VISVESVARAYA TECHNOLOGICAL UNIVERSITY

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A Project Phase – 1 Report

on

"MILITANT INTRUSION DETECTION USING MACHINE LEARNING"

Submitted in the partial fulfillment of the requirements for the award of the Degree of

Bachelor of Engineering

in

Computer Science and Engineering

submitted by

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CERTIFICATE

This is to certify that the project Phase-I entitled **" MILITANT INTRUSION DETECTION USING MACHINE LEARNING"** is carried out by **Supritha B R [1DB19CS147], Sushma Patil [1DB19CS149], Srujana M R [1DB19CS143] and Sushmitha S [1DB19CS150]** are bonafide students of **Don Bosco Institute of Technology, Bangalore** in partial fulfillment for the award of the degree of **Bachelor of Engineering in Computer science and Engineering** of **Visvesvaraya Technological University, Belagavi** during the academic year **2022-23**. The project Phase-I report has been approved as it satisfies the academic requirements in respect of the Project Phase-I prescribed for the Bachelor of Engineering Degree.

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DECLARATION

We, **Supritha B R [1DB19CS147], Sushma Patil [1DB19CS149], Srujana M R [1DB19CS143] and Sushmitha S [1DB19CS150]** students of seventh semester B.E, at the department of Computer Science and Engineering, Don Bosco Institute of Technology, Bengaluru declare that the project phase-I entitled "**MILITANT INTRUSION DETECTION USING MACHINE LEARNING**" has been carried out by us and submitted in partial fulfillment of the course requirements for the award of degree of Bachelor of Engineering in Computer Science and Engineering discipline of Visvesvaraya Technological University, Belagavi during the academic year **2022-23**. The matter embodied in this report has not been submitted to any other university or institution for the award of any other degree.

Place: Bangalore

Date:09-01-2023

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ABSTRACT

In today's digital world counter-terrorism is considered as the highest priority in defense departments. This model has the ability to recognize or detect the weapons, militants, intruders, tankers, etc. This is an essential model which is trained based on military resources, which will be helpful for counter-terrorist to be updated by the followed queries. We realized automatic detection of military targets in complex environment through deep learning.

The Proposed work is being used for surveillance, monitoring, and classifications of weapons, live tracking, and many more purposes. In this work, live surveillance videos are taken for monitoring and detecting abnormal events based on real-time image processing techniques. Shape detection algorithms and object detection algorithms have been tested to find accuracy in detection and analysis. The proposed work drastically reduces the crime rate and it also provides higher-level security in certain areas and it will reduce the time required to catch criminals.

Operations of the proposed project have three processing modules:

- The first processing module is for object detection using Convolutional Neural Networks(CNN).
- The second processing module will handle the classification of weapons.
- Monitoring and alarm operations will be carried out by the third processing module.

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“ MILITANT INTRUSION DETECTION USING MACHINE LEARNING ”

CHAPTER 1

INTRODUCTION

Over time and space, technology is widely spreading across the world. It is used to facilitate our living skills in our daily life. Technology has been around surveillance systems for decades. In recent years, video-surveillance systems become a main interest in people's life such as government agencies, business, and private possessions. Nowadays, people seek for better image quality, less in cost, better in size and scalability. For safety issues, cameras can monitor real-time occurrences, collect data, and come out with analyzing the behavior of people. Monitoring is often performed through consecutive frames which are extracted from the video.

Deep learning is an AI function that mimics the workings of the human brain in processing data for use in detecting objects, recognizing speech, translating languages, and making decisions. The process of learning begins with observations or data, such as examples, direct experience, or instruction, in order to look for patterns in data and make better decisions in the future based on the examples that we provide. The primary aim is to allow the computers to learn automatically without human intervention or assistance and adjust actions accordingly.

Closed circuit television systems (CCTV) are becoming more and more popular and are being deployed in many offices, housing estates and in most public spaces. There are a million of CCTV cameras that are currently in operation in India. This makes for an enormous load for the CCTV operators, as the number of cameras views a single operator can monitor is limited by human factors. The task of the CCTV operator is to monitor and control, detect, observe, recognize and identify individuals and situations that are potentially harmful to other people and property but it becomes harder to monitor when there are a lot of CCTV cameras.

When an individual carries a weapon (firearm or a knife) out in the open, it is a strong indicator of a potentially dangerous situation. While some countries allow for open carry firearms, in such an event, it is still advisable to grab the CCTV operators' attention in order to assess the situation at hand. During recent years, an increase in the number of incidents with the use of dangerous Automated methods for video surveillance have started to emerge in recent years, mainly for the purpose of intelligent transportation systems (ITS).

we have focused on the specific task of automated detection and recognition of dangerous situations applicable in general for any CCTV system. The problem we are tackling is the automated detection of dangerous weapons—knives and firearms, the most frequently used and deadly weapons. The appearance of such objects held in a hand is an example of a sign of danger to which the human operator must be alerted.

