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Object Detection with Theft Alert Using Tensorflow and Yolo

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ABSTRACT

Theft is a common criminal activity that is prevailing over the years and is increasing day by day. To tackle this problem many surveillance systems have been introduced in the market. Some are simply based on video surveillance monitored by a human while some are AI-based capable of detecting suspicious activity and raising an alarm. However, none of them are intelligent enough to identify what kind of suspicious activity is being carried out and what kind of protective measures should be taken in real-time. This blog presents the design of an effective surveillance system using machine learning techniques.

Keywords— Machine learning, Image Processing, Yolo, Tensor Flow.

I. INTRODUCTION

Theft is the most common crime committed across the world. According to the National Crime Records Bureau (NCRB), ~80% of the criminal cases are related to theft [1] as shown in figure 1. Increasing theft rates cause people to suffer both financially and emotionally. Therefore, there is a need to develop a more deterrent surveillance system, which is convenient to use, free from false alarms, minimize human interference, and cost-effective.

Machine Learning (ML) techniques prove to be fruitful in developing efficient surveillance systems. This blog aims to design a theft detection and monitoring system, which would be capable to detect theft using a motion-sensing camera using ML and alarm the owner with an alert message along with the captured image of that instance of motion.

The major contributions are:

- To detect and activate motion in the still place according to requirements
- To recognize facial expressions and detect people wearing the mask using the ML model
- To detect the suspiciousness in the surrounding for any kind of weapon and raise alert messages

II. METHODOLOGY

1. 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 for object detection generally fall into either machine learning-based approaches or deep learning based approaches.
2. 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.

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 alert on display and buzzer will ring.

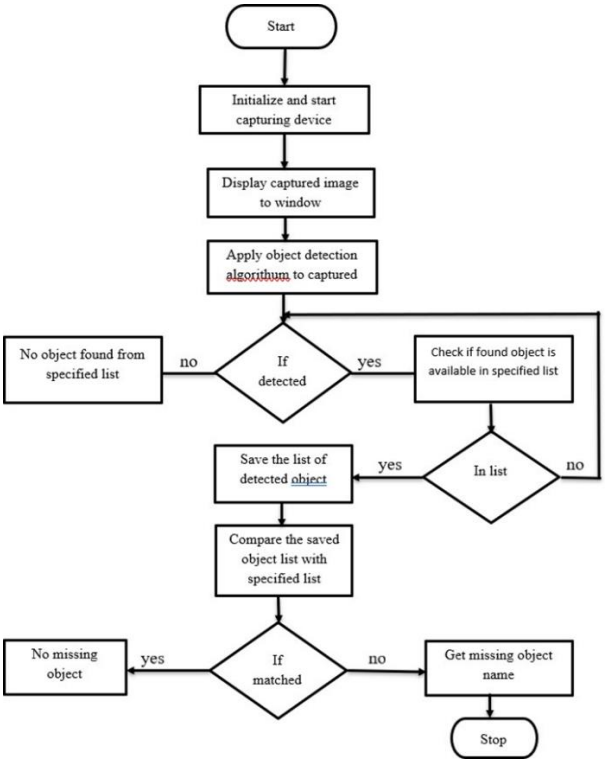


Fig.1 : flow Chart of Methodology

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 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.

III. HARDWARE COMPONENT

1) Ardiuno Nano:

The Arduino Nano is another popular Arduino development board very much similar to the Arduino UNO. They use the same Processor (Atmega328p) and hence they both can share the same program.

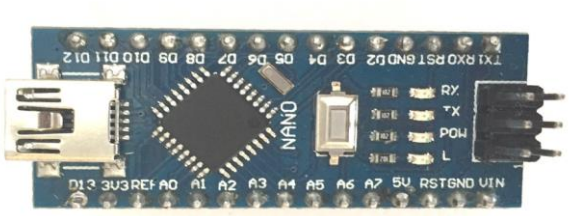


Fig.2 Arduino Nano

There are total 14 digital Pins and 8 Analog pins on your Nano board. The digital pins can be used to interface sensors by using them as input pins or drive loads by using them as output pins. A simple function like pin Mode() and digitalWrite() can be used to control their operation. The operating voltage is 0V and 5V for digital pins. The analog pins can measure analog voltage from 0V to 5V using any of the 8 Analog pins using a simple function like analog Read().

2) Buzzer:

A buzzer is a small yet efficient component to add sound features to our project/system. It is very small and compact 2-pin structure hence can be easily used on breadboard, Perf Board and even on PCBs which makes this a widely used component in most electronic applications.

