Detecting Weapon using Artificial Intelligence and Deep Learning for Security Applications

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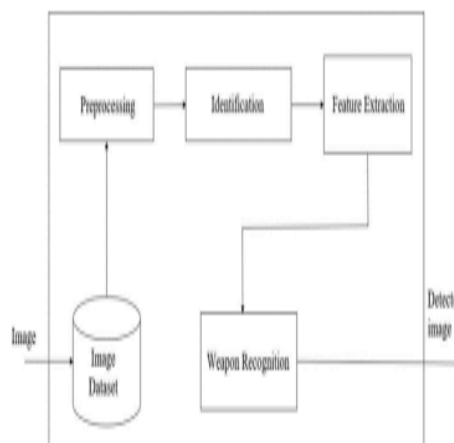Rushikonda Visakhapatnam 530045 Andhra Pradesh, INDIA
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ABSTRACT Security is very often a most important situation in each and every domain, due to an upward push in crime charge in a crowded tournament and suspicious lonely areas. Abnormal detection and monitoring have foremost functions of pc imaginative and prescient to address a variety of problems. Due to extending demand in the protection of safety, security and private properties, needs and deployment of video surveillance structures can understand and interpret the scene and anomaly occasions play an indispensable function in Genius monitoring. This paper implements Gun and knife (or) weapon detection with the use of a Yolo V3 algorithm. Proposed implementation makes use of two sorts of datasets. One dataset, which had pre-labeled images and another one, is a set of images, which had been labelled manually. Results are shown at the end, the algorithm gained accurate accuracy, and however its implementation in actual conditions can be primarily based on the trade-off between speed and accuracy.

1. INTRODUCTION

Weapon or Anomaly detection is the identification of irregular, unexpected, unpredictable, uncommon occasions or items, which is not viewed as a generally happening event and as a result unique from current patterns. An anomaly is a figure that happens in a different way from a set of preferred patterns. Therefore, anomalies rely on the phenomenon of activity [3] [4]. Object detection makes use of feature extraction and gaining knowledge of algorithms or fashions to apprehend situations of quite a number class of objects [6]. Proposed implementation focuses on correct gun and knife detection. Also involved with accuracy, on the grounds that a false alarm may want to end result in damaging responses [11] [12]. Choosing the proper method required to make an acceptable trade-off between accuracy and speed. Figure 1 indicates the methodology of weapons detection the use of deep learning. Frames are extracted from the enter video. Frame differencing algorithm is utilized and bounding container created before the detection of object [7] [8] [14].

Fig 1: System Architecture

2. LITEARTURE SUREVY

2.1 Wei Liu et al., "SSD: Single Shot MultiBox Detector", European Conference on Computer Vision, Volume 169, pp 20-31 Sep. 2017.

Conventionally used cement –a predominant binder additionally a necessitate thing in producing concrete prices first in the building industry. Production of traditional cement requires a larger ability and is power intensive. The utilization of waste substances in the

manufacturing of concrete and discount in cement content material used to be solely the feasible choice in the previous decade. Associated dangers with the manufacturing of Ordinary Portland Cement are properly known. A greener aided with a herbal pleasant declare can be made solely with the utilization of the waste substances and discount in evolving breathing fuel to the atmosphere. Almost all works are carried out the use of supply fabric fly ash, with exceptional mixture and coarse aggregate. Concrete performs a indispensable position in the development enterprise and on the different hand, river sand; one of the integral cloth has end up very highly-priced which is a scarce material. Depletion of sand is a disturbing trouble due to extended utilization of sand in construction. No different substitute substances such as quarry rock dirt are now not centered in casting geopolymer specimens. Even although in some lookup papers the alternative substances are brought solely in partial substitute except aiming on a hundred percent replacement. Many researches basically focal point toward take a look at outcomes of GPC specimens the usage of metal fibers, glass fibers. But the find out about associated to herbal fibers and hybrid fibers are observed scarce. The principal phase of this work aimed at characterizing the engineering energy residences of geopolymer concrete by means of one hundred percent substitute of first-class mixture with quarry rock dust. Hence, aggregate of flyash and quarry rock dirt in GPC have been viewed for evaluating the mechanical homes of geopolymer concrete. Also, investigation focuses on incorporation of three distinct fibers specifically polypropylene fibers(PF), coir fibers(CF) and hybrid fibers(HF) in unique proportion of proportions such as 0.5%,1%,and 1.5% to decide the most energy houses of GPC.

2.2 D. Erhan et al., "Scalable Object Detection Using Deep Neural Networks," IEEE Conference on Computer Vision and Pattern Recognition (CVPR),2014.

