Third – Eye Aid for Blind

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Abstract -

People who are visually impaired face numerous challenges in their daily lives. They frequently rely on the assistance of others. Several technologies exist to assist the visually impaired. People with disabilities have been developed. Computer Vision-based solutions are emerging as one of the most promising possibilities for assisting the blind due to its cost and accessibility. As a result, an efficient technique, such as a machine learning algorithm, is offered as a solution for such persons. The essential data input is gathered via an Image Classification technique in order to access machine learning techniques. The suggested technology captures images using a camera and then converts them into auditory signals to assist blind people. The Raspberry Pi 3B+ is used to build artificial vision in Python.

Keyword- Blind assistant, Image to audio conversion, Machine Learning, YOLO V3, Python.

INTRODUCTION

BLINDNESS affects millions of individuals worldwide. Blind persons confront a wide range of challenges. difficulties in doing every day normal works. Even in their own houses, individuals must exert effort to go from one location to another and to seek belongings. According to the World Health Organization (WHO), 253 million people have visual impairment, 36 million of them are blind, and 217 million have moderate to severe vision impairment. Traditional approaches, such as using a cane, assist them in avoiding obstacles, but they do not assist them in identifying and locating objects. As a result, the blind require aid in locating items in an indoor environment.

This study project focuses on how to assist blind people. We use well-known image processing and computer vision technologies for this, which focuses on finding things in computerized images. Object detection can be utilized for a range of applications, including recovery and surveillance. Other important concepts in object detection, such as using the OpenCV library of Python 2.7 to improve the accuracy and effectiveness of object detection, are discussed.

displayed. We employ the YOLO V3 algorithm to assist blind people, which can recognize objects using deep neural networks to make precise detection. We also use open CV with Python on a Raspberry Pi 3B+.

There are seven features in the dataset. In this study, I attempted to create four models to detect objects and signboards in order to assist visually impaired people in managing their daily routines. This model will assist blind individuals by detecting items using image processing techniques and providing auditory output to help them navigate barriers around them.

EXISTING SYSTEM

person nature and behavioral structure development have revealed over years of conventional study that every person visualizes the objects around them, then realizes, and finally understands. However, it is more pathetic and inconvenient for a blind person to move around, realize, and understand things without seeing them. By concentrating continually, they will be able to recognize the objects or location. This is also feasible by paying close attention to their surroundings, perceiving noises, and storing them in their memories. However, if they fail to recall the information from memory or become confused in identifying the objects, they are in trouble. They will then require guidance from others. They will then require guidance from others. There are also some similar issues in finding the directions towards the desired destiny. The current method overcomes all these challenges for visually impaired people by utilizing ETO (Electronic Travel Aids), a wearable vision support system. [1-3].

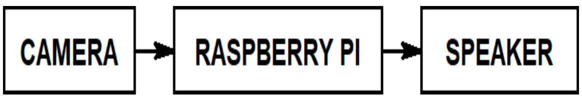
Blind persons employ a variety of instruments, including a cane, a PING sensor, a CMP COMPASS sensor, and a stereo camera [4-6]. There are also numerous approaches available, such as video capturing techniques and voice assistance techniques [7-8]. Existing technologies such as OCR (Optical Character Recognition) and TTS (Text-To-Speech) are examples of this.