Public safety is a major concern in today's modern society. Modern weapons and military and firearms pose serious threats to the safety and security of everyday people, and recent events and Media coverage have only further publicized the inherent dangers that one may face in even the most public places. It is hoped that through the vigilance of the common citizen and the swift response of the authorities, violent perpetrators who threaten others with dangerous weapons and military can be quickly and reliably apprehended and fatalities prevented. But oftentimes, when threatened with the very real danger of a live firearm, people panic, and their justified self-preservation may prevent the proper authorities from being notified, causing small but noticeable delays in police response time at best and resulting in the loss of lives from failure to respond at worst.

A solution to the problem of overloading the human operator is to apply automated image understanding algorithms, which, rather than substituting the human operator, alert them if a potentially dangerous situation is at hand.

CHAPTER 2
LITERATURE SURVEY

IN [1] : RUBEN J FRANKLIN, MOHANA AND VIDYASHREE DABBAGOL, (Members, IEEE) "Anomaly Detection in Videos for Video Surveillance Applications using Neural Networks", publication is on Proceedings of the Fourth International Conference on Inventive Systems and Control (ICISC 2020) IEEE. 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 regards to real-time scenarios.

IN [2] : ANDRZEJ GLOWACZ, MARCIN KMIEC AND ANDRZEJ DZIECH, (Members, IEEE) "Visual detection of knives in security applications using Active Appearance Models", publication is on Springer. This paper presents a novel application of Active Appearance Models to detecting knives in images. In contrast to its popular applications in face segmentation and medical image analysis, we not only use this computer vision algorithm to locate an object that is known to exist in an analyzed image, but–using an interest point typical of knives–also try to identify whether or not a knife exists in the image in question. We propose an entire detection scheme and examine its performance on a sample test set. The work presented in this paper aims to create a robust visual knife-detector to be used in security applications.

IN [3] : NAMAN JAIN, SHREESHA YERRAGOLLA, TANUJA GUHA AND MOHANA (Members, IEEE) "Performance Analysis of Object Detection and Tracking Algorithms for Traffic Surveillance Applications using Neural Networks", publication is on proceedings of the Third International Conference on I-SMAC (IoT in Social, Mobile, Analytics, and Cloud) (I-SMAC 2019) IEEE. It consists of 80 classes out of which five classes have been considered for this project which are: car, bus, truck, motorcycle, and train. Using the Multiple Object Detection concepts, tracking of vehicles was further implemented. The first frame of the video was taken and Multiple object detection was performed in the further frames of the video, the object was tracked using its centroid position. This has been developed using OpenCV and Python using the YOLOv3 algorithm for the object detection phase.

IN [4] : DUMITRU ERHAN, CHRISTIAN SZEGEDY, ALEXANDER TOSHEV AND DRAGOMIR ANGUELOV (Member, IEEE) “Scalable Object Detection using Deep Neural Networks”, publication is on IEEE Conference on Computer Vision and Pattern Recognition. In this work, we propose a saliency-inspired neural network model for detection, which predicts a set of class-agnostic bounding boxes along with a single score for each box, corresponding to its likelihood of containing any object of interest. The model naturally handles a variable number of instances for each class and allows for cross-class generalization at the highest levels of the network.

CHAPTER 3

SYSTEM DESIGN

CHAPTER 3.1

OVERVIEW

Systems design is the process of defining the architecture, modules, interfaces and data for a system to satisfy specified requirements. Systems design could be seen as the application of systems theory to product development. There is some overlap with the disciplines of systems analysis, systems architecture and systems engineering. If the broader topic of product development "blends the perspective of marketing, design, and manufacturing into a single approach to product development," then design is the act of taking the marketing information and creating the design of the product to be manufactured. System design is the phase that bridges the gap between problem domain and the existing system in a manageable way. This phase focuses on the solution domain, i.e. ―how to implement? It is the phase where the SRS document is converted into a format that can be implemented and decides how the system will operate. In this phase, the complex activity of system development is divided into several smaller sub-activities, which coordinate with each other to achieve the main objective of system development.

CHAPTER 3.2

EXISTING SYSTEM

The existing systems does not classify normal and abnormal events leading the police to become more reluctant to attend the crime scenes unless there was a visual verification, either by manned patrols or by electronic images from the surveillance camera.

The system is done with the image classification model using CNN with the concept of sequential models and YOLOv3 model in the darknet framework.

DRAWBACKS :

- The processing speed of the existing system and accuracy will be low.
- Running under the darknet framework which is made by C language.
- Background junk detections were high.

