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Survey Paper on Assistive Device for Blind

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ABSTRACT

Independent travel is a well-known challenge for visually impaired persons. In this paper, we propose a computer vision-based way finding system for assisting the blind people to independently access unfamiliar buildings. In order to find different rooms (i.e. a lab, an office, or a bathroom) and other building amenities (i.e. an exit or an elevator), we incorporate door detection with text recognition [4]. The visually impaired have to be dependent on a lot of people to make their life a bit comfortable while moving from one place to another.

Keywords— Tensorflow, OpenCV, YOLO,COCO.

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I. INTRODUCTION

Efficient and robust indoor object detection can help people with severe vision impairment to independently access unfamiliar indoor environments. While GPS-guided way finding aids show much promise in outdoor environments but there is still a lack of orientation and navigation aids to help people with severe vision impairment to find rooms, doors, elevators, bathrooms, stairs, and other building amenities in unfamiliar indoor environments by their own. Computer vision technology has the potential to assist blind individuals to independently access, understand, and explore such environments. [4]

There are many devices which are useful the blind people to move independently such as cane, electronic aided devices etc. They usually have to rely on someone or the other to do their work.

Computer vision technologies, mainly the deep convolutional neural network, have been rapidly developed in recent years. It is promising to use the state-of-art computer vision techniques to help people with vision loss.[5]

These navigation systems and others rely on machine learning techniques to solve the recognition problems like face, pedestrian and car detection and object detection. They are characterized by their easy operation and accurate performance. Many classification techniques can achieve the goal. It has pros and cons. [9]

II. ELECTRONIC AIDED DEVICES

All the devices, systems, services and appliances that are used by disabled people to help in making their activities easier and in their daily lives and provide a safe mobility are included under one umbrella term: assistive technology. [1]

These devices help the visually impaired people know about its surrounding and help them detect different objects present in the surrounding.

A. Existing System

Moving through an unknown environment becomes a challenge when we can't rely on our own eyes. Since dynamic obstacles produce noise while moving, blind people develop the ability of hearing to localize them. The

common way for navigating of vision less person is using a walking stick cane or walking cane.

B. Proposed System

In order to overcome the above problem, our project abates the disabilities of blindness and to make themselves dependent to an extent by constructing Raspberry pi-based hardware that can help a blind to detect obstacles in front of him/her instantly. This can be achieved by capturing, identifying the surrounding environment and converting it to an audio output.

In the existing world of technology there are many aided devices to help the visually impaired people. But these devices cost a fortune. Our proposed device is being built as a cost effective and easily portable device.

III. TENSOR FLOW AND OPENCV

A. TensorFlow

The TensorFlow API is used in the field of object detection. TensorFlow APIs can be used to detect with bounding boxes, objects in videos and or images using either some of the pre-trained models made available or through models which you can train on your own. TensorFlow, an open source machine library with a branch of machine learning called deep learning. It has led to proficient improvements in many zones mainly image recognition and classification. Deep learning has major importance when working in the field of any texture of images. It is also done by classifiers. Classifiers are a set of codes or modules (Functions). In order to make image recognition and classification at a comparatively easier pace, miscellaneous datasets have been created by the TensorFlow open source environment. Some illustrations include Open image, Coco and Kitti. Here comes in the coco dataset which has a collection of pre-trained detection models.[3]

B. OpenCV

Open Source Computer Vision Library is a machine learning software library and an open source computer vision. It was built to provide a typical infrastructure to accelerate the utilization of machine perception within the commercial products and for computer vision applications. Being a BSD-licensed product, OpenCV makes it simple for businesses to utilize and modify the code.

The library has many optimized algorithms, which includes a set of both classic and state-of-the-art computer vision and machine learning algorithms. These algorithms are used to detect and identify objects, recognize faces, track camera movements, classify human actions in videos, track moving objects, extract 3D models of objects, stitch images together to produce a high resolution image of an entire scene, produce 3D point clouds from stereo cameras, find similar images from an image database, follow eye movements, recognize scenery, etc. The library is used extensively in companies, research groups and by governmental bodies.