RELATED WORK

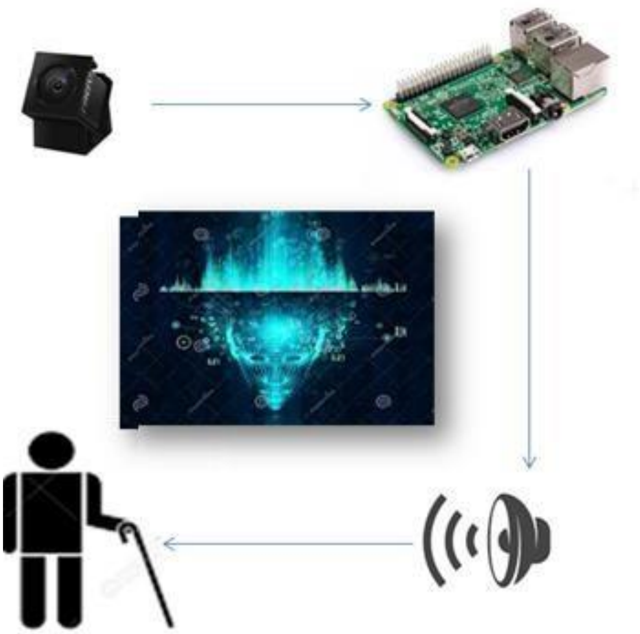
To overcome the travelling difficulty for the visually impaired group, this paper presents a novel ETA (Electronic Travel Aids)-smart guiding device in the shape of a pair of eyeglasses for giving this people guidance efficiently and safely. In the last decades there has been a tremendous increase in demand for Assistive Technologies (AT) useful to overcome functional limitations of individuals and to improve their quality of life [1]. To overcome "user need oriented" critical drawback, in this paper an original "task oriented" way to categorize the state of the art of the AT works has been introduced: it relies on the split of the final assistive goals into tasks that are then used as pointers to the works in literature in which each of them has been used as a component [2]. With the advances in vision sensors and computer vision, the design of wearable vision assistance system is promising. Typically, the performance of visual sensors is affected by a variety of complex factors in practice, resulting in a large number of noise and distortion. In this paper, we will creatively leverage image quality evaluation to select the captured images through vision sensors, which can ensure the input quality of scenes for the final identification system [3]. This work introduces a wearable system to provide situational awareness for blind and visually impaired people. The system includes a camera, an embedded computer and a haptic device to provide feedback when an obstacle is detected. The system uses techniques from computer vision and motion planning to (1) identify walkable space; (2) plan step-by-step a safe motion trajectory in the space, and (3) recognize and locate certain types of objects, for example the location of an empty chair. These descriptions are communicated to the person wearing the device through vibrations. We present results from user studies with low- and high-level tasks, including walking through a maze without collisions, locating a chair, and walking through a crowded environment while avoiding people [4]. Cane is a tool that used by blind people or someone who has visually impaired which is caused by an accident or an illness. Cane helps the blind people to check whether there are any obstacles around them. This research designed a prototype named Smart Guide Extension that can detect obstacles, holes and give information about eights wind direction using Arduino. The obstacles and holes module uses 2 PING Sensors, while the 8 direction of the wind information uses CMP compass sensor 511. All the information will be informed through the sound [5]. A Stereo Image Processing System for Visually Impaired is a system that includes a wearable computer, stereo cameras as vision sensor and stereo earphones, all mounted on a helmet. The image of the scene in front of visually handicapped is captured by the vision sensors. The captured images are processed to enhance the important features in the scene in front, for navigation assistance. In order to incorporate the distance information, stereo cameras are used. But, the system uses a stereo camera hence making the system complex and cost ineffective. Real-Time Visual Recognition with results converted to 3D Audio is a system which comprises of several modules. Video is captured with a portable camera device (Microsoft Kinect, or GoPro) on the client side, and is streamed to the server for real-time image recognition with existing object detection models [6]. This paper introduces a technique for automating the methodology of detecting and tracking objects utilizing colour feature and motion. Video Tracking is the methodology of finding a moving object over the long distance using a camera in this paper an algorithm is developed to track the real-time moving objects in different frames of a video using colour feature and motion [7]. This paper proposed an object detection system for the blind using deep learning technologies. Furthermore, a voice guidance technique is used to inform sight impaired persons as to the location of objects. The object recognition deep learning model utilizes the You Only Look Once(YOLO) algorithm and a voice announcement is synthesized using text-to speech (TTS) to make it easier for the blind to get information about objects. As a result, it implements an efficient object-detection system that helps the blind find objects in a specific space without help from others, and the system is analyze through experiments to verify performance [8]. This project tries to transform the visual world into the audio world with the potential to inform blind people objects as well as their spatial locations. Objects detected from the scene are represented by their names and converted to speech. Their spatial locations are encoded into the 2-channel audio with the help of 3D binaural sound simulation [9]. In this paper we introduce a novel set of rotated Haar-like features. These novel features significantly enrich the simple features of Viola et al. and can also be calculated efficiently. With these new rotated features our sample face detector shows off on average a 10% lower false alarm rate at a given hit rate. We also present a novel post optimization procedure for a given boosted cascade improving on average the false alarm rate further by 12.5% [10]. These systems intend to help by providing their user with some critical information about their environment using senses they can still use. In this paper, we discuss a system that uses existing technologies such as the Optical Character Recognition (OCR) and Text-to-Speech (TTS) available on an Android smartphone and use them to automatically identify and recognize texts and signs in the environment and help the users navigate. The proposed system uses a combination of computer vision and Internet connectivity on an Android smartphone not only to recognize signs, but also reconstruct sentences and convert them to speech. This paper discusses the design flow and the experimental results of the project [11]. This project focuses on the field of assistive devices for visual impairment people. It converts the visual data by image and video processing into an alternate rendering modality that will be appropriate for a blind user. The alternate modalities can be auditory, haptic, or a combination of both. Therefore, the use of artificial intelligence for modality conversion, from the visual modality to another [12].

PROPOSED SYSTEM

The suggested system will assist blind persons by recognising objects and their locations using image processing techniques and providing auditory output signals to the person to help them navigate around barriers. The system's primary goal is to identify objects and sign boards. This will assist the vision impaired person in managing daily chores. This method will assist visually impaired persons in navigating any obstacles and will provide them with a sense of visualization of the environment around them.



Because of its adaptability to current trends and technology, image processing has been done with the help of coding done in the Python language. The processed image is transformed into audio signals and transmitted to the speaker via the audio connection. The existing technique has some drawbacks, such as incompatible size and immovability. To remedy these shortcomings, an embedded platform such as the Raspberry Pi is used, with which the camera is interfaced and captured images forwarded to the board for processing. To localise and recognise the text, the ROI (region of interest) approach is applied.



METHODOLOGY

A) Raspberry Pi –

The Raspberry Pi is a credit card-sized computer that runs Linux on an ARM processor. The Raspberry Pi 3 Model B+ has 2GB of RAM, dual-band Wi-Fi, Bluetooth 4.2, Bluetooth Low Energy (BLE), an Ethernet port, HDMI output, audio output, RCA composite video output (via the 3.5 mm jack), four USB ports, and 0.1″-spaced pins for general purpose inputs and outputs (GPIO). A micro SD card with an operating system is required for the Raspberry Pi.

B) Camera –

The camera module utilized in this process is depicted in Fig. The photos are captured using the raspberry pi camera module, which can be linked to the raspberry pi through CSI. It is very adaptable to increasing data rates, as well as fast processing and recognition. It has a clear image quality rating of 5 pixels and can capture HD video at 360fps.

C) Audio Jack -

Figure 5 depicts the audio jack utilised in this process. The audio jack is utilised to extract the audio output from the module and transmit it to the blind people's headphones. It has a USB port on one side and a female jack on the other, which is used to connect the earphones.

D) Ultrasonic Sensor –

An ultrasonic sensor is an electronic device that measures the distance of a target object by emitting ultrasonic sound waves and converting the reflected sound into an electrical signal. Ultrasonic waves travel faster than audible sound (i.e. sound that humans can hear).