Deep convolutional neural networks have these days accomplished ultra-modern overall performance on a quantity of picture awareness benchmarks, consisting of the ImageNet Large-Scale Visual Recognition Challenge (ILSVRC-2012). The triumphing mannequin on the localization sub-task used to be a community that predicts a single bounding field and a self-assurance rating for every object class in the image. Such a mannequin captures the whole-image context round the objects however can't take care of a couple of cases of the identical object in the photograph barring naively replicating the range of outputs for every instance. In this work, we recommend a saliency-inspired neural community mannequin for detection, which predicts a set of class-agnostic bounding packing containers alongside with a single rating for every box, corresponding to its probability of containing any object of interest. The mannequin naturally handles a variable range of situations for every classification and permits for cross-class generalization at the best possible tiers of the network. We are capable to reap aggressive awareness overall performance on VOC2007 and ILSVRC2012, whilst the usage of solely the pinnacle few expected places in every photograph and a small quantity of neural community evaluations. Object detection is one of the vital duties in pc vision.

3.PROPOSED SYSTEM

This paper implements automatic gun (or) weapon detection using a yolo algorithm. Proposed implementation uses two types of datasets. One dataset, which had pre-labelled images and the other one, is a set of images, which were labelled manually. Results are tabulated, both algorithms achieve good accuracy, but their application in real situations can be based on the trade-off between speed and accuracy.
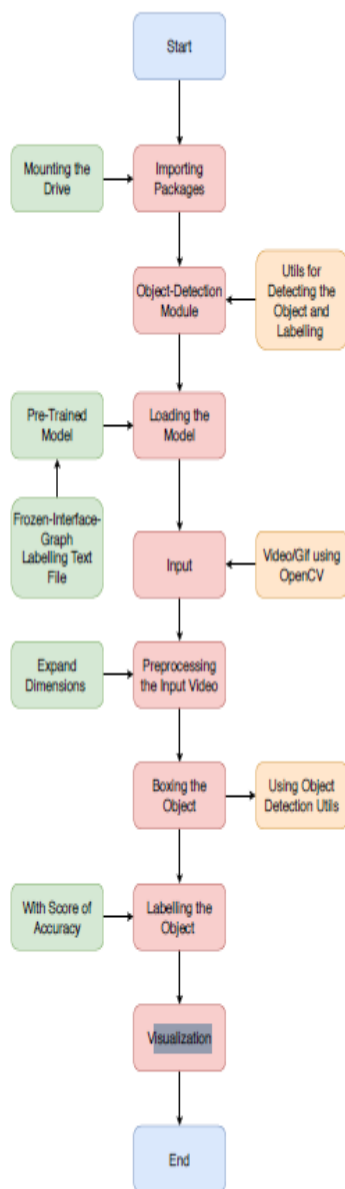
Fig 2: Flow Chart

3.1 YOLOV3

There are essential variations between YOLOv3 and older variations happen in phrases of speed, precision, and specificity of classes. YOLOv2 and YOLOv3 are worlds aside in phrases of accuracy, speed, and architecture. YOLOv2 got here out in 2016, two years earlier than YOLO v3.

The following sections will supply an overview of what's new in YOLOv3.

Speed

YOLOv2 used to be the usage of Darknet-19 as its spine characteristic extractor, whilst YOLOv3 now makes use of Darknet-53. Darknet-53 is a spine additionally made through the YOLO creators Joseph Redmon and Ali Farhadi.

Darknet-53 has fifty three convolutional layers as a substitute of the preceding 19, making it greater effective than Darknet-

19 and greater environment friendly than competing backbones (ResNet-101 or ResNet-152).

Using the chart furnished in the YOLOv3 paper through Redmon and Farhadi, we can see that Darknet-52 is 1.5 instances quicker than ResNet101. The depicted accuracy doesn't entail any trade-off between accuracy and velocity between Darknet backbones both because it is nevertheless as correct as ResNet-152 but two instances faster.

YOLOv3 is speedy and correct in phrases of suggest common precision (mAP) and intersection over union (IOU) values as well. It runs extensively quicker than different detection strategies with same overall performance (hence the title – You solely seem once).

Moreover, you can without difficulty trade-off between velocity and accuracy without a doubt by means of altering the model's size, besides the want for mannequin retraining.
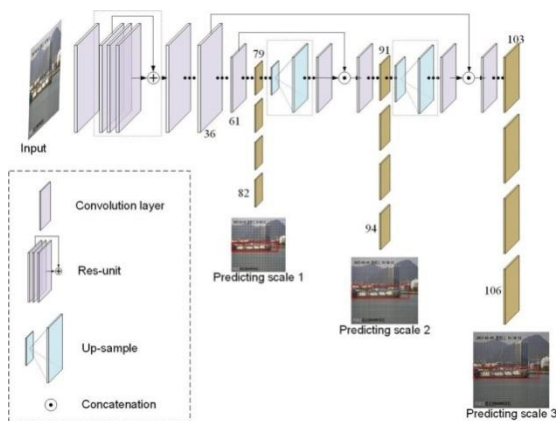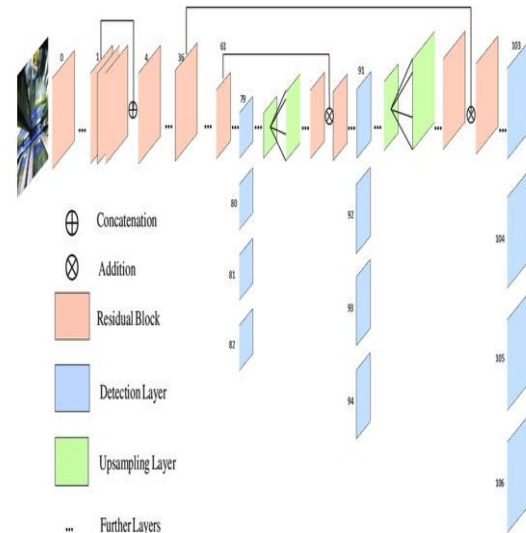
Fig 4: Architecture