It has Python, C++, MATLAB and Java interfaces and supports Linux, Windows, Android and Mac OS. OpenCV leans mostly towards real-time vision applications. OpenCV is written natively in C++ and has a templated interface that works seamlessly with STL containers.

IV. LITERATURE SURVEY

RESEARCH PAPER	TECHNOLOGY	DESCRIPTION	LIMITATIONS
Context-based Indoor Object Detection as an Aid to Blind Persons Accessing Unfamiliar Environments. [4]	OCR (Optical Character Recognition) software. Camera sensor.	A computer vision-based indoor way finding aid to assist blind persons accessing unfamiliar environments by incorporating text information given on the door with door detection.	Only limited for text recognition and suitable for indoor use only.
Smart Navigation System for the Visually Impaired Using TensorFlow. [3]	Convolutional Neural Network model (CNN) developed using TensorFlow, Raspberry Pi-3 Processor.	The project aids the blind people to navigate independently using real time object detection and identification.	The CNN model used is the first CNN model. Better and improved CNN model has been introduced which give a better and faster output.
Let Blind People See: Real-Time Visual Recognition with Results Converted to 3D Audio [5]	YOLO (You Only Look Once) Model. Portable Camera Device.	In this project, video is captured with a portable camera device on the client side, and is streamed to the server for real-time image recognition with existing object detection models.	While detecting objects in cluster YOLO model shows error.
Human and Car Detection System for Blind People. [6]	OpenCV software. Raspberry pi.	In this system the input is given as a 2D image captured by a Raspberry Pi camera and processed by Raspberry Pi 2 model B ARM Cortex-A7 processor which run on an algorithm which is developed in C++ including OpenCV library.	This project is using the older model of Raspberry Pi which has comparatively slower processor than the Raspberry Pi 3B+

V. COCO DATASET

COCO is a large-scale segmentation, object detection and captioning dataset. This version contains images, bounding boxes and labels. Coco 2014 and 2017 versions uses the same images. The test split doesn't have any annotations (only images). Coco defines 92 classes but the data only uses 80 classes. [7] This dataset is better as can detect objects in a cluster which YOLO Model cannot.

VI. FUTURE IMPLEMENTATION

- Upgradation to a night vision camera could help with optimal vision during the night.
- With technology improving every year, the possibilities will keep varying allowing for a number of improvements such as better a newer model of the Raspberry Pi.
- Audio improvements switching from wired connections to wireless solutions could very much be in the works.

VII. CONCLUSION

From the above table we concluded that the OpenCV works best for object detection, also accessing and manipulation of the data could not have been simpler if not for OpenCV and by using TensorFlow as the framework, it furthers the project's objective as it(TensorFlow) allows for better data handling and allows fluid integration with different networks and algorithms.

TensorFlow and OpenCV come with preinstalled libraries. OpenCV and TensorFlow can be programmed using the python language.

Choosing the COCO model is also very straightforward over YOLO as its capabilities regarding multiple object detection are far better than that of the latter.

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[4] Context-based Indoor Object Detection as an Aid to Blind Persons Accessing Unfamiliar Environments. Xiaodong Yang, Yingli Tian Chucai Yi Aries Arditi

[5] Let Blind People See: Real-Time Visual Recognition with Results Converted to 3D Audio Rui (Forest) Jiang Qian Lin Shuhui Qu

[6] Human and Car Detection System for Blind People Ayat Nada, Samia Mashaly, Mahmoud A. Fakhr, Ahmed F. Seddik.

[7] "Microsoft COCO: Common Objects in Context" Tsung-Yi Lin, Michael Maire, Serge Belongie, Lubomir Bourdev, Ross Girshick, James Hays, Pietro Perona, Deva Ramanan, C. Lawrence Zitnick, Piotr Dollar

