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HOUSEHOLD OBJECT FINDER AND LOCALIZER

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Abstract - *The world around us is changing continuously People are becoming more and more busy by a second and losing focus in our daily lives ending up becoming clumsy and lazy that we don't even care about anything except we want everything in apps. Object detection is an important application focused on machine learning technology, which is distinguished by its high capacity for feature learning and representation compared to conventional object detection approaches. Convolutionary Neural Networks (CNNs) for household object finders and localizers are suggested in this study. To help see objects and say the type and position of objects through speech, Raspberry Pi 3 is used to create a wearable device for the elderly.*

Key Words: **CNN, Masking, Computer Vision, Object Detection, Raspberry Pi.**

1. INTRODUCTION

Object detection is important in computer vision systems. It can be used for many applications like video surveillance, medical imaging, and robot navigation. Many algorithms can be used for this task like background subtraction, temporal differencing, optical flow, Kalman filtering, support vector machine, and contour matching. Aside from the said algorithms, the newest method used for object detection is called convolutional neural networks (CNN). Breakthroughs in image classification started when Alex won the 2012 ImageNet competition using deep convolutional neural networks. A deep CNN has been qualified to identify 1.2 million high-resolution images in the ImageNet contest, which has 1,000 categories. They achieved more accurate prediction than the previous state of the art models. From this, many researchers became interested in finding a novel way to develop an efficient deep convolutional neural network.

1.1 Object Detection

The methods of object detection are primarily done by establishing mathematical models based on any previous information prior to the advent of deep learning technologies. At present, Popular classical methods for detecting objects are as follows: Hough transform method, frame-difference method, Context subtraction process of optical flow method, sliding window model method and deformable component model. Due to the close relationship between object detection and video analysis, a lot of research has also been attracted attention in the past two years. Traditional object detection methods rely on shallow trainable architectures and handcrafted features. Their performance effectively stagnates by creating complex sets that integrate numerous low-level image features with high-level meaning from object detectors and scene classifiers. With the exponential growth of deep learning, more efficient techniques capable of learning semantic, high-level, deeper features are being developed to solve the problems that occur in conventional architectures. These models behave differently in the field of network engineering, training strategy, and optimization. Aim of this project is to develop the prototype device that can identify the objects in front of the elderly and also can tell the elderly roughly locations of that objects by using Convolutional Neural Networks (CNNs) and sound generator software.

The CNNs is trained for both classification and localization on specific common household objects such as glasses, folk, spoon, cell phone, etc. Network is trained offline on desktop computer and transferred into Raspberry Pi 3 in order to create wearable device that easy to carry around a house. Webcam and an in-ear headphone are connected to Raspberry Pi 3 to gather picture and deliver the output voice of the locations and kinds of recognized objects. Because of the flexible of the neuron networks, CNNs can be easily implemented and can achieve the good performance even though operates in very limited resources hardware likes in Raspberry Pi platform. CNN (Convolutionary Neural Network) is a deep, feed-forward artificial neural network class that has been utilized to produce an accurate performance in computer vision tasks, such as image classification and detection. CNNs are like traditional neural network, but with deeper layers. It has weights, biases and outputs through a nonlinear activation. The neurons of the CNN are arranged in a volumetric fashion such as, height, width and depth. the CNN architecture, it is composed of convolutional layer, pooling layer and fully connected layer. Convolutional layer and pooling layer are typically alternated and the depth of each filter increases from left to right while the output size (height and width) is decreasing. The fully connected layer is the last stage which is similar to the last layer of the conventional neural networks.

2. LITERATURE SURVEY

Here Yachao Zhang [1] tries to explain the proposed algorithm contains three modules as: synthetic samples generator, object detection network and semantic-relevant

detection, which can realize multiple object detection of indoor scene even in small samples. Experimental results show the proposed method is significantly better than the existing techniques in terms of both subjective and objective. On the other hand, here Ross Girshick and Jian Sun [2] explains the origins and development of Convolutional Neural Networks and the domains in which this technology can be used. It primarily focuses on its use in real-time object detection and region proposal networks. On contrary to those papers above here Peng Zheng and Shou-Tao Xu [3] provide a thorough analysis of deep learning-based object recognition systems dealing with numerous subproblems, such as occlusion, low resolution and clutter, with various degrees of R-CNN modifications.

But in case of object detection techniques Argel A. Bandala [4] explains the object detection capability of the two state of the art models in CNN was successfully demonstrated. It shows that the SSD with MobileNetV1 has high speed detection but low accuracy compared with Faster-RCNN with InceptionV2 that has low speed but more accurate. And here Yunsong Feng, Xing Yang and Chao Zheng [5] firstly, the classical methodologies of object detection are introduced and the interaction and discrepancies in object detection between classic methodologies and deep learning methodologies are addressed. And here Trevor Darrell Jitendra Malik [6] primarily explains the main architecture and working CNN's and the base API that works in the background for making everything work by use of PASCAL VOC dataset. It also thoroughly explains the architecture including input image, extract region proposals, compute CNN features and the classify features. Complex assemblies integrating several low-level image features with high-level background from object detectors and scene classifiers were the highest performing devices

3. METHODOLOGY

This project we will develop using python. First, we will collect the dataset. We will clean the data for making model. Then we are doing pre-processing on the dataset. Using classification algorithm, we will classify the objects. Once we trained classified model then we this model we use for raspberry pi to recognize objects. For capturing the image of object, we will connect the webcam to the Raspberry pi and to showing output as voice also connect sound device like headphone to raspberry pi. - In this project we are classifying the images using region-based convolution neural network and trained a model, and that can be configure to the Raspberry pi. And we will also configure the webcam for capturing the images of object. And finally shows the proposed output to the user.

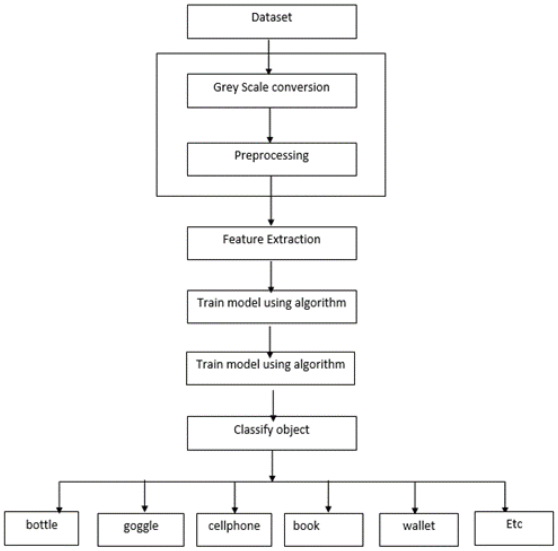

Fig 3.1 : Flowchart of Working Model

Fig 3.2 : Normal Images

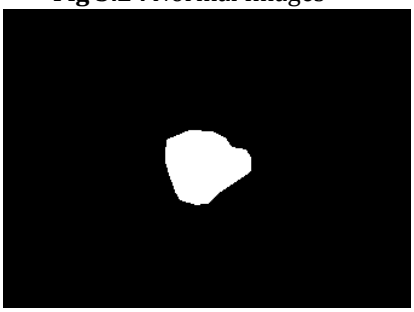

Fig 3.3 : Masked Images

4. EXPERIMENTS

As we know from the existing system, the methods used for object detection are s template matching-based object detector, shallow machine learning-based object detector. This method did not require extensive training data and were widely used years of age. But efficiency and precision were very poor and the not getting performance and also in some methods overfitting problem can be occurred. So, to overcome the problem of precision and efficiency we have come up with this project which uses Convolutional Neural

Networks (CNNs) to roughly locate the object in the particular area. Webcam and sound device will be connected to Raspberry Pi 3 to gather picture and deliver the output voice of the locations and kinds of recognized objects. Because of the flexible of the neuron networks, CNNs can be easily implemented and can achieve the good performance even though operates in very limited resources hardware likes in Raspberry Pi platform.

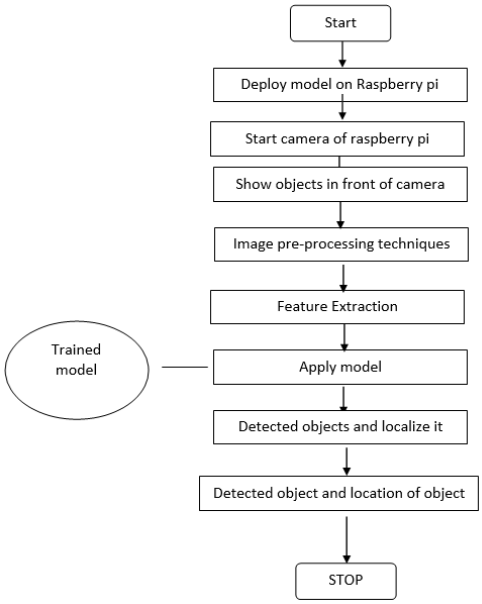

Fig 5.1 : Flowchart from User's Perspective

Images for Reference of an actual working model with website for easy control and detection.

