Implementation towards Real Time Object Detection For Visually Challenged People

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***Abstract*—The system is an assistant for visually impaired that is design to narrate the description of a scene through pictures via webcam. There are millions of visually impaired people in the world. They are not able to experience the world which we people can. So our project of object detection for visually impaired people will try to provide them the missing experience of the beautiful world. The blind people who live in our society faces numerous problems like People walking on the street, Approaching of vehicles Uncertainty of the roads, Numerous obstacle present on the street.**

***Index Terms*—Object Detection, Image Processing, CNN, Blind People, Yolo**

I. Introduction

It is hard for visually impaired people to carry out their daily routine. Our aim is to provide a small help for those people by describing them about the surrounding. This narration will be basic outline of the surrounding. The visually impaired person is unable to see this beautiful world so we have to implement such a system that describe theworld. We can implement it by using the Image Processing technique and embedded system. We are using a camera to capture the image present in the real world and store it intothe database. Then manipulate it by using various image processing algorithms like Canny Edge Detection Algorithm, Speed Up Robust Features (SURF) and Convolutional Neural Networks and Image Classification (CNN) for image classification for pattern matching. We are matching the pattern and then recognizing the class of that object. Oncethe object is detected then it converted into text format and then it narrates through the speaker

Blind people face problem when they walk on the street or stairs using a white cane, but they have sharp haptic sensitivity. The system will assist the blind people by supporting extra handy manner of existence. There are numerous steering structures for visually impaired travelers to navigate quickly and thoroughly against boundaries and different dangers faced.

Paper is organized as follows. Section II describes about the related work done earlier for the system to be developed. Section III presents method used and algorithms used for the detection. Section IV presents experimental results showing results of images tested. Finally, Section V presents conclusion.

II. Related Work

1) **Rohilla, Yogesh Parihar, Vipul K Rohilla, Kusum.“ Ultrasonic Sensor based Smart Cap as Electronic Travel Aid for Blind People.” 2020**
This paper aims to develop an ultrasonic sensor based smart cap prototype as an electronic travel aid for blind people that can help them travel independently. Thesmart cap consists of ATmega microcontroller, Arduino board, three ultrasonic sensors, and a buzzer
2) **Vijitha, D. and Mrs. P. Pushparani. “A Smart Walking Assistance for Visually Impaired People – A Review.” (2019).**
This paper proposes an Arduino Nano based obstacle finding stick for visually impaired people, which helps a blind person by detecting the obstacles using Ultrasonic sensors and android mobile application. It is able to inform the blind person about the circumstances & present condition of the path where he/she is walking.
3) **Gaikwad, Arun G., and H. K. Waghmare. ”Ultrasonic smart cane indicating a safe free path to blind people.” 2015.**
Human vision plays a vital role in awareness about surrounding environment.[3] The term visual impairment covers wide range and variety of 3 vision, from blindness and lack of usable sight; to low vision, which cannot be corrected to normal vision with standard eyeglasses or contact lenses. Visually impaired tools can assist them to enrich their lifestyle.
4) **Oladayo, Olakanmi O.. “A Multidimensional Walking Aid for Visually Impaired Using Ultrasonic Sensors Network with Voice Guidance.” 2014.**
Science and technology always try to make human life easier.[2] The people who are having complete blindness or low vision faces many difficulties during their navigation. In this paper, we design and implement a smart cap which helps the blind and the visually impaired people to navigate freely by experiencing their surroundings.
5) **Mahmud, Mohammad Hazzaz Saha, R Islam, Sayemul. (2013). Smart walking stick-an electronic**

approach to assist visually disabled persons. International Journal of Scientific and Engineering Research.
Visually impaired people face lot of difficulties in their daily life. Most of the times they depend on others for help. Several technologies for assistance of visu- ally impaired people have been developed. Among the various technologies being utilized to assist the blind, Computer Vision based solutions are emerging as one of the most promising options due to their affordability and accessibility. The main objective of the proposed system is to create a wearable visual aid for visually impaired people in which speech commands are accepted from the user.

6) **Dambhare, Shruti, and A. Sakhare. "Smart stick for Blind: Obstacle Detection, Artificial vision and Real-time assistance via GPS." 2011.**
This paper presents an effective method of providing dayto-day mobility aid to visually impaired people.[4] An android application named X-EYE using LOOXCIE wearable camera is designed for blind people to navigate safely. Existing navigation aid systems use various hardware components such as sensors that are expensive and cause health hazards. The proposed system presents an economical solution using a wearable camera and a smart phone to provide safe navigation facility to the visually impaired user. X-EYE provides the features of obstacle detection, person recognition, location tracking and sharing, SMS reader, and language translation. Audio messages are specifically generated to provide better usability to the blind/visually impaired user.

