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Target Detection in Military - A Survey

Arav Kavan Lakshmipur[1], Gurukiran P S [2], Akhila C R[3], Prof. Vanishree M L[4]

[1,2,3]*Student, Global Academy of Technology, Bengaluru, Karnataka*
[4]*Assistant Professor, Global Academy of Technology, Bengaluru, Karnataka*

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ABSTRACT:
We aim at designing and developing a prototype system for Military Target Detection using Deep Learning with help of Yolo-G algorithm. We want to improve the performance of military target detection system available in the literature and to precisely detect other objects such as guns, grenades and tankers from the images acquired. We are to develop a user interface to alert the control room about suspicious activities. The present surveillance system used in military is used for video recording and requires a human monitoring all the time. As the number of cameras increases, it becomes difficult to operate and efficiency of humans is reduced. The Proposed work will be used for surveillance, monitoring, classifications of weapons and live tracking. The live videos from surveillance camera are taken by real time image processing techniques for monitoring and detecting the abnormal activities. Operations of proposed project has been divided into three processing modules, first processing module is for object detection using Convolutional Neural Networks and second processing module will handle the classification of weapons, monitoring through ANN techniques. The final processing module will deal with the alarm operations. The CCTV will monitor circular area and it will automatically perform all operations. Shape detection algorithms and object detection algorithms will be tested to find accuracy in detection. The analysis of the processing time before implementing in such environment will be predicted. The results will provide optimal accuracy in matching weapons and object types with name and shape from the given database. The proposed work will drastically reduce the severe consequences and it also provide a higher-level security and helps in alerting the military.

Keywords: Convolutional Neural Network, Artificial Neural Network, Regional Convolutional Neural Network, You Only Look Once, Computer Vision, Closed-Circuit Television Systems

I. INTRODUCTION

The general purpose of the Closed-Circuit Television Systems (CCTV) in present environment is just for recording purpose and does no work or processing of its own. Every CCTV requires a human operator for its maintenance. The task of the CCTV operator is to monitor, control, detect, observe, recognize, identify individuals and situations that are potentially threat to nation [1]. This becomes harder to monitor when there are a lot of CCTV cameras. This leads to either less efficiency of work or more human force wastage.

The images collected under low illumination conditions are prone to problems such as low contrast, blurred details and noise, which lead to the degradation of image quality [3]. The research of low illumination image enhancement algorithm has always been a hot spot in the field of computer vision.

When an individual alone or carries a weapon like guns, grenades, rocket launchers in the open, it is a strong indicator of a potentially dangerous situation [2].In such an event, it is still required to have the operator's attention in order to look into the situation During recent years, an increase in the number of such incidents of trespassing and attacks is seen[4]. A solution to this problem is applying automated image-detecting algorithms, which would substitute the human operator and alert them if a potentially threat situationis at hand artificially. Automated inspection helps to reduce manpower to inspect the public and also can be used in any place.

II. LITERATURE SURVEY

A literature survey is a text of a scholarly paper, which includes the current knowledge including substantive findings, as well as theoretical and methodological contributions to a particular topic. Literature reviews use secondary sources, and do not report new or original experimental work. Most often associated with academic- oriented literature, such as a thesis, dissertation or a peer- reviewed journal article, a

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literature review usually precedes the methodology and results sectional though this is not always the case. Literature reviews are also common in are search proposal or prospectus (the document that is approved before a student formally begins a dissertation or thesis). Its main goals are to situate the current study within the body of literature and to provide context for the reader. Literature reviews are abasis for researching nearly every academic field.

