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Object Detection Using Machine Learning (Missing Object Alert)

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Abstract - Object detection and tracking could be an immense, vivacious however inconclusive and trending area of computer vision. Due to its immense use in official surveillances, tracking modules applied in security and lots of others applications have made researchers to devise a lotof optimized and specialized methods. For validation purpose live input video will be taken for the same where objects will be getting detected and it can be simulated same for real-time through external hardware added. In the end we see the proper optimized and efficient algorithm for object detection and alert for security. Object Detection is computer visiontechnique used to detect object and identify its localisation. This technique is not only used to identify the location but also to identify which type of object it is. This CV technique is used to detect objects in real time while maintaining the level of accuracy. By bringing some advancement in it, this system can be very helpful for people to keep track of their precious things or devices which are very expensive and need to be protected. Open CV (Open Source Computer Vision Library) is a library of programming functions mainly aimed at real- time computer vision. Open CV features GPU acceleration for real-time operations. This feature helps us to write computationally intensive codes in C/C++ and create a Python wrapper for it so that we can use these wrappers as Python modules.

Keywords - Object Detection; vivacious; YOLOv3;Tensor Flow; Security; Tracking Module

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1. Introduction

Humans can easily detect and identify objects present in an image. The human visual system is fast and accurate and can perform complex tasks like identifying multiple objectsand detect obstacles with little conscious thought. With the availability of large amounts of data, faster GPUs, andbetter algorithms, we can now easily train computers to detect and classify multiple objects within an image with high accuracy. In this , we will explore terms such as objectdetection, object localization, loss function for object detection and localization, and also explore an object detection algorithm known as "You only look once" (YOLO) [1-4].

Effective and reliable geographic point security is extremely necessary these days. Many times individualslose their most vital things and until the time they fight to report a grievance for a similar, time already goes from their hand. What if there's a machine which might facilitateindividuals to stay secure for his or her necessary things and not solely keep secure but additionally if any of the necessary things gets miss from its place it provides alert atthe same time, so the action will be taken presently against the theft? affirmative, it will be finished with the assistance of some tools and a software package cryptography, trough that we will implement a machine which might be used as a security system. Here we tend to square measure making system exploitation some hardware tools and properties from Machine learning Language. However, there square measure several issues with pictures in real- world shooting like tiny object detection,

the accuracy of tiny object detection isn't therefore sensible and these issues have a very important impact on object Detection. So, they are resolved by exploitation YOLOv3 formula here we tend to are exploitation Open CV, Tensor Flow library and YOLOv3 formula and that we are going to be labeling the detected layers with accuracy being checked at a similar time [4-8].

2. Literature Survey

We have carried out a survey of four research papers.

2.1 Object Detection Based on YOLO Network [9]

- Yolo is an algorithm which is used to detect and recognize small objects moreaccurately.
- In comparison to recognition algorithms, a detection algorithm does not only predict class labels but detects locations of objects as well.

2.2 Object Detection and Tracking using Tensor Flow [10]

- Tensor Flow is the library of Python which plays important role in recognizing and detecting an image.
- Tensor Flow is at present the most popular software library. There are several real world applications of deep learning that makes TensorFlow popular. Being an Open-Source library for deep learning and machine learning, TensorFlow findsa role to play in text-based applications, image recognition, voice search, and many more.

2.3 Object Detection Tutorial in Tensor Flow: Real- Time Object Detection [11]

- This system captures images and detects the object continuously in real time.
- Real-time object detection is the task of doing object detection in real-time with fast inference while maintaining a base level of accuracy.

2.4 Object Detection through Modified YOLO Neural Network [12]

- YOLO is an algorithm which is used to detect and recognize small objects accurately and location as well.
- YOLO struggles with small objects. However, with YOLOv3 we see better performance for small objects, and that because of using short cut connections.

3. Methodology

Object detection is a computer technology related to computer vision and image processing that deals with detecting instances of semantic objects of a certainclass(such as humans, buildings, or cars) in digital images and videos.

Object Detection is computer vision technique used to detect object and identify its localisation. The special attribute about object detection is that it identifies the class of object (person, table, chair, etc.) and their location- specific coordinates in the given image. The location is pointed out by drawing a bounding box around the object. The bounding box may or may not accurately locate the position of the object. The ability to locate the object insidean image defines the performance of the algorithm used for detection. Face detection is one of the examples of object detection.

This CV technique is used to detect objects in real time while maintaining the level of accuracy. By bringing some advancement in it, this system can be very helpful for people to keep track of their precious thingsor devices which are very expensive and need to be methods for object detection generally fall into either machine learning based approaches or deep learning basedapproaches.

Here in our project we are using the concept of deep learning based approach via YOLO (You only look once). Starting the concept, first the camera will work as an i/p forthe system, then after taking in the image it will initialize and start capturing device. After capturing the image to window we will apply object detection algorithm to captured image.

Then condition applies if object isn't detected then system will say no object found from specified list, if detected is a yes, then check if found object is available in specified list, if in list then save the list of detected object and compare the saved object list with specified object list, if match found then system will display no object missing and if match not found then system will show missing objects name and give us alert on display and the buzzer will ring. At a time we are showing more then one object on the display.

Figure 1 and Figure 2 shows the labelled images in which each objects is identified and showing the names of images. As we are using the Yolo in which COCO file is available and there are lacs of images of common objects are present. This images matches with the captured image and label them as well as bound the boxes around each image.

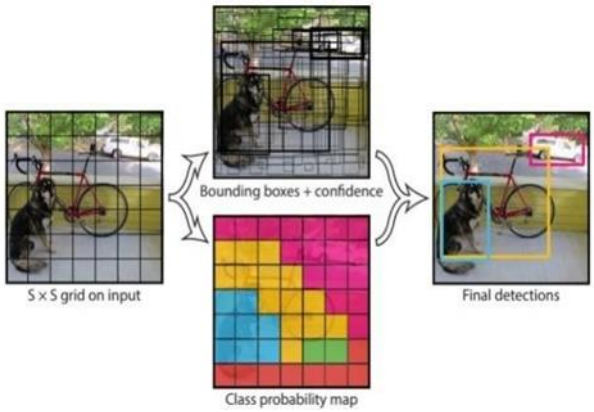

Figure 1. The labelled images in which each objects is identified

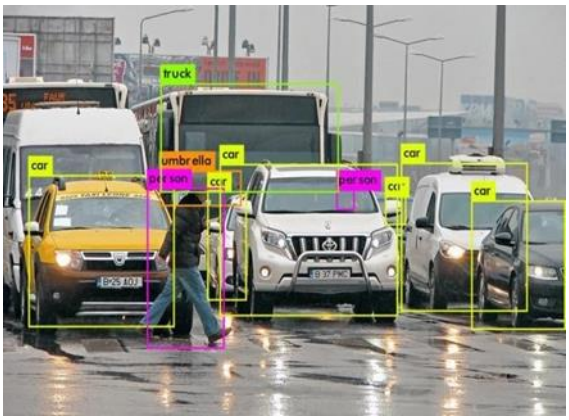

Figure 2 . Image showing the names of images

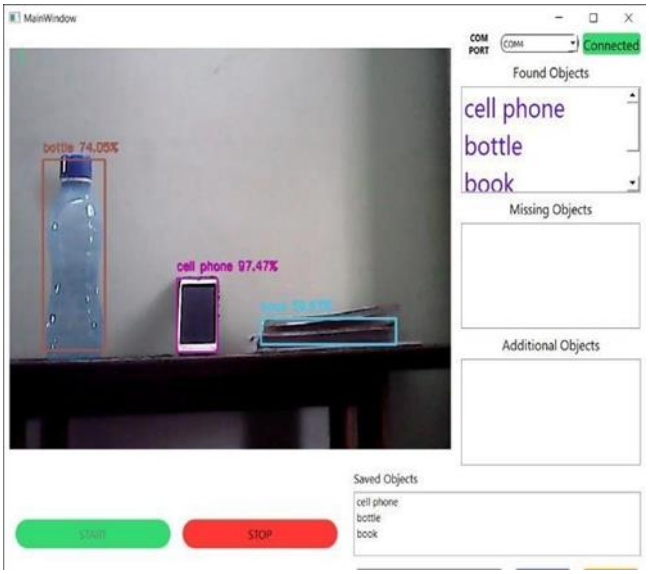

Figure 3. When all objects are present

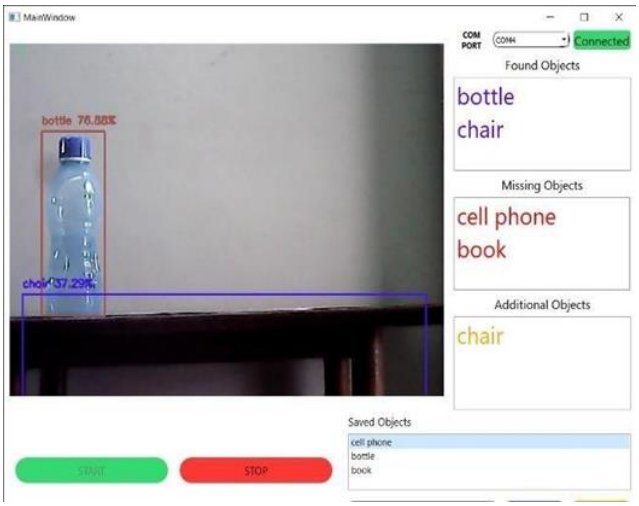

Figure 4. When objects are missing and additional objects areadded.

4. Discussion

The figures above in the result section shows the outputwhen the objects are present in front of the camera and when it is missed from its place. The GUI of the output screen is designed in Qt source objects in front of the camera is being detected, along with that we can see their labels (names), bounding boxes and confidence in %. On the top right corner, we can see the found objects block which shows the detected objects name. The objects which we want to keep in our database are being added in saved objects block. These three objects are being saved in our database.

The two objects are missing and are not in the frame so we can see their names in missing objects block. If the camera detects an object apart from the database the object comes under the additional object list. Here, chair is not in our database so it has been shown in additional objects block.

We can see 20x4 LCD module, the (*) displayed initially on the LCD indicates that LCD is connected to Arduino. Wecan also see the names of two objects which were missing.

5. Conclusion

This thesis report discusses about the most suitable deep- learning models for real-time object detection and recognition and evaluates the performance of these algorithms on the detection and recognition of objects at a scaled site. Object detection is a key ability for most computer vision and security system. YOLOv3 is able to detect 10 times faster than the state-of-the-art methods. Hence YOLOv3 and its variant Tiny-YOLOv3 has been selected for the experimentation. As, we are familiar with object detection, there are many objects to be kept under surveillance so, we bought an advancement in system where we can take sudden action in real-time itself. The performance of our algorithm is good in still images and videos. The accuracy of the proposed model is more than 79.8%. Firstly, the readers of this report can find relevant information regarding Machine Learning, Deep Learning and the working of Neural Networks, which is required to understand and work with several deep-learning models. The readers can also find information about the most suitable deep-learning algorithms for performing real-time object detection and recognition and especially gain deeper understanding of the deep-learning models – YOLOv3, Tiny-YOLOv3. Future research can extend our proposed model by training the datasets for micro-objects.

We have applied the knowledge of science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems. This project also required the basic knowledge of engineering domain. Therefore PO1 is mapped successfully.

We also identified, formulated and reviewed research literature as well as analyzed complex engineering problems reaching validated conclusions using theknowledge of first-principles of engineering sciences, so PO2 is mapped.

We also designed solutions for complex engineering problems and designed systemcomponents that meet the specified needs with appropriate considerations for public health and safety, airline travel, cultural, societal and environmental considerations. Thus PO3 is mapped. Using our research-based knowledge and research methods (including design of experiments, its analysis and interpretation of data, synthesis of the information to provide valid conclusions), we have conduct investigations to provide solutions to complex problems. ThusPO4 is mapped.

We also applied analytical reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice. The project will also help the society to analyzethe daily usage of electricity. Thus PO5 and PO6 is also mapped.

The project work required us to understand the impact of the professional engineering solutions in societal and environmental contexts as well as to demonstrate the knowledge and need for technological & sustainable development. We applied ethical principles & commit toprofessional ethics, responsibilities and norms of the engineering practice. Hence PO7 and PO8 are mapped.

This project helped us inculcate qualities like extensive individual and teamwork management, effective communication, planned project managementskills and its finance, which has taught us so any things that will helps life longs. Therefore PO9, PO10 , PO11& PO12 are successfully mapped.

The design and implementation of this project required the knowledge of Electronics and Telecommunication Engineering that helped us to innovate and develop a modern cost- effective system. We have developed an ability to

design and implement complex systems in areas like signal processing, embedded systems, VLSI and Communication Systems. Hence PSO1 is mapped appropriately.

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