III. PROPOSED METHODOLOGY

The proposed system consists of a raspberry pi as a controller which will accept the input from the camera, the image captured from camera will undergo a process, after processing image the program will return the object name or the person name in the form of voice for blind person also an android application will be developed for navigation where it willaccept the input in the form of voice and will guide the blind person in the form of voice about the path and navigation.

The image captured by camera will undergo various processes such as :

1) RGB To Gray Scale Conversion
RGB to gray conversion is done on the progression of images. Now gamma correction is done on each of the captured gray image to achieve image enhancement.
2) Image Enhancement:
The acquired image in RGB is first converted into gray. Now we want to bring our image in contrast to background so that the appropriate threshold level may be selected while binary conversion is carried out. This calls for image enhancement techniques. The objective of enhancement is to process an image so that result is more suitable than the original image for the specific application.
3) Edge Detection:
Edge detection methods locate the pixels in the image that correspond to the edges.Edge detection is a basic tool in image processing, machine vision and computer envisage, particularly in the areas of feature reveal and feature extraction. In our project we use "CANNY EDGE DETECTION TECHNIQUE" because of its var- ious advantages over other edge detection techniques.
4) CANNY EDGE DETECTION:
The Canny Edge Detector is one of the most commonly used image processing tools detecting edges in a very robust manner. It is a multi-step process, which can be implemented on the GPU as a sequence of filters.

A. System Architecture

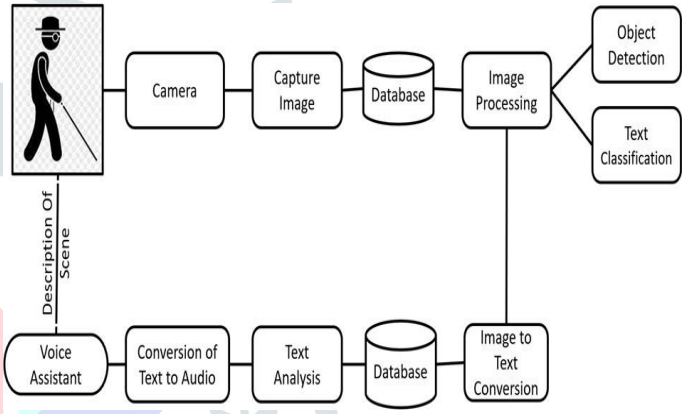

Fig. 1. System Architecture

B. MODULES

1) Image Acquisition
Image is acquired by Camera, The above mentioned process is done on each image.
2) Training Model The model is trained with images so that they are able to recognize objects and faces later.
3) Face and Object Recognition The model is tested to give results for face recognition and Object Recognition.

C. Algorithm

1) CNN Encoder:

- Step 1: Dataset containing images along with reference caption is fed into the system
- Step 2: The convolutional neural network is used a encoder which extracts image features 'f' pixel by pixel.
- Step 3: Matrix factorization is performed on the extracted pixels. The matrix is of m x n.
- Step 4: Max pooling is performed on this matrix where maximum value is selected and again fixed into matrix.
- Step 5: Normalization is performed where the every negative value is converted to zero.

- Step 6: To convert values to zero rectified linear units are used where each value is filtered and negative value is set to zero.
- Step 7: The hidden layers take the input values from the visible layers and assign the weights after calculating maximum probability.

2) YOLO: YOLO object detection stands for "You Only Look Once" object detection, whereas most people misunderstood it as "You Only Live Once". It is a real-time method of localizing and identifying objects up to 155 frames per second. In YOLO, the architecture splits the input image into m x m grid, and then further each grid generates 2 bounding boxes and the class probabilities of those bounding boxes. The main point to be noted here is that the size of the bounding box is larger than the grid size itself.

