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WEAPON DETECTION USING ARTIFICIAL INTELLIGENCE AND DEEP LEARNING FOR SECURITY APPLICATIONS

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ABSTRACT
Security is always a main concern in every domain, due to a rise in crime rate in a crowded event or suspicious lonely areas. Abnormal detection and monitoring have major applications of computer vision to tackle various problems. Due to growing demand in the protection of safety, security and personal properties, needs and deployment of video surveillance systems can recognize and interpret the scene and anomaly events play a vital role in intelligence monitoring. This paper implements automatic gun (or) weapon detection using a convolution neural network (CNN) based SS D and Faster RCNN algorithms. 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.

1. INTRODUCTION

Weapon or Anamoly detection is the identification of irregular, unexpected, unpredictable, unusual events or items, which is not considered as a normally occurring event or a regular item in a pattern or items present in a dataset and thus different from existing patterns. An anomaly is a pattern that occurs differently from a set of standard patterns. Therefore, anomalies depend on the phenomenon of interest [3] [4]. Object detection uses feature extraction and learning algorithms or models to recognize instances of various category of objects [6]. Proposed implementation focuses on accurate gun detection and classification. Also concerned with accuracy, since a false alarm could result in adverse responses [11] [12]. Choosing the right approach required to make a proper trade-off between accuracy and speed. Figure 1 shows the methodology of weapons detection using deep learning. Frames are extracted from the input video. Frame differencing algorithm is applied and bounding box created before the detection of object

1.1 MOTIVATION

An anomaly is a pattern that occurs differently from a set of standard patterns. Therefore, anomalies depend on the phenomenon of interest [3] [4]. Object detection uses feature extraction and learning algorithms or models to recognize instances of various category of objects [6]. Proposed implementation focuses on accurate gun detection and classification.

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Also concerned with accuracy, since a false alarm could result in adverse responses.

1 Existing System

Security is always a main concern in every domain, due to a rise in crime rate in a crowded event or suspicious lonely areas. Abnormal detection and monitoring have major applications of computer vision to tackle various problems.

Due to growing demand in the protection of safety, security and personal properties, needs and deployment of video surveillance systems can recognize and interpret the scene and anomaly events play a vital role in intelligence monitoring.

1.2.1 Limitations of existing system

SSD Used

. 1.3 Objectives

The main objective of project is to detect weapons.

1.4 Outcomes

SSD and Faster RCNN algorithms are simulated for pre labeled and self-created image dataset for weapon (gun) detection. Both the algorithms are efficient and give good results but their application in real time is based on a tradeoff between speed and accuracy. In terms of speed, SSD algorithm gives better speed with 0.736 s/frame. Whereas Faster RCNN gives speed 1.606s/frame, which is poor compared to SSD. With respect to accuracy, Faster RCNN gives better accuracy of 84.6%. Whereas SSD gives an accuracy of 73.8%,

1.5Applications

This strategy used in Healthcare

STRUCTURE OF PROJECT

(SYSTEMANALYSIS)

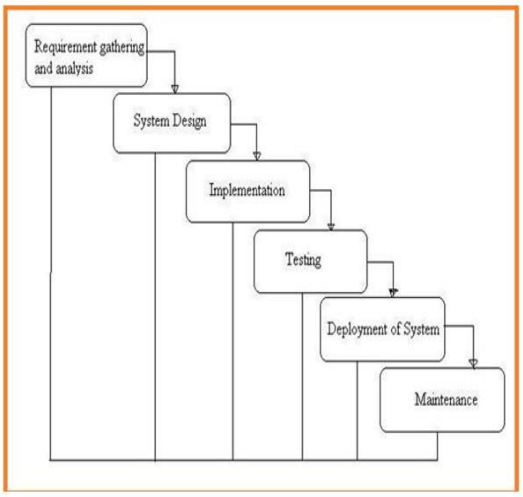

Fig: 1 Project SDLC

- Project Requisites Accumulating andAnalysis
- Application SystemDesign
- PracticalImplementation
- Manual Testing of MyApplication
- Application Deployment ofSystem
- Maintenance of theProject