CHAPTER 3.3

PROPOSED SYSTEM

The main purpose of this system is to find the Intrusion of the Militant and Weapon on Surveillance area by using YOLOV5 model. The YOLOV5 model takes in an input image of size 418×418(×3 color channels), and applies a convolution of size 3×3(with 64 kernels/output channels) with a stride of 1and a padding of 1. The model extracts the learning features and classify the Detections in live video as militant or any other weapon classification. If any anomaly object detected then the system will send the alert feed to the Respective admin of force.

CHAPTER 3.4

SOFTWARE AND HARDWARE REQUIREMENTS

SOFTWARE REQUIREMENTS :

- **Operating System**: Windows 10
- **Coding Language**: Python
- **Library**: Open CV
- NVIDIA GPU's
- Google colab

HARDWARE REQUIREMENTS :

- **Processor**: Intel Core i5 and more.
- **Hard Disk**: 500 GB.
- **Monitor**: 15 VGA Color.
- **RAM**: 4GB / 8 GB.
- HD Camera

CHAPTER 3.5

OBJECTIVES

- Aim of the project is to implement the detection of intruders, guns, grenades, tankers, and militants using a YOLO(You Only Look Once) algorithm which is the base of CNN layers(Convolutional Neural network).
- It detects the guns, grenade and tankers.
- Once the system detects the objects the detection details are stored & it will wait for speech recognition questions.
- Gives back the answer with the voice output.

CHAPTER 3.6

PROBLEM STATEMENT

In this project, we are going to develop a vision-based detection system that detects militant activities in surveillance areas with region based. For this purpose, we have employed deep learning in order to meet the requirements.

CHAPTER 3.7

SYSTEM ARCHITECTURE

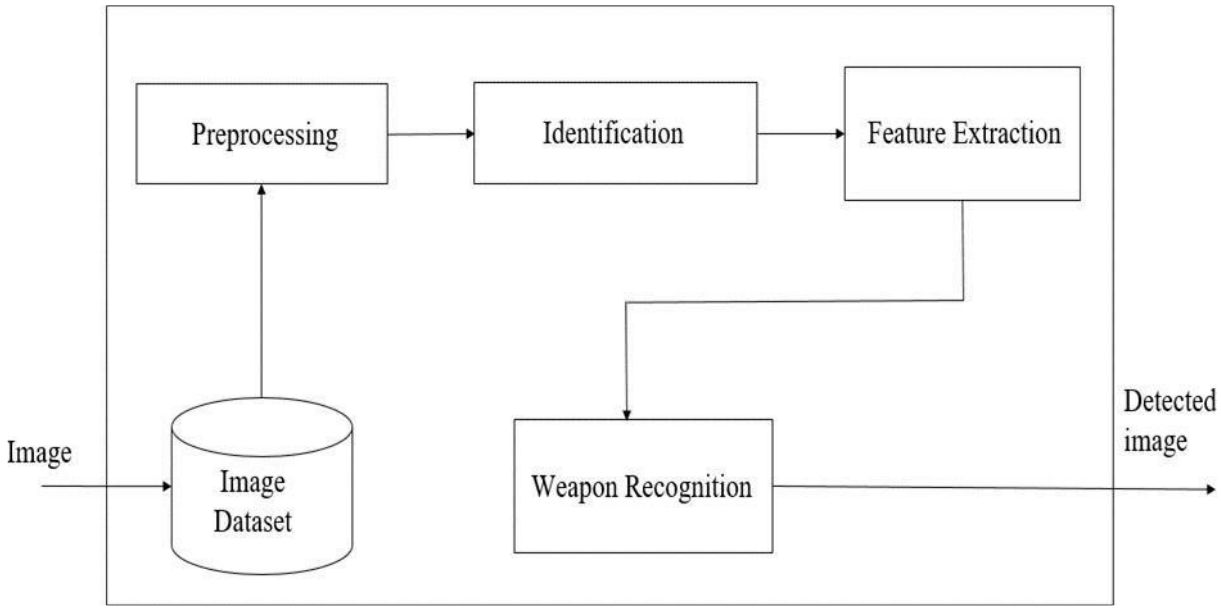

FIG.3.7.1: Block diagram for Weapon Detection

Image Processing: Image processing is a mechanism that focuses on the manipulation of images in different ways in order to enhance the image quality. Images are taken as the input and output for image processing techniques. It is the analysis of image to image transformation which is used for the enhancement of image.

Identification: In this stage identify the region which needs to proceed for further process, it is involved in the identification of the particular region of the image that is used for the further process like feature extraction and classification of the images. The output of the pre-processing step is given as the input for the identification process. This process is based on the binary values obtained in the pre-processing step. The region with black is considered a region of interest. The region of interest obtained by the pre-processing of the images. That region is considered as proceeding part of the image from which weapon and militant will be identified. The identified weapon and militant images are given to the feature extraction process.