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Training Step: 299  | total loss: 1.01546 | time: 4.751s
| Adam | epoch: 100 | loss: 1.01546 - acc: 0.8346 -- iter: 128/140
Training Step: 300  | total loss: 1.34204 | time: 6.568s
| Adam | epoch: 100 | loss: 1.34204 - acc: 0.7845 | val_loss: 5.43083 - val_acc: 0.1667 -- iter: 140/140
--
INFO:tensorflow:C:\Users\dvkar\CNN-Household-object-detection\Object-detection-0.001-5conv-basic.model is not in all_model_chec
kpoint_paths. Manually adding it.
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Fig 5.2 : Training the Model

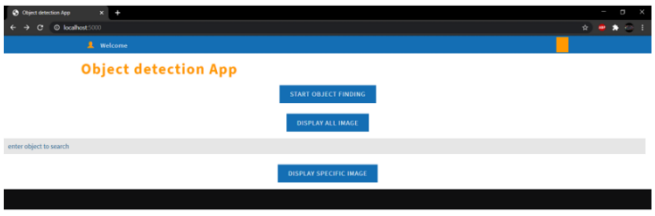

Fig 5.3 : Website Overview for Control

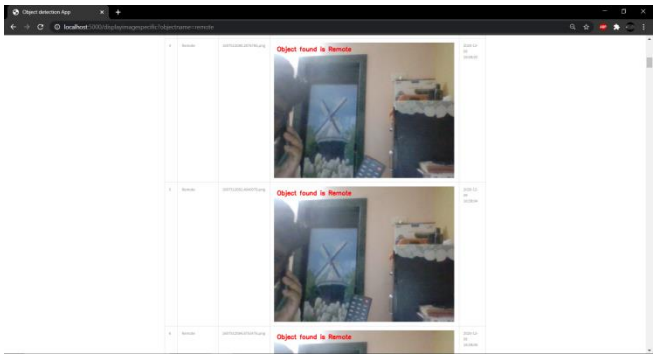

Fig 5.4 : Detected Image Output

5. CONCLUSIONS

Conclusion content comes here. Deep learning-based target recognition has become a study hotspot in recent years owing to its strong learning capability and advantages in coping with occlusion, scale transition, and context switches. In this project we first train the dataset using Convolution neural network for classify the objects on desktop computer and this model in the raspberry pi device. we are making a prototype model for detecting object images captured by webcam which is connected to the raspberry pi and giving the recognized output as a voice. For recognize and classify the objects we used the convolution neural network (CNN). The greater part of the nations is confronting maturing society and it makes numerous issues for both older and other family individuals. Older are compelled to live alone during a day time since different individuals need to work outside. Older have a troublesome chance to help themselves since they can't see things plainly. In this examination, Convolutional Neural Networks (CNNs) for family protests locater and localizer is proposed.

Raspberry Pi 3 is utilized to make a wearable gadget for older to help see items and tell the sort and area of the items by means of voice since it is modest, little, light weight and adequately amazing to run CNNs. Later on, this improvement will be executed in to other ARM stage and more perplexing CNNs will be actualized for additional classes to be grouped, restricted and more yield precision. Bigger battery will be introduced to build gadget usable time. Also, the created CNNs will be sent to other gadget to make more helpful application, for example, a brilliant item finding in-house reconnaissance camera framework. We conclude by noting that it is important that by using a combination of classical tools from computer vision and deep learning area proposals and Convolutionary neural networks, we achieved these results. The two are natural and inevitable allies, rather than competing lines of scientific inquiry. In the near future we plan to use comparable techniques for weakly controlled segmentation of images for future work. Using more efficient matching strategies to allocate weak labels to classification data during preparation, we also expect to boost our detection results. With an immense amount of marked info, computer vision is blessed.

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