mounting the cartridge [9].The next one is an embodiment of the present invention is a method for communicating navigation information on a physical environment to a user [10].An invention included .An electronic talking stick for the blind and more particularly to a stick which talks to instruct a blind man to walk [11].

A. Proposed Model

Blind as a special group in society, the needs of society to give them more care and attention, so that they are better able to live independently. However, how safe walking blind life is the biggest problem. Traditional navigation device mostly blind cane, blind by tapping the ground or walking around the object to determine the direction, the structure is simple, single function, easy to use, but the secondary effect is not very obvious, in fact, will encounter many problems when using the blind such as poor road conditions, uneven, hanging in front of obstacles, ordinary cane can not be proven accurate, such a serious impact on the safety of blind travelers.

A smart ultrasonic glasses for blind people comprises of a pair of wearable glasses, ultrasonic sensors for detection of obstacles in the way of blind man, a buzzer to give the sound as per the direction of the obstacle from the man, a central processing unit comprising of Arduino NANO which takes the

information from the sensor about the obstacle distance and processes the information according to the coding done and sends the output through the buzzer, power supply is given to the central unit which distributes the power to different components. The sensor is mounted in between of the top bar and bridge present in optical glasses as shown in the figure. All the components are connected to the central unit using single strand copper wires and the power is given to the central unit using a USB cable.

The best sensors that can be used will be ultrasonic sensors because ultrasound is a strong point, the energy consumption of slow wave propagating in the medium relatively far distance. Therefore often it is used to measure the distance over big length. At the same time, ultrasound for the object in the dark, dust, smoke, electromagnetic interference, toxic and other harsh environments have a certain ability to adapt, with a wide range of applications.

The ultrasonic sensor is fixed at a perpendicular from the glasses.

According to claim 1, as the blind man goes closer to the obstacle the distance sent by the sensors to the central unit will decrease. Hence the beeping of the buzzer will take shorter intervals and hence the beeping will be faster. But as the man will go far away the beeping will take long intervals and hence decrease.

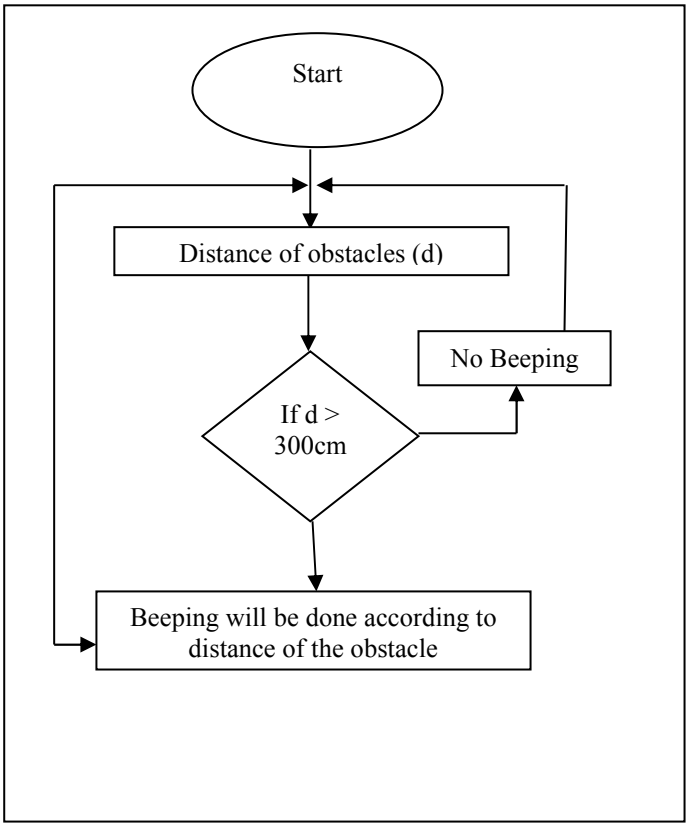
At present, many of the navigation device using seeing-eye guide dogs, guide dogs by seeing some extent, although the trip to ensure the safety of the blind. But there are still some problems, training a guide dog larger difficulty, generally have to spend 3-6 months, training a skilled guide dogs will need to spend about two years, with dog the daily life of consumer spending, the cost it takes to reach the million, while the limited life cycle of guide dogs.