1) Weapon Detection using Artificial Intelligence and Deep Learning for Security Applications
Author: TSS Hashmi, NazeefUlHaq, Muhammad MoazamFraz, Muhammad Shahzad
Year: 2021

Security is often a main concern in each domain, thanks to an increase in rate during a crowded event or suspicious lonely areas. Abnormal detection and watching have major applications of pc vision to tackle numerous issues. thanks to growing demand within the protection of safety, security and private properties, desires and readying of video police investigation systems will acknowledge and interpret the scene and anomaly events play an important role in intelligence watching. This project implements automatic gun (or) weapon detection employing a convolution neural network (CNN) based mostly SSD and quicker RCNN algorithms. projected implementation uses 2 sorts of datasets. One dataset, that had pre-labelled pictures and also the alternative one could be a set of pictures, that were tagged manually. Results area unit tabulated, each algorithms come throughs good accuracy, however their application in real things is supported the trade-off between speed and accuracy.

Methodology used: YOLO (V3 and V4), Faster R-CNN, Pascal-VOC methods have been used.
Advantage:
YOLOV4 performance is superior to YOLOV3.
Disadvantage:
Number of images in Dataset is very small.

2) Automatic Handgun and Knife Detection Algorithms: A Review
Author Ruben J Franklin, Mohana Mohana, VidyashreeDabbagol
Year: 2020

Security is always a main concern in every domain, due to a rise in crime rate in the crowded event or suspicious lonely areas. Due to growing demand in the protection of safety, security and personal properties, the needs and deployment of video surveillance systems can recognize and interpret the scene and anomaly events play a vital role in intelligence monitoring. Anomaly detection is a technique used to distinguish various patterns and identify unusual patterns with a minimal period, this pattern is called outliers. Surveillance videos can capture a variety of realistic anomalies. Anomaly detection in video surveillance involves breaking down the whole process into three layers, which are video labelers, image processing, and activity detection. Hence, anomaly detection in videos for video surveillance application gives assured results in regard to real-time scenarios. In this paper, we anomaly was detected in images and videos with an accuracy of 98.5 %.

Methodology used: Region-Based Convolutional Neural Networks(R-CNN) methods have been used.
Advantage:
Using the R-CNN and IOU function image noise was reduced.
Disadvantage:
Low in NMS results in segments having 80% probability of accuracy.

3) Application of Deep Learning for Weapons Detection in Surveillance Videos.
Author: Hari Surisyad, Wahyano
Year: 2020

Convolutional Neural Network (CNN) is an algorithm that can classify image data with very high accuracy but requires a long training time so that the required resources are quite large. One of the causes of the long training time is the existence of a backpropagation-based classification layer, which uses a slow gradient-based algorithm to perform learning, and all parameters on the network are determined iteratively. This paper proposes a combination of CNN and Extreme Learning Machine (ELM) to overcome these problems. Combination process is carried out using a convolution extraction layer on CNN, which then combines it with the classification layer using the ELM method. ELM method is Single Hidden Layer Feedforward Neural Networks (SLFNs) which was created to overcome traditional CNN's weaknesses, especially in terms of training speed of feedforward neural networks. The combination of CNN and ELM is expected to produce a model that has a faster training time, so that its resource usage can be smaller, but maintaining the accuracy as much as standard CNN.
Methodology used: YOLO (V3 and V4), Faster R-CNN, Pascal-VOC methods have been used.

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Advantage:
YOLOV4 performance is superior to YOLOV3
Disadvantage:
Number of images in Dataset is very small.

III. SYSTEM ARCHITECTURE

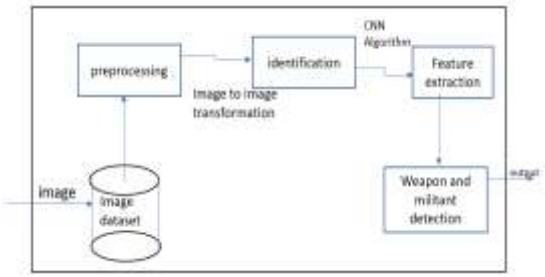

Fig1: System Architecture

The system architecture shows the Military target detection in 5 different steps or phases. The system takes an image as input and does preprocessing like image enhancement. Then it will identify the region of interest then the feature extraction occurs through CNN. It later gives the result and warns the user through alerts on object being successfully detected.