REQUISITES ACCUMULATING AND ANALYSIS

It's the first and foremost stage of the any project as our is a an academic leave for requisites amassing we followed of IEEE Journals and Amassed so many IEEE Relegated papers and final culled a Paper designated "Individual web revisitation by setting and substance importance input and for analysis stage we took referees from the paper and did literature survey of some papers and amassed all the Requisites of the project in this stage

1.6.1 SYSTEMDESIGN

In System Design has divided into three types like GUI Designing, UML Designing with avails in development of project in

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facile way with different actor and its utilizer case by utilizer case diagram, flow of the project utilizing sequence, Class diagram gives information about different class in the project with methods that have to be utilized in the project if comes to our project our UML Will utilizable in this way The third and post import for the project in system design is Data base design where we endeavor to design data base predicated on the number of modules in ourproject

1.6.2 IMPLEMENTATION

The Implementation is Phase where we endeavor to give the practical output of the work done in designing stage and most of Coding in Business logic lay coms into action in this stage its main and crucial part of the project

1.6.4TESTING UNITTESTING

It is done by the developer itself in every stage of the project and fine-tuning the bug and module predicated additionally done by the developer only here we are going to solve all the runtime errors

MANUAL TESTING

As our Project is academic Leave, we can do any automatic testing so we follow manual testing by endeavor and error methods

1.6.3 DEPLOYMENT OF SYSTEM AND MAINTENANCE

Once the project is total yare, we will come to deployment of client system in genuinely world as its academic leave we did deployment i our college lab only with all need Software's withhaving Windows OS.

The Maintenance of our Project is one-time process only

1.7 FUNCTIONALREQUIREMENTS

1.Data Collection
2.DataPreprocessing
3.Training And Testing
4.Modiling
5.Predicting

1.8.1 EXAMPLES OF NON-FUNCTIONALREQUIREMENTS

Here, are some examples of non-functional requirement:

Users must upload dataset

The software should be portable. So moving from one OS to other OS does not createany problem.

Privacy of information, the export of restricted technologies, intellectual property rights, etc. should beaudited.

1.8.2 ADVANTAGES OF NON-FUNCTIONALREQUIREMENT

Benefits/pros of Non-functional testing are:

- The nonfunctional requirements ensure the software system follow legal and compliance rules.
- They ensure the reliability, availability, and performance of the softwaresystem
- They ensure good user experience and ease of operating thesoftware.
- They help in formulating security policy of the software system.

1.8.3 DISADVANTAGES OF NON-FUNCTIONALREQUIREMENT

Cons/drawbacks of Non-function requirement are:

- None functional requirement may affect the various high-level softwaresubsystem

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- They require special consideration during the software architecture/high-level design phase which increasescosts.
- Their implementation does not usually map to the specific softwaresub-system,
- It is tough to modify non-functional once you pass the architecturephase.

1.8.4 KEYLEARNING

The character of the time period, the length of road, the weather, the bus speed and the rate of road usage are adopted as input vectors in Support Vector Machine

2. LITERATURESURVEY

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

Conventionally used cement –a primary binder also a necessitate element in producing concrete rates first in the construction industry. Production of conventional cement requires a greater skill and is energy intensive. The usage of waste materials in the production of concrete and reduction in cement content was only the possible alternative in the past decade. Associated risks with the production of Ordinary Portland Cement are well known. A greener aided with a natural friendly claim can be made only with the usage of the waste materials and reduction in evolving respiration gas to the atmosphere.

Almost all works are carried out using source material fly ash, with fine aggregate and coarse aggregate. Concrete plays a vital role in the construction industry and on the other hand, river sand; one of the essential material has become very expensive which is a scarce material. Depletion of sand is a hectic issue due to increased usage of sand in construction. No

other replacement materials such as quarry rock dust is not concentrated in casting geopolymer specimens. Even though in some research papers the replacement materials are added only in partial replacement without aiming on 100% replacement. Many researches mainly focus towards test results of GPC specimens using steel fibers,

glass fibers. But the study related to natural fibers and hybrid fibers are found scarce. The main part of this work aimed at characterizing the engineering strength properties of geopolymer concrete by 100% replacement of fine aggregate with quarry rock dust. Hence, combination of flyash and quarry rock dust in GPC have been considered for evaluating the mechanical properties of geopