

Survey on Blind Assist System using ML and Image Processing

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Abstract: *This paper presents a Blind Assist System (BAS) leveraging Machine Learning (ML) and Image Processing (IP) techniques to enhance the autonomy and safety of visually impaired individuals. The system utilizes a convolutional neural network (CNN) to process real-time image inputs from a wearable camera device. Through ML classification, it identifies objects, obstacles, and environmental cues. The IP module further refines data, providing depth perception and spatial awareness. Leveraging ML's adaptability, the system continuously learns and improves its recognition accuracy. Integration with auditory feedback facilitates intuitive interaction, conveying vital information to users. In evaluations, the BAS demonstrates promising results in aiding navigation and increasing users' independence. The fusion of ML and IP offers a robust solution for empowering the visually impaired in navigating complex environments*

Keywords: Blind Assist Systems, Machine Learning, Image Processing, Visual Impairment, Navigation Assistance

I. INTRODUCTION

The significance of eyesight in human perception cannot be overstated, as it enables individuals to comprehend and navigate their surroundings effectively. However, for visually impaired individuals, this fundamental sense is compromised, impeding their ability to experience and interact with the world around them. The International Classification of Diseases 11 (2018) categorizes vision impairment into distance and near presenting vision impairment, highlighting the diverse challenges faced by individuals with visual impairments. Globally, vision impairment is predominantly caused by uncorrected refractive errors, cataracts, age-related macular degeneration, glaucoma, diabetic retinopathy, corneal opacity, trachoma, and eye injuries. These conditions severely limit the ability of visually impaired individuals to navigate, perform daily tasks, and engage with their environment independently. Traditional solutions to address these challenges, such as the Eye-ring project, text recognition systems, hand gestures, and face recognition systems, have been introduced. However, these solutions often suffer from drawbacks such as being heavyweight, expensive, less robust, and low acceptance rates among users. In light of these limitations, there is a pressing need for advanced technologies to assist visually impaired individuals more effectively. To address this need, we propose a novel system that leverages the breakthroughs in image processing and machine learning. This system captures real-time images, preprocesses them to separate background and foreground elements, and applies a Deep Neural Network (DNN) module with a pre-trained YOLO model for feature extraction. The extracted features are then matched with known object features to identify objects present in the scene. Subsequently, the system utilizes text-to-speech conversion to provide auditory feedback, stating the names of recognized objects. This innovative approach aims to enhance the autonomy and quality of life for visually impaired individuals by providing real-time assistance in navigating their surroundings.

II. RELATED WORK

Real-Time Objects Recognition Approach for Assisting Blind People:

In this paper, two cameras placed on blind person's glasses, GPS free service, and ultrasonic sensors are employed to provide information about the surrounding environment. Object detection is used to find objects in the real world such as faces, bicycles, chairs, doors, or tables that are common in the scenes of a blind. Here, GPS service is used to create

groups of objects based on their locations, and the sensor detects an obstacle at a medium to long distance. The descriptor of the Speeded-Up Robust Features (SURF) method is optimized to perform the recognition. The use of two cameras on glasses can be sophisticated.

Wearable Object Detection System for the Blind:

In this paper, the RFID device is designed as a support for the blind for the disclosure of objects; especially, it is developed for searching the medicines in a cabinet at home. This device can provide information about the distance of a defined object, how near or far it is and simplifies the search. For identifying the medicines, the device can provide the user with an acoustic signal to find the desired product as soon as possible.

III. METHODOLOGY

1: Designing and training the neural network to identify objects

A convolution neural network is designed with multiple dense layer, with several activation functions such as relu and sigmoid. This neural network is trained with 1000's of images of objects which are used in day to day life. The images used to train are collected using open source data sets available on the internet. The trained neural network is saved and used to identify object.

2: Object recognition and audio conversion

Live video acquisition using camera is the first step. video will be converted into frames of images which will be used to detect object. The image is then pre processed to achieve required resolution using open cv library. Preprocesses image will be sent to Convolution Neural Network to classify and detect object. The detected object is then announced using speaker.

IV. CONCLUSION

In recent years, some solutions have been devised to help blind or visually impaired in recognizing objects in their environment but they are not efficient. Our purpose is to provide a robust and comfortable system for the blind to recognize their surrounding objects. Our advanced system uses a USB camera to seize real-time images in front of the users. The machine learning and feature extraction technique for image to object detection using pre trained COCO model and in this model we have around 91 different objects trained perfectly and it can be used for detection of objects in real time for blind people, On the other hand we have book reading feature for the blind because for the blind people there are limited books to read because the format of the books are quite different from the usual book so this book reading feature will read the book and make the audio output of the book for the blind person.

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