3.2   DATASET SPECIFICATIONS

Image specifications
•   System Configuration- Intel i5 7th Generation (4 Cores)
•   Clock Speed- 2.5 GHz
•   GPU- NVIDIA GeForce 820M
•   Input Image Size- 200-300 KB
•   Image Format - .JPG
•   COCO and self-created image dataset
•   Number of classes trained for- 3

Assumptions and Constraints made for implementation

• The gun is in line of sight of camera and fully/partially exposed to the camera.

• There is enough background light to detect the ammunition.

• GPU with high-end computation power was used to remove lag in the ammunition detection.

• This is not a completely automated system. Every gun detection warning will be verified by a person in charge.

Fig 3:Framework

Images are downloaded in bulk using storage.googleapis which can download multiple Google Images at once. Then the downloaded images are labelled. 80% of total images used for training and 20% images for testing. The created

3.3 METHODOLOGY

Object detection is especially associated to pc imaginative and prescient that consists of distinguishing objects in computerized images. Object detection is a area that has benefited immensely from the current developments in the realm of deep learning. YOLO is essentially a pre-trained object detector. It is a CNN model. A CNN is a deep gaining knowledge of algorithm which can take in a uncooked enter picture and assign learnable weights and biases to more than a few aspects/objects in the image. A convolutional layer in CNN mannequin is accountable of extracting the high-level elements such as edges, from the input image. This works by means of making use of kxk filter regarded as kernel many times over uncooked image. These similarly consequences in activation maps or function maps. These function maps are the presence of detected elements from the given input. Thus, the preprocessing required is a great deal decrease as in contrast to different classification algorithms, whereas in preferred approach, filters are hand-engineered and in CNN these are discovered thru a range of iterations and training. Figure three shows a fundamental CNN structure as classification mannequin for 10 special weapons. Subsequently, the subsequent layer is Max-Pooling or Sub sampling layer, which is accountable for decreasing the spatial measurement of the convolved features. This is to minimize the computational energy required to procedure the information via dimensionality reduction. ReLU is a rectified linear unit activation expressed in (1), which is associated to the function of

ammunition dataset was then trained using Yolov3 model and made 2500 iterations/steps on the model to ensure that the loss is less than 0.05 in order to increase the accuracy and precision

non-saturating activation. It eliminates undesirable values from an activation map successfully by way of putting them to nil. Finally, the ultimate layers are entirely linked layers remodeling the records into a 1-dimensional array. To create a specific lengthy function vector, the flattened output is fed to a feedforward neural community and returned propagation is utilized to each and every generation of training. These layers are dependable to examine nonlinear combos of the high-level aspects as represented via the output of the convolutional layer.

3.4 COMPARISION TABLE

SNO	ALGORITHM	ACCURACY
1	SSD	80%
2	YOLOV3	84.6%

4.RESULTS AND DISCUSSION
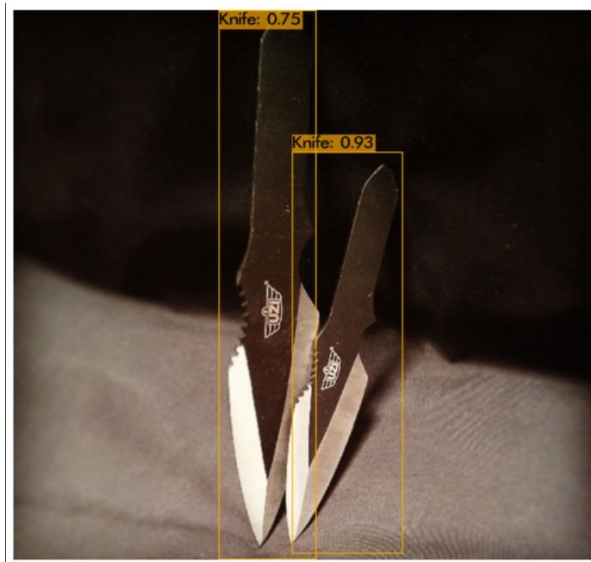
Fig 3:Knife Detected

Fig 4:Knife Detected

Fig 5:Handgun Detected

5.CONCLUSION

Yolo methods are simulated for weapon (gun and knife) detection using pre-labeled and self-created image datasets. Algorithm is efficient and produces decent results, but its use in real time requires a choice between speed and precision. In terms of performance, Yolo V3, provides a speed of 1.606s/frame. In terms of accuracy, Yolo has a higher rate of 84.6 percent.

7. REFERENCES

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