Implementation And Algorithm -

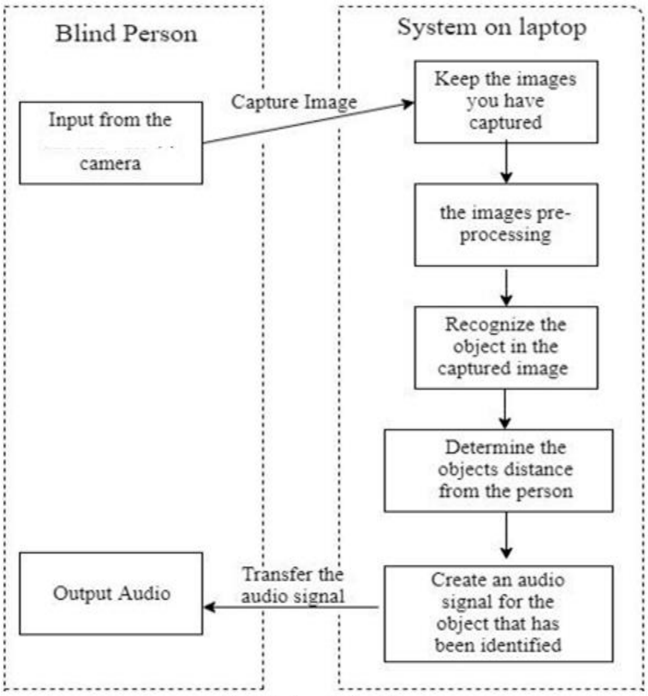


Fig 1. System Methodology

The initial phase in this machine is for the digicam to take the footage, which is then separated into frames. On those frames, object detection is completed using the "Haar Cascade classifier" and a primarily based object detection technique.

The Open CV library in Python is primarily capable of detecting things. It provides software packages that are used to train classifiers for object detection, known as Haar Training.

Object detection using Haar characteristic-based cascade classifiers is a machine learning-based approach in which a cascade function is trained on a large number of good and bad images. It is then used to recognise object features in separate images. The algorithm extracts snapshots from a large number of positive and negative photos. A Haar-like characteristic can be thought of as a template of many interconnected white and black rectangles. The characteristics employed include a specified length and a square shape.

Various components of this system are:

- Raspberry Pi
- Pi Camera
- Ultrasonic sensor

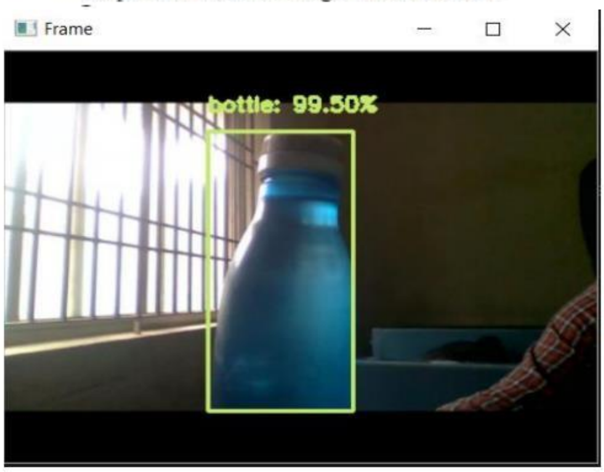
Open CV and Python:

Some coloured objects, such as a green bottle or a purple ball, are detected and tracked using the color-based object detection technique. To begin, the upper and lower limits of the object's shade are defined in HSV colour.

Video is recorded and converted to frames. These frames are converted to HSV colour space. The received image is a binary image that has been degraded and dilated to remove noise. The greatest contour in this binary image is then computed, followed by the coordinates and radius of a circle containing this contour.

RESULT

Snapshot of washroom sign board detected.



Sample Image for water bottle

The proposed system is beneficial to visually impaired individuals. It not only assists them in avoiding any obstacles, but It also assists them in visualizing their immediate surroundings.

CONCLUSION

The suggested system has successfully progressed to the point where a portable, inexpensive, and accessible system based on image processing technologies may assist visually impaired persons in navigating their route and coping with their day-to-day activities with ease.

Also, using brain waves to understand when a user requires assistance rather than voice commands can be one way to improve the system's design. As a result, this device provides individuals with a sense of visualisation while also assisting them in visualising their immediate surroundings depending on their voice commands.

This system has a simple architecture, which eliminates complexity and makes it user friendly.

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