Object Detection using Machine Learning (Missing Object Alert)

Bhagyashri Anchalwar[1], Disha Bhagwat[2], Sakshi Gokhe[3], Shivani Petkar[4]

Utkarsha Warhade[5], Dr.Trupti Nagrare[6]

[1,2,3,4,5] *(Student, Dept. of Electronics & Telecommunication Engineering, SB Jain Institute Of Technology Management & Research, Nagpur, Maharashtra, India)*

[6] *(Assistant Professor, Dept. of Electronics & Telecommunication Engineering, SB Jain Institute Of Technology Management & Research, Nagpur, Maharashtra, India)*

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Abstract

Object Detection is a computer vision technique used to detect an object and identify its localization. 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.

Keywords: Object detection; localization; security; Track.

1. INTRODUCTION

Effective and reliable workplace is extremely necessary these days. Many times individuals lose 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 facilitate individuals 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 at the 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, Open CV, Tensor Flow library and that we are going to be labeling the detected layers with accuracy being checked at a similar time.

1.1 Object Detection

Object detection may be a computer vision technique within which a software package will detect, locate, and trace the thing from a given image or video. The special attribute concerning object detection is that it identifies the category of object (person, table, chair, etc.) and their location-specific coordinates within the given image. The situation is distinguished by drawing a bounding box around the object. The bounding box could or might not accurately find the position of the thing, the power to find the thing within a picture defines the performance of the formula used for detection. Face detection is one of all the samples of object detection.

1.2 Tensor Flow

Tensor Flow permits developers to form a graph of computations to perform, every node within the graph represents a mathematical process and every association represents knowledge. Hence, rather than managing low-details like deciding the correct ways in which to hitch the output of 1 operate to the input of another, the developer will specialize in the general logic of the appliance.

1.3 YOLO

YOLO that stands for "You only look once" may be a single shot detection algorithmic rule that was introduced by Joseph Redmon in 2016, though the name of the algorithmic rule could sound strange, it provides an ideal description of this algorithmic rule because it predicts categories and bounding boxes for the total image in one run of the algorithmic rule.

1.4 Open CV

Open CV (Open sourcecomputer Vision Library) may be a library of programming functions primarily aimed toward period computer vision. Originally developed by Intel, it had been later supported by Willow Garage then (which was later non-heritable by Intel). The library is cross-platform and free to be used beneath the ASCII text file Apache a pair of License. Beginning with 2011, Open CV options GPU acceleration for period operations. This feature helps us to put in writing computationally intensive codes in C/C++ and make a Python wrapper for it so that we will use these wrappers as Python modules. This gives us two advantages: first, our code is as fast as original C/C++ code (since it is the actual C++ code working in background) and second, it is very easy to code in Python. This is how OpenCV-Python works, it is a Python wrapper around original C++ implementation.

2. METHODOLOGY

Here, we are using components like external camera, computer, Arduino controller, buzzer and 20x4 LCD.The camera will capture the images coming in front of it and the detection part is done using coding in the computer/ laptop. The Arduino nano used here is for serial communication between the computer, LCD and buzzer. Buzzer used here gives us the alert of object being missed and to display the names of particular objects missed, we are using LCD.

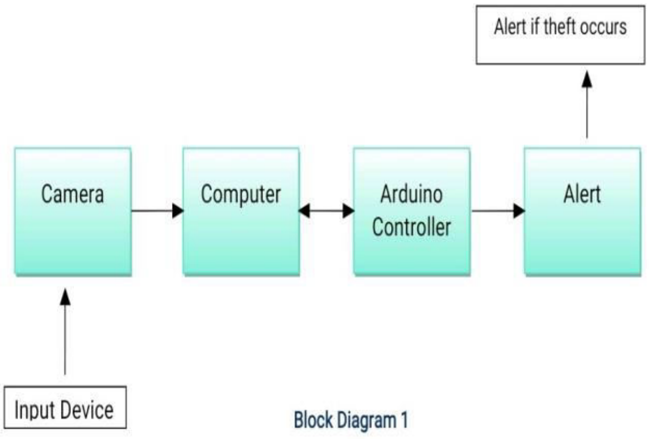


Figure 1: Block Diagram of Object Detection.