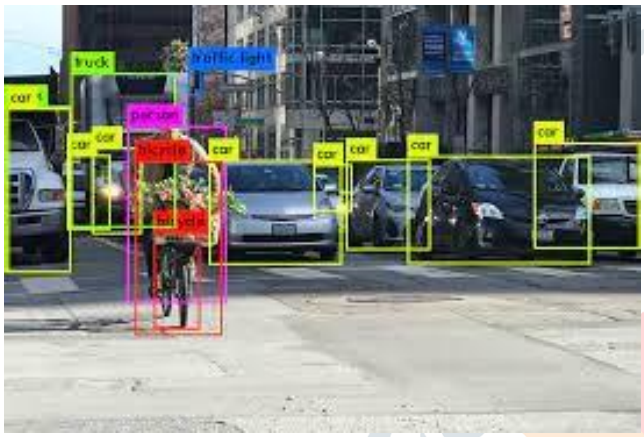

Fig. 2. YOLO

IV. Result & Discussions

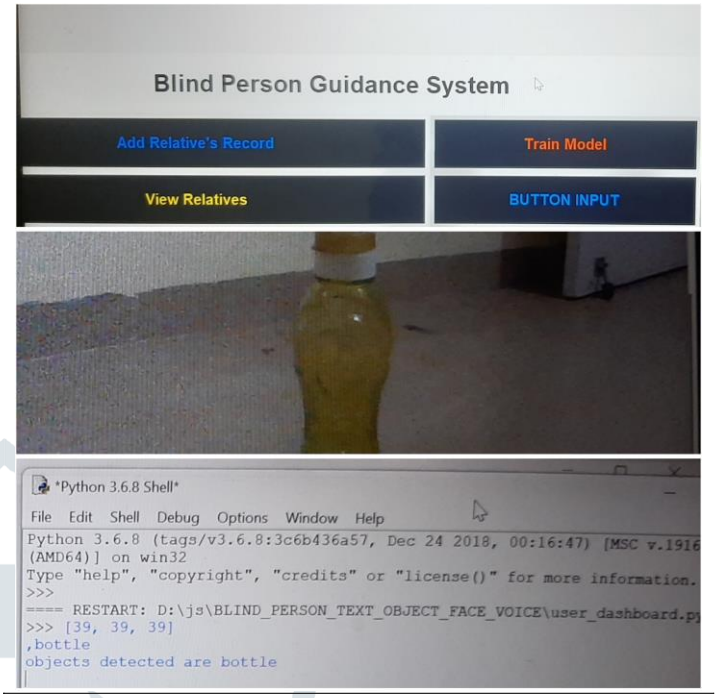

Fig. 3. Object Detection : Bottle

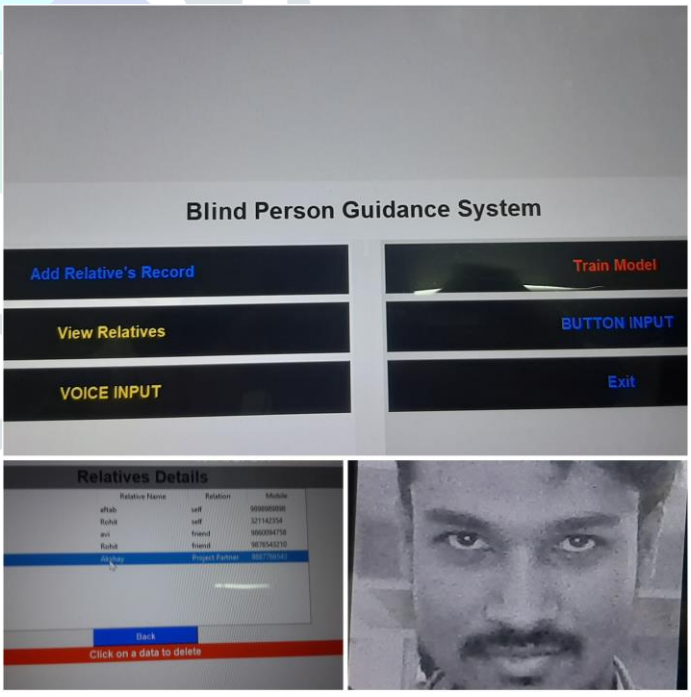

Fig. 4. Face Detection : Aftab

V. Conclusion

Various research studies have investigated the challenges that disabled people, especially those with visual impairment face during and after disasters. Unfortunately, this group of individuals are constantly being excluded from disaster management plans in different countries, and no specific supporting devices or services are provided for them during and after disaster situations. These people have been identifiedas a vulnerable group who may be affected dramatically by disasters. Besides their loss of vision, their challenges also extend to mobility and communication difficulty in disaster scenarios. To address this challenge, this research study has proposed the Smart Cap solution that can be utilized by the visually impaired for normal activities, and especially during disaster situations. This Smart Cap device will provide a real-time navigation and narrative system. The device is cost effective ,which makes it affordable and accessible for the wider community who suffer from this problem. We hope that this proposed Smart Cap can be a step to providing the visually-impaired people with the missing support and services they so desperately need during and after disaster situations. This research work is only a proof-of-work; in our futurework, we hope to make a complete standalone version with additional assistive functionalities for the blind.

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