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Department of Computer Science and Engineering

Synopsis for the Project work

"Gun Detection System using YOLOv3"

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2021-2022

BMS INSTITUTE OF TECHNOLOGY & MANAGEMENT

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Project Synopsis (18CSP77)

Academic Year 2021-22

Batch No:	Guide Name:	Submission Date:
B3	Dr. Radhika K R	15-11-2021

Project Title

Gun Detection System using YOLOv3

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Project Execution Place		In college under the guidance of project guide
Project Category		Research and Societal

1. Abstract:

The project is to study the application of the YOLOv3 algorithm to create a gun detection system, demonstrating its effectiveness in this task. Individuals carrying guns in public places are a strong indicator of dangerous situations. Many people have been killed indiscriminately using handguns in different countries. Terrorist acts, online fighting games and mentally disturbed people are considered the common reasons for these crimes. Studies show that a rapid response from law enforcement agents is the main factor in reducing the number of victims. Based on current situation around the world, there is major need of automated visual surveillance for security to detect handgun. The identification of handguns from surveillance cameras and images requires monitoring by human supervisor that can cause errors. To overcome this issue, the designed detection system sends an alert message to the supervisor when a weapon is detected. Proposed detection system has improved result; we have created our own dataset of handguns with all possible angles and merged it with an existing dataset. Hence the dataset needs to be prepared for guns and train it so that it should not send false alarm to authorities when similar item is detected. By using Raspberry pi and Alert signal/message needs to be sending to nearby police station and security officials of that building or area. The merged data is trained using YOLOv3 algorithm for gun detection.

2.Introduction:

The number of crimes involving guns violence is increasing in many parts of the world, especially in that places where the possession of guns is legal. [1] Reported incidents caused by guns violence in America in year 2015, 2016 and 2017 were 333752, 58908 and 61721 respectively. Another study ranked Malaysia in top 10 countries having highest gun violence in East, South East and South Asia in year 2016 [2]. From these statistics, it can be assumed that violence rate concerning guns are increasing every year, it is becoming a challenge for law enforcement agencies to overwhelm this issue timely. The solution of this problem is monitoring and early detection using control camera or surveillance systems which can help to prevent this kind of violence and assist policemen or security agents to act timely. Recently, the area of machine learning mainly in detection and classification of objects and image segmentation has been revolutionized by deep learning. You look only once (YOLO) outperformed other detection algorithm at predict in images what objects they are [3]. In this project, we present an automatic gun detection system using deep learning mainly YOLOv3 which is compared with the results of existing system [4]. Detecting gun in a scene is very challenging issue because of various subtleties linked with it. The challenges in gun detection are particularly caused by occlusion. Gun to scene and gun to object are the two types of gun occlusion. Real time processing is another main problem in gun detection system that arises during detection.

3.Motivation:

- The imaging studies, video related gun detection have been used for many years to detect the different images.
- Accidental gun firing has frequently occurred in many places, including superstores, communities, malls, and hotels, yielding huge loss to production and human life. After several decades of development, virtual reality technology has matured quickly and has changed people's lifestyles by being widely applied in many field.
- The main motivation to develop this system is to protect human life and avoid such illegal actions which harm human being and society.
- Hence Machine learning technique is used to predict the different gun angles.

4.Literature Survey:

Paper	Literature Review	Advantages	Disadvantages
1.Fire and Gun Violence based Anomaly Detection System Using Deep Neural Networks **Author:** Parth Mehta, Atulya Kumar, Shivani Bhattacharjee **Year:** 2020	• Real-time object detection • Applications of Convolutional Neural Networks (CNNs). • The proposed work has built a deep learning model based on the YOLOv3 algorithm. • Has fast detection rate that can be deployed indoor as well as outdoors	• Faster prediction	• High training time
2. Weapon Detection using YOLOv3 for Smart Surveillance System **Author:** Sanam Narejo , 1 Bishwajeet Pandey , 2 Doris Esenarrovargas , 3 Ciro Rodriguez , 4 and M. RizwanAnjum 5 **Year:** 2021	• Computer based fully automated • Implemented on YOLO v3 • Results confirm that YOLO V3 outperforms YOLO V2 and traditional convolutional neural network (CNN). • Can also be implemented in high-end surveillance and security.	• Superb speed – it's incredibly fast. • Accurate prediction of objects.	• Struggle to detect close objects
3. A novel approach for identifying Gun and Fire using deep neural	• Based on Convolutional Neural Networks (CNNs). • Weapon viciousness plus	• Faster prediction. • Accurate in image classification.	• High training time. • High computational cost.