Object detection is a computer technology related to computer vision and image processing that deals with detecting instances of semantic objects of a certain class (such as humans, buildings, or cars) in digital images and video methods. Object detection generally fall into either machine learning-based approaches or deep learning-basedapproaches. Here, we are using deep learning based approach via YOLO (You only look once).

Starting the concept, first the camera will work as an i/p for the 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 objectand 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 alert on display and buzzer will ring.

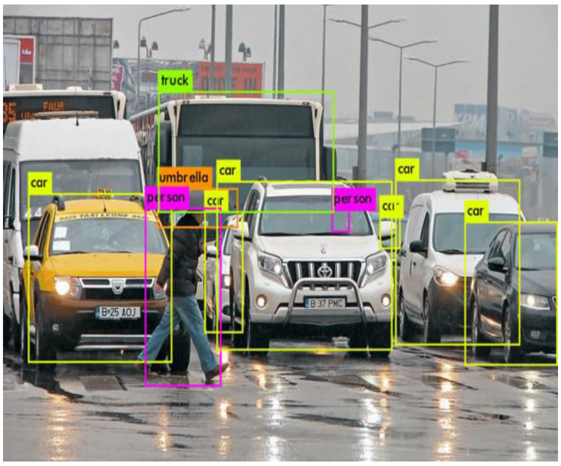
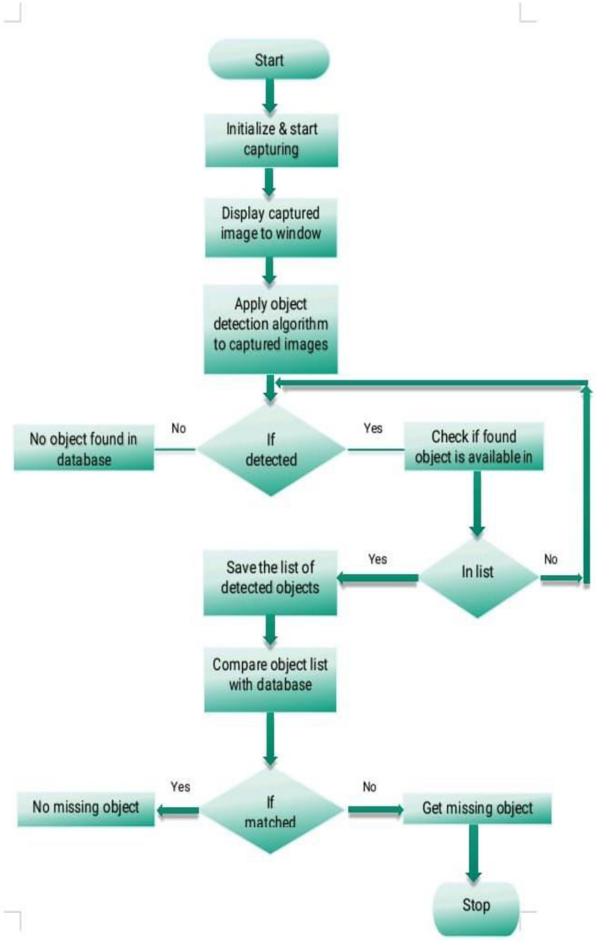


Figure 2: Bounding boxes around objects and labeling them.


Start
Initialize & start capturing
Display captured image to window
Apply object detection algorithm to captured images
No object found in database
No
If detected
Yes
Check if found object is available in
Save the list of detected objects
Yes
In list
No
Compare object list with database
No missing object
Yes
If matched
No
Get missing object
Stop

3. IMPLEMENTATION

The following subsequent specs have been used to build this module:

- Quantum QHM495LM Web Camera interpolated to 2 Megapixels.
- Arduino nano Atmega328P Processor
- Display (20x4 LCD Module)
- Computer / Laptop: Windows 8 i5 8th gen Intel Core Processor (64-bit)

Steps followed:

1. **Import:** Imported required libraries i.e. Open CV, TensorFlow, and Yolo.

2. **Software Program:** Here we are using Python language in Visual Studio.