There are two types of buzzers that are commonly available. The one shown here is a simple buzzer which when powered will make a Continuous Beeeeeeppp.... sound, the other type is called a readymade buzzer which will look bulkier than this

and will produce a Beep. Beep. Beep. Sound due to the internal oscillating circuit present inside it. But, the one shown here is most widely used because it can be customised with help of other circuits to fit easily in our application.

This buzzer can be used by simply powering it using a DC power supply ranging from 4V to 9V. A simple 9V battery can also be used, but it is recommended to use a regulated +5V or +6V DC supply. The buzzer is normally associated with a switching circuit to turn ON or turn OFF the buzzer at required time and require interval.

Fig.4 buzzer

3) Webcam:

A webcam is a video camera that feeds or streams an image or video in real time to or through a computer network, such as the Internet. Webcams are typically small cameras that sit on a desk, attach to a user's monitor, or are built into the hardware. Webcams can be used during a video chat session involving two or more people, with conversations that include live audio and video.

Webcam software enables users to record a video or stream the video on the Internet. As video streaming over the Internet requires much bandwidth, such streams usually use compressed formats. The maximum resolution of a webcam is also lower than most handheld video cameras, as higher resolutions would be reduced during transmission. The lower resolution enables webcams to be relatively inexpensive compared to most video cameras, but the effect is adequate for video chat sessions.

IV. SOFTWARE

1) Tensor Flow

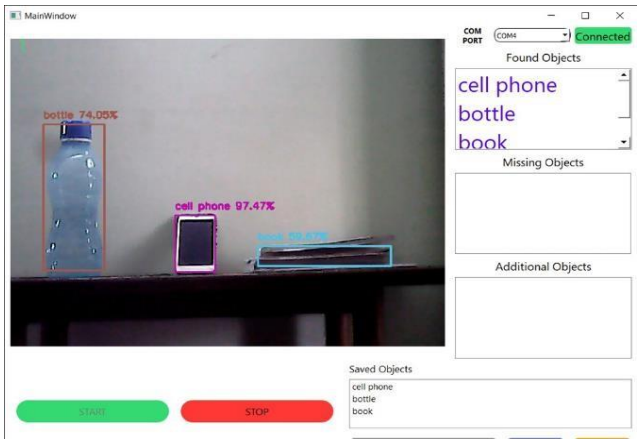
Tensor flow allows developers to create a graph of computations to perform. Each node in the graph represents a mathematical operation and each connection represents data. Hence, instead of dealing with low-details like figuring out proper ways to hitch the output of one function to the input of another, the developer can focus on the overall logic of the application.

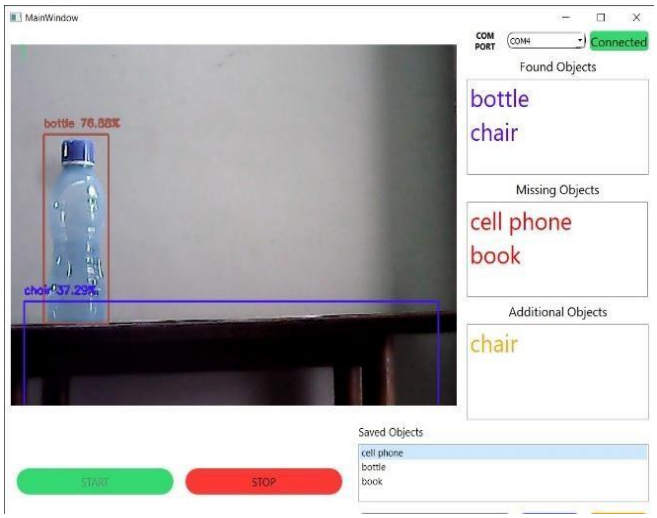
2) YOLO

YOLO which stands for “You only look once” is a single shot detection algorithm which was introduced by Joseph Redmon in May 2016. Although the name of the algorithm may sound strange, it gives a perfect description of this algorithm as it predicts classes and bounding boxes for the whole image in one run of the algorithm.

V. Result

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.





VI. CONCLUSION

In machine learning based theft detection using yolo object detection Designed machine learning based theft detection system that used in various CCTV camera, Surveillance camera for identification of theft. It used in various application for monitoring theft in home, various mall, museum, etc.

In this system we used YOLO (You Only Look Once) Real time object detection system. For object detection once detecting the object we can add importance to that device and if that object is missed we got alert through buzzer also our system tell which object is missed.

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