Feature Extraction: In this stage extract the required feature from the identified region which is obtained from the previous step. That region is compressed by converting a reduced size matrix to control over fitting. The reduction of the matrix size helps in reducing the memory size of the images. Then the flattening process is applied to the reduced matrix, in which the reduced matrix is converted to a one-dimension array, which is used for final detection.

Weapon Recognition: In this stage one-dimension array is used for the final classification process. The output image obtained from feature extraction is given as input to this process. Where continuous classification of all the features obtained from the previous stage.

Artificial neural networks are applied in this process.

Each node of the input layer has a value from a one-dimension array which represents the feature from the extracted region.

That is sent to the hidden layer. Multiple features are getting from the input layer and undergo multiple iteration in the hidden layer.

Finally get the predictive values by applying SoftMax activation function to it. Finally, get some output values from this process and these values undergo further process.

The highest value in the predictive value is considered as output identified as weapon and militant. By using these methods, the weapon and militant will be detected by considering highest accuracy values.

CHAPTER 3.8

METHODOLOGY

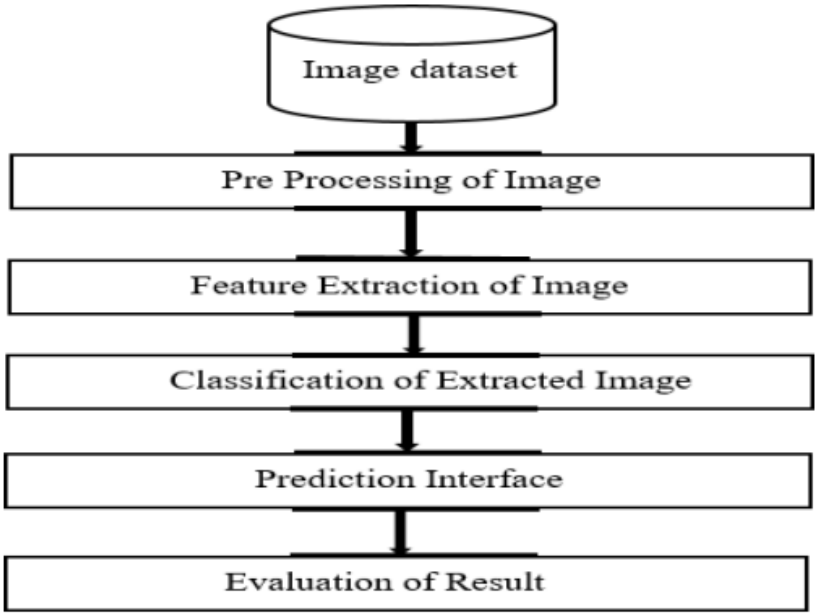

FIG.3.8.1:Block diagram for proposed system

STAGES IN PROJECT:

Data Collection and Dataset Preparation: Images can be downloaded from the Internet using the keywords hand gestures and sign language. Subsequently, all the images can be classified into different groups.

Training: In this step, training the deep convolutional neural network for making an image classification model will be done. Appropriate architecture will be used and adjusted to support our different categories (classes). Rectified Linear Units (ReLU) will subsequently be used as substitute for saturating nonlinearities. This activation function adaptively will learn the parameters of rectifiers and improve accuracy at negligible extra computational cost.

Video Acquisition: First step deals with acquiring the video by any one the devices, such as Handy Cam, Mobile Camera, USB camera and CCTV Camera etc.

Frame Conversion: Once the video is capture, those videos are converted into frames and suitable type of processing can be done conveniently.

Pre-Processing: Pre-processing is applied on the frames of the video to reduce the noise. some of the common methods of pre-processing are smooth, dilate, erode and median etc.

Background Modelling: Once the pre-processing is done, background modelling is used to create an ideal background (static or dynamic) according to the environmental changes. Background Modelling important step of the system to perform some image subtraction operations. It is the default characteristics of any background subtraction system. According to the literature there are several background modelling techniques which are categorized as recursive or non-recursive techniques. For this system recursive technique being used.

Background Subtraction: This is the main step in the background subtraction system. In this step any significant changes in the image region from background model are identified & then pixels constituting the regions undergoing change are marked for further processing. Usually connected component labelling algorithm is applied to obtain connected regions corresponding to the object.

Post-Processing: Finally, post-processing is done to improve the results. There are many post processing techniques that can be used after background modelling and subtraction. These techniques have an objective to improve foreground mask.

Foreground Extraction: This is the final step in the process which extracts the moving object from the frame. The result of this step helps in the judgment of the efficiency of the background subtraction system.

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[6] Dumitru Erhan et.al., "Scalable Object Detection Using Deep Neural Network", IEEE Conference on Computer Vision and Pattern Recognition.