3. **Algorithm:**

1. The camera will get activated and start capturing things that are placed in front of it and display it to the window.
2. According to our algorithm, if an image is detected then check the found object is available in the specified list.
3. If it's in the list, save the list of detected objects and compare it with the database.
4. If not matched then get a missing object alert using a buzzer.

4. RESULT & DISCUSSION

The following figures show the output when 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.

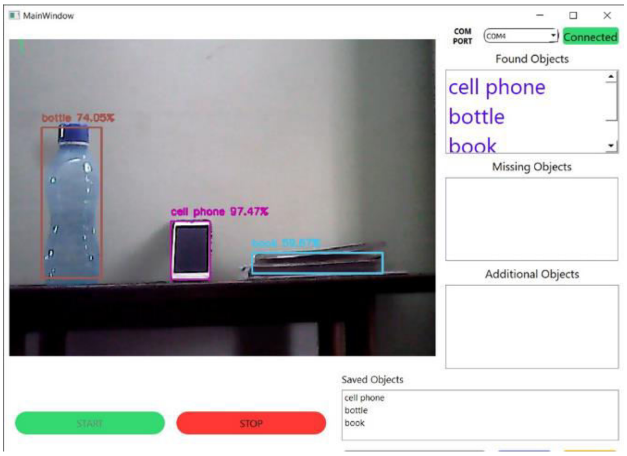
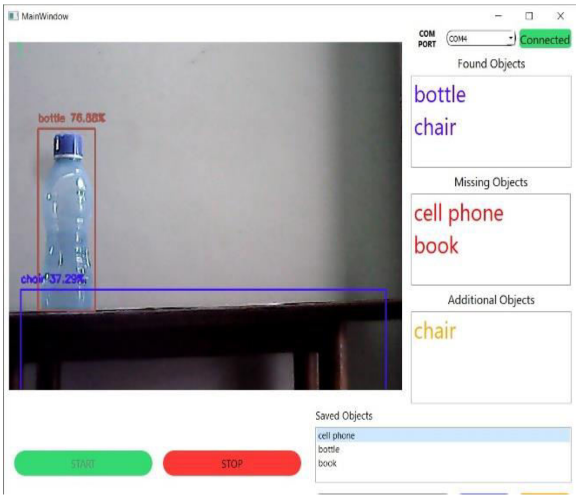


Figure 4: When all objects are present

In figure 4, Object in front of camera is being detected, along with that we can see their labels (names), bounding boxes and confidence (accuracy) 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.



COM PORT: COM4 Connected

Found Objects
bottle
chair

Missing Objects
cell phone
book

Additional Objects
chair

Saved Objects
cell phone
bottle
book

Figure 5: When objects are missing and additional objects are added.

In figure 5, 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.

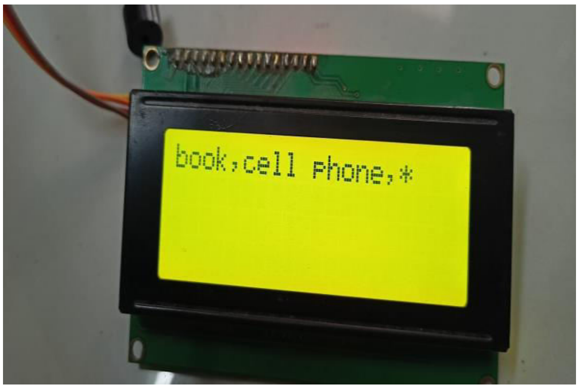


Figure 6: List of missing objects displayed on LCD.

In figure 6, we can see 20x4 LCD module, the (*) displayed initially on the LCD indicates that LCD is connected to Arduino.We can also see the names of particular two objects which were missing.

5. CONCLUSION

Object detection is a key ability for most computer vision and security system. 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%.Such system will be of great use in this fast adaptive technology world.Future research can extend our proposed model by training the datasets for micro-objects.

6. FUTURE SCOPE

Despite fast development and achieved promising progress of object detection, there are several areas that we can add future, the primary one is little(small) object detection like occurring in the COCO palm dataset to enhance localization accuracy on little(small) objects. We can additionally work on the gap traveled by the article so we can track the article. Also, not simply displaying it on the digital display, we can additionally work on period messaging of the article that we'd get notified by message app, etc.

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