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OBJECT DETECTION VIA MAXIMALLYSTABLE REGION MOTION AND REPEATABILITY

Arunachalam.G.M
Computer Science and Engineering
Francis Xavier Engineering College
Tirunelveli-Tamil Nadu-India
arunachalamgm.ug19.cs@franci sxavier.ac.in

Kajiesh.V.K
Computer Science and Engineering
Francis Xavier Engineering College
Tirunelveli-Tamil Nadu-India
kajieshvk.ug19.cs@francisxavie r.ac.in

Kathiresan.M
Computer Science and Engineering
Francis Xavier Engineering College
Tirunelveli-Tamil Nadu-India
kathiresanm.ug19.cs@francisxa vier.ac.in

Tino Merlin.R
Assistant Professor / Dep. Of Computer Science and Engineering
Francis Xavier Engineering College
Tirunelveli - Tamil Nadu - India
tinomerlin@francisxavier.ac.in

Dr.R.Ravi
Professor/ Dep. Of Computer Science and Engineering
Francis Xavier Engineering College
Tirunelveli
Tamil Nadu - India
fxhodcse@gmail.com

Abstract

The primary objective of this project is to create a system that can recognize things in still photographs, time-lapse video, or live camera feeds. The system will draw bounding boxes around the observed items. Also, the system will determine which categories the item fits within. Object detection is accomplished using Python and a Convolutional Neural Network trained with the YOLO (You Only Look Once) method from a Machine Learning technique.

Key Words: Machine Learning, Object Detection, YOLO, Bounding Box, Convolutional Neural Network.

I. INTRODUCTION

M. D. Amala Dhaya and R. Ravi (2021) introduced the approach, which eliminates nodes based on the backward trust score after detecting the presence of a botnet. Their suggested algorithm enhances botnet detection performance and lessens the incidence of money laundering [1]. S. Edwin Raja et al. (2019) proposed a novel method for identifying and isolating phishing attacks on websites based on trust. Using a Hidden Markov Model (HMM), the levels of reliability and falsity for these page data are predicted [2]. R.Kabilan, R.Ravi, S. Suhirtha, M. Sankara Gomathi, and S. Sofia (2019) reported that results showed no erroneous object detection in any of the photos

evaluated, perfect tracking for the artificial images, and 98 percent tracked rate on the real images [3]. P. Mano Paul and R. Ravi (2018) suggested that by building probabilistic models on the suspected email, ESHIELD can speed up spam detection. Additionally, it uses similarity tests on the emails to identify spam with greater accuracy and fewer false positives and negatives [4]. According to B. Suvitha and R. Ravi (2021) an automated flaw detection and classification method can guarantee better tile quality during the manufacturing process as well as higher production rates. [5]. P. Mano Paul and R. Ravi (2018) suggested that by building probabilistic models on the suspected email, ESHIELD can speed up spam detection. Additionally, it uses similarity tests on the emails to identify spam with greater accuracy and fewer false positives and negatives [6]. M. Masthan and R. Rav (2016) stated that the xperiments with the KDD Cup 1999 set showed that it achieves over 80% of the average detection rate. The findings section provides more information on additional parametric analyses[7]. S. Devi Rahini, R. Ravi, and Beulah Shekhar (2014) suggested that we investigate using the Support Vector Machines (SVM) method to further increase the accuracy of predicting the number of attackers when the training data are available. To pinpoint the locations of several attackers, an integrated detection and localization system is created [8]. According to J. John Princy and R. Ravi (2016) algorithms are improved by cell region distributions and change in response to local cell properties. It must be categorised and segmented using a bio-driven approach. This approach makes advantage of the high intensity algorithm [9]. J. John Princy, R. Ravi (2016) stated that the Robotized identification using the suggested method would enable quick quantifiable analysis of hESCs using enormous data sets that are anticipated to give it dynamic cell practices [10]. In-depth explanations of the ideas behind the Object Detection using Machine Learning project are provided here.This study falls under the umbrella of Artificial Neural Network's Machine Learning subfield. With the use of Machine Learning principles, a system may learn from its own experiences with little human intervention.

For detection, we use the YOLO (You Only Look Once) method implemented in a Convolutional Neural Network. It is based on an idea from the field of Artificial Neural Networks known as Deep Neural Networks. The artificial neural network is based on the notion of the biological nervous system, in which the "neurons" are the network nodes. Similarly, with an ANN, perceptron's serve as equivalents to the network's nodes. An Input Layer, a Hidden Layer, and an Output Layer make up the three parts of an Artificial Neural Network. Deep Learning is the subset of ANNs that includes numerous Hidden Layers for Feature Extraction and Classification.