DataFlowDiagram–Level0

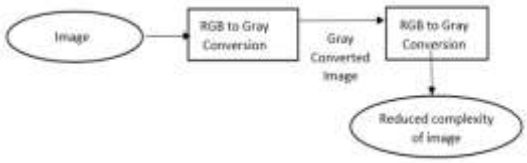

Fig 2: DFD level 0

It shows that the color RGB image is converted into gray scale values to reduce complexity in the image. For efficient feature extraction gray scale values are converted into binary values.

DataFlowDiagram–Level1

It shows that the image with reduced complexity is given as input. The region with the value of one is considered as black that region is considered for next process.

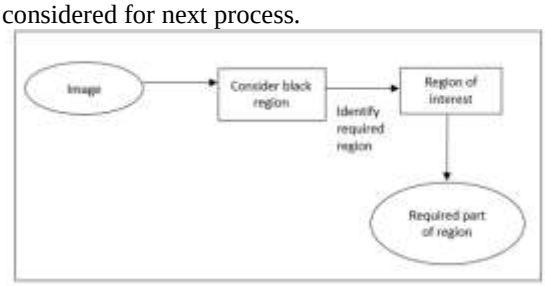

Fig3: DFD level 1

DataFlowDiagram–Level2

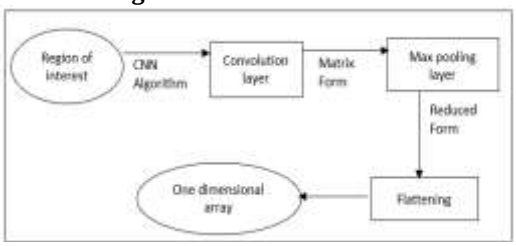

Fig4: DFD level 2

The region of interest is obtained from converting RGB color image to the gray scale image by using minmax scalar method. CNN algorithm is applied here which consists of an input layer, an output layer and hidden layers (convolution layer, pooling layer, flattening layer).

DataFlowDiagram–Level3

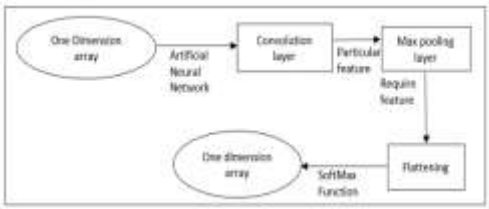

Fig 5: DFD level 3

Artificial neural network method is applied to this layer. particular features are identified by the hidden layer of ANN. By considering all the features, output layer gives the result using SoftMax function. it gives predictive values Based on which the final result will be identified. The highest value of prediction is identified as weapon and militant.

IV. KEY CHARACTERISTICS OF DEEP LEARNING

Deep Learning is a subset of Artificial intelligence and Machine Learning. It is part of a broader family of machine learning methods based on ANN with representation learning. The present surveillance system in military is used for video recording and requires a human monitoring. As the number of cameras increases, it becomes difficult to operate and efficiency of humans is reduced. The System is used to detect and identify Military threats through CCTV visuals using various object and shape detection algorithm. It later uses automated bots to alert the user.

IV. CONCLUSION

This project aims to provide a solution to the problem and with satisfactoryresults of the project. The pre-processing steps will reduce the

amount of data input during the classification which have been proven to be useful. The development of these subsystems will accomplish the objective of using only the significant data that is the pixels with its intensity around the regions that might be weapon and militants. The data augmentation process will work efficiently. The processes of rotation and translation of the images will allow them to obtain many examples of weapons and militants to train the CNN to learn from them. The image dataset will have been labelled manually using YOLOv5 for image detection. An automated bot will send alerts effectively on detection. In this report we have diagrammatically explained the whole idea our project as data flow diagrams, sequence diagram, activity diagram and also mentioned method and the languages which we are using to build this project.

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