networks **Author:** Shubangini Patil [1], Ashwini Gururaj Tikotekar [2] **Year:** 2021	mass shootings be furthermore on ascent in specific pieces of world. • Work has assembled a profound learning replica reliant on YOLOv3 computation to way a video outline via-edge to recognize such abnormalities.		
4. A Handheld Gun Detection using Faster R-CNN Deep Learning **Author:** G. K. Verma and A. Dhillon **Year:** 2017	• Based on Convolution Neural Network (CNN) Deep learning. • Achieved best results so far in classical image processing problems such as image segmentation, classification, and detection in several applications.	• Good performance	• Possibility of false alarm
5. A Computer Vision based Framework for Visual Gun Detection using Harris Interest Point Detector **Author:** R. K. Tiwari and G. K. Verma	• Hybrid approach of colour-based segmentation and interest point detector. • Used combination of Harris interest point detectors and FREAK descriptor for detecting interest point and extracting features which	• It is robust to partial occlusion, scale, rotation, affine variation. • Can detect the presence of multiple guns in an image.	• Less robust to illumination change • High time and space complexity

Year: 2015	is used for matching with gun descriptor. • Colour based segmentation is performed using k-means clustering algorithm to eliminate unrelated colour or object present in the image.		
6.Web Based Home Automation using IoT **Author:** Satyam H. Nalawade#1, Nilesh kumar K. Verma *2, Ravindra N. Rathod **Year:** 2018	• Home automation system on Raspberry Pi through accessing a web address and controlling the appliances. • The algorithm for the same has been developed in python environment • The algorithms are linked to the GUI via html / php platform. • Deals with web connectivity using IoT and energy efficient control.	This paper deals with web connectivity using IoT and energy efficient control of the home appliances in a user-friendly manner. The connectivity achieved by use of Raspberry Pi.	• More space and time complexity
7.Batik Image Classification Using SIFT Feature Extraction, Bag of Features and Support Vector Machine **Author:** Ryfial Azhara, Desmin	• Based on Automatic batik image • Combination of Bag of Features (BOF) extracted using Scale-Invariant Feature Transform (SIFT) • Support Vector Machine	Image classification in this study. The experimental results show that average accuracy	• Very slow training process.

Tuwohingidea,b, Dasrit Kamudia,b, Sarimuddina c, Nanik **Year:** 2015	(SVM) classifier which had been successfully implemented.		
8. Yolov3: An incremental improvement **Author:** J. Redmon, A. Farhadi, **Year:** 2018	• YOLOv3 is pretty good. • In terms of COCOs weird average mean AP metric it is on par with the SSD variants but is 3× faster. • It is still quite a bit behind other models like Retina Net in this metric though. • YOLOv3 is almost on par with Retina Net and far above the SSD variants.	• YOLOv3 is a good detector • It's fast • It's accurate	• It has worse performance on • Medium and larger size objects • Less model stability
9You only look once: Unified, real-time object detection. **Author:** Redmon, Joseph, Santosh Divvala, Ross Girshick, and Ali Farhadi. **Year:** 2016	• Fast, accurate algorithms for object detection would allow computers to drive cars without specialized sensors • Enable assistive devices to convey real-time scene information to human users, and unlock the potential for general purpose, responsive robotic systems. • Systems like deformable parts models (DPM) use a	• Good accuracy. • Faster object detection. • Simple to construct.	• YOLO imposes strong spatial constraints on bounding box predictions since each grid cell only predicts two boxes and can only have one class. • Our model struggles with small objects that appear in groups, such as flocks of birds