When it comes to visual analysis, Deep Learning's Convolutional Neural Network (CNN) is where it's at. The network is built up of four distinct layers: a Convolutional Layer, a Pooling Layer, an Activation Layer, and a Fully Linked Layer. While obtaining Feature Maps, Convolution Layer employs filtering and striding. The matrix that is created after the convolution layer is called Feature Maps. Rectified Linear Unit (ReLU) is a useful simplification that converts negative numbers to zero. The Pooling Layer is then used to further minimize the size of the resulting Feature Map.

As per the figure 1. The Fully Connected Layer is the last stage of a convolutional neural network and is responsible for doing the actual Classification.

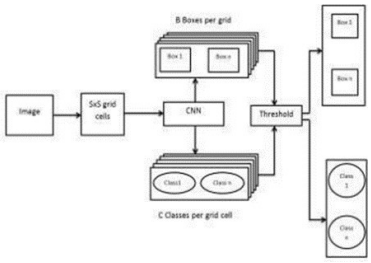

Figure .1

II. PROBLEM STATEMENT

Using the YOLO technique and applying it to both image and video data, the project titled "Object Detection System Using Machine Learning Technology" is able to effectively recognize things.

III. ARCHITECTURE OF THE PROPOSED MODEL

The proposed YOLO model's architecture is seen in the system receives images as input. As video is just a series of pictures, it may be used as input too. Once is a single-pass network that returns results including Bounding Boxes and Labels for objects that have been recognized.

The images are divided into SXS grid cells before sending to the Convolutional Neural Network (CNN). B Bounding boxes per grid are generated around all the detected objects in the image as the result of the Convolutional Neural Network. On the other hand, the Classes to which the objects belong is also classified by the Convolutional Neural Network, giving C Classes per grid. Then a threshold is set to the Object Detection. In this project we have given a Threshold of 0.3.

Lesser the Threshold value, a greater number of bounding boxes will appear in the output resulting in the clumsy output.

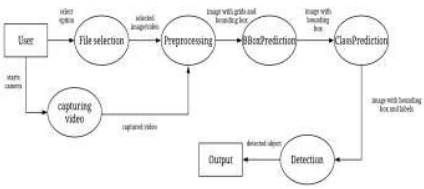

Fig.2.Data Flow Diagram of the System

The information flow in the system is shown in **Fig 2**. In the outset, the User will be presented with a menu of file entry possibilities. As a result, the user may either initiate the camera or choose files. User may choose a Picture File or a Video File in the former, and the Camera module can be activated in the latter. Pre-processing is the step when the SXS grids are generated once the input has been chosen. The grids' output is then sent to the Bounding Box Prediction step, where Bounding Boxes are created around the items that have been identified. Class Prediction then receives the output of the preceding process and predicts the Class to which the item belongs. The data is then delivered to the detection phase, where a Threshold is established to lessen the output's clumsiness from the inclusion of several Bounding Boxes and Labels. The final result for picture and video or camera input is an image or series of images accompanied with Bounding Boxes and Labels.

IV. IMPLEMENTATION

This chapter describes the methodology for implementing this project. Following is the algorithm for detecting the object in the Object Detection System.

Algorithm for Object Detection System

1. The input image is divided into SxS grid
2. For each cell it predicts B bounding boxes Each bounding box contains five elements:
3. (x, y, w, h) and a box confidence score

4. OLO detects one object per grid cell only regardless of the number bounding boxes
5. It predicts C conditional class probabilities
6. If no objects exists then confidence score is zero Else confidence score should be greater or equal to threshold value
7. YOLO then draws bounding box around the detected objects and predicts the class to which the object belongs

V. RESULTS AND ANALYSIS

This chapter describes the results obtained by the System, different Test Cases used while Testing the System. We used pretrained dataset of COCO which had 80 classes. The reason why 80 classes because a greater number of classes resulted in the overfitting of the data. Following section will describe the different Test Cases and the results obtained.This section describes different results obtained by giving various Test Cases described above.The illustrates the output of the Object Detection System. Bounding Boxes are drawn around the Objects detected. illustrates the output obtained when objects are overlapping. This shows that partially visible objects will also be detected by drawing bounding box around it along with the label indicating the class to which it belongs. In thesome people are partially visible in the image of a crowded classroom. The system is able to detect every person visible in the image.

Fig 3.sample output for object detection

The output generated when Video is given as the input is shown in Fig 3. The video that is to be given as input to the system should be in format. illustrates the output when Camera is used to detect the object. Fillillustrates the output generated when a blur image is given as the input. Random bounding boxes are drawn with no detected object. This is one of the drawbacks of the project which given unsuccessful test result.

VI. CONCLUSION

The purpose of this project is to recognize things in images, videos, and cameras in real time. The identified items have bounding boxes drawn around them, and they are labeled with the category to which they belong. In this project, we have relied on CPU to do all of the processing. Doing the project on a GPU-equipped machine will provide quicker results and higher accuracy, two areas where future improvements may be concentrated.

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