According to claim 5, the ultrasonic glasses according to specifications mentioned in claim 1 are very cheap resulting in a very cheap device affordable by all.

These smart glasses are very easy to use and very simple to understand. If a blind uses it for 2-3 times then he/she will understand the working and can handle it easily

II. PROPOSED PROTOCOL

In this protocol sensor find out the object from distance, if it found with in300 miter then it give sound and aware the user. Also if it more nearer it give more sound effect.



A. Field of Invention:

There has always been a need for the person with disability to live a normal life and get opportunity to excel in the world. There have been many inventions so far to bring such peoples on the same grounds like others. Some have failed but some have made it well. The science and technology in today's world has always tried to serve the mankind in the health and safety field and same is the motto of this project.

B. Description of the invention:

This device helps the blind people to easily feel the obstacles in front of them and can save them from accidents. They could buy this product at a very cheap rate. With the help of E-Wastes this project has been built. The blind people could become independent. These "GLASSES" are designed for blind people. The concept of obstacle detection by SONAR sensor has been used here. As soon as the obstacle is detected by the sensor, its distance it sent to the Arduino. We convert the distance into centimeters from milliseconds and check whether the distance of obstacle is less than 3m, if yes then we send the output through a buzzer. The beeping frequency of the buzzer is indirectly proportional to the distance of the obstacle from human. The other products which are in the market with same purpose and in the same field are not so cheap in costing and user-friendly. Also no use of any high level technology is used here just simple arduino coding with sonar sensor and a buzzer the whole project is built-up.

This device is very easy to use and very simple to understand this makes it user-friendly. Also it is very cheap thus affordable.

Additional Details:

- Light weight and portable device.
- Easy to use, user friendly.
- Cheap in price.

Diagram and Description*:*

The Obstacle detection module and the output device is connected to the processing unit. The power supply is used to supply power to the central processing unit. The obstacle detection module basically consists of a ultrasonic sensor, processing unit consist of a control module and the output unit consists of a buzzer. The control unit controls the ultrasonic sensors and get the information of the obstacle present in front of the man and processes the information and sends the output through the buzzer accordingly.

III. RESULT ANALYSIS

In this protocol when find object but distance greater than 3 miter then it not sense, if distance less than 300 cm then it sense and create sound. When the distance between object and user are closer then sound effect is high gradually.

Fig. 1: Sensor Implementation

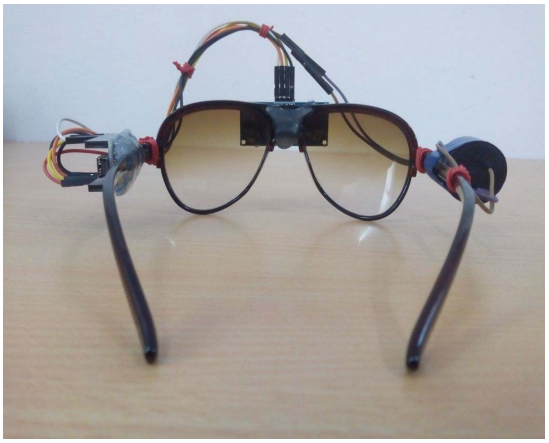


Fig. 2: Smart Glass with Sensor Implementation

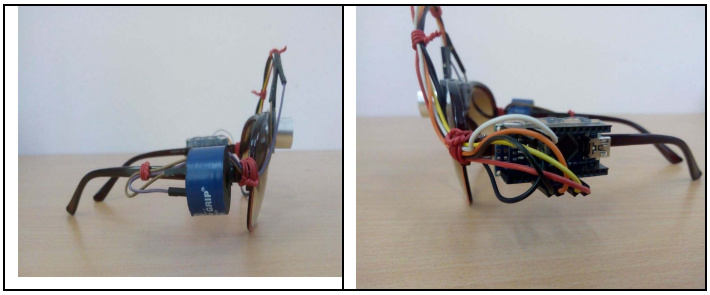


Fig 3: Internal circuit diagram for Smart Glass

Here this smart glass can detect the object by sensor and make alrt the user. Figure 1,2 &3 are shows the internal architecture of smart glass.

IV. CONCLUSION

This smart glass implemented for blind person who are unable to see any object so this person can aware about accident. In future it can be implemented as a image recognization where sensor give information user about the object.

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