	sliding window approach where the classifier is run at evenly spaced locations over the entire image.		
10. Automatic handgun detection alarm in videos using deep learning. **Author:** Olmos, Roberto, Siham Tabik, and Francisco Herrera **Year:** 2018	• Based on Deep learning and Convolution Neural Networks (CNNs). • Instead of manually selecting features, deep learning CNNs automatically discover increasingly higher-level features from data. • Aim at developing a good gun detector in videos using CNNs	• Greater Accuracy • The best detector has shown a high potential even in low quality YouTube videos and provides very satisfactory results as automatic alarm system.	• Higher time and space complexity

5.Existing System:

In existing systems, they have deployed surveillance system or control cameras with automatic handheld gun detection and alert system. They have used Convolutional neural networks (CNN) for image processing. In some system, they have used a method for detection visual guns in images using colour-based segmentation and Harris interest point detector. Then FREAK features of each Harris interest points are used to find out similarity of each segmented object with the gun descriptor.

And in other few systems, they sought to improve ViF(variance inflation factor) using different optical flow algorithms as IRLS(Iterative Reweighted Least Squares), Horn-Schunck and Lucas Kanade, their performance in different datasets and different sub sampling video frames were

evaluated. This evaluation concluded that the ViF's accuracy with the original optical flow algorithm (IRLS) had better results, but in the case of Hockey dataset ViF's with Horn-Schunck was better. In few systems, they have used Web Based Home Automation using IoT.

6. Limitations of Existing System:

1. Inaccurate prediction.
2. Time consuming.
3. Complex process.
4. No hardware implementation.

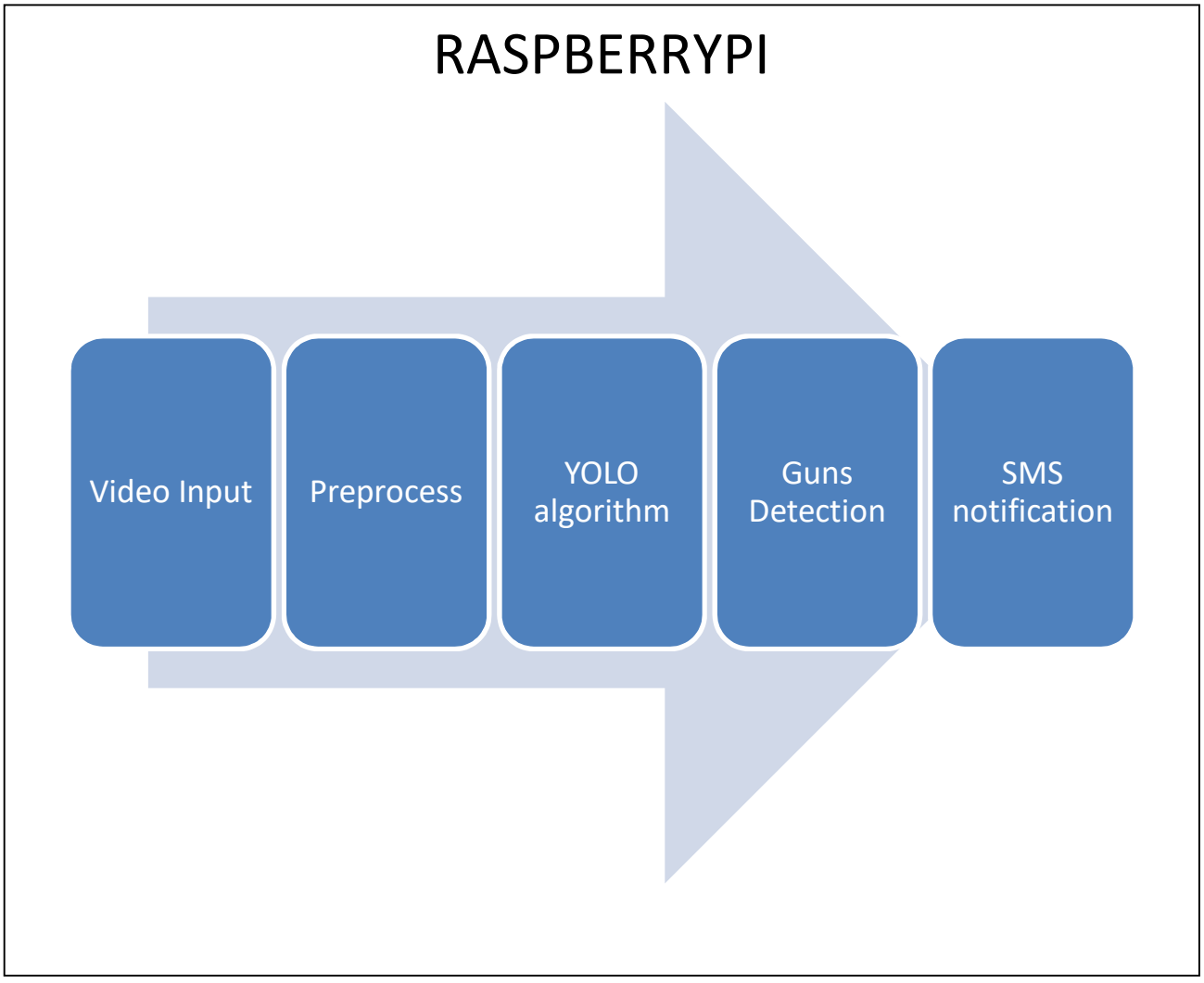
7. Objective:

1. Make through literature survey
2. Create dataset for the application
3. Study the working of Raspberry-Pi
4. To minimize false positive using YOLOv3 algorithm

8. Proposed System:

We are using the video and image data. The video/image is passed to the algorithm. Then the YOLO algorithm processes the input data. Hence the dataset needs to be prepared for guns and train it so that it should not send false alarm to authorities when similar item is detected, by using Raspberry pi and Alert signal/ message needs to be send to nearby police station.

8.1 System Architecture:



9.System Requirement Specifications:

9.1 H/W System Configuration:

Processor	**Above i3.**
Speed	**1.1 G Hz.**
RAM	**4 GB**
Hard Disk	**500 GB.**

9.2 S/W System Configuration:

Operating System	**Windows 10.**
Technology	**Machine Learning.**
IDLE	**Python 3.7 or higher.**

9.3 Functional Requirements

The necessities are user interfaces. The outside clients are the customers. Every one of the customers can utilize this product for ordering and looking.

- Hardware Interfaces: The outside equipment interface utilized for ordering and looking is PCs of the customers. The PC's might be portable PCs with remote LAN as the web association gave will be remote.
- Software Interfaces: The working Frameworks can be any rendition of windows.
- Performance Prerequisites: The PC's utilized must be at least Pentium 4 machine with the goal that they can give ideal execution of the item

9.4 Non-Functional Requirements

Non utilitarian necessities are the capacities offered by the framework. It incorporates time imperative and requirement on the advancement procedure and models. The non-useful prerequisites are as per the following:

- Speed: The framework ought to prepare the given contribution to yield inside fitting time.
- Ease of utilization: The product thought to be easy to understand. At that point the clients

can utilize effortlessly, so it doesn't require much preparing time.

- Reliability: The rate of disappointments ought to be less than just the framework is more solid.
- Portability: It thought to be anything but difficult to actualize in any framework

10. Proposed Methodology

1.Give the input data.

2.Capturing the input objects

3.Applying YOLOv3 algorithm

4.Detection of objects

11. Conclusion:

We have used YOLOv3 algorithm for guns detection. Image-type fire flame recognition methods are unconventional for early gun recognition. This study has investigated image-type gun recognition using a YOLOv3 and required training to recognize and extract images regions.

Gun detection system developed using YOLOv3 has greater efficiency than using Faster R-CNN technique. The advantage of YOLOv3 over Faster RCNN is its speed. The processing speed of YOLOv3 is 45 frames per seconds while Faster RCNN has 8 frame per seconds. Two out of four videos showed better accuracy than Faster RCNN algorithm.

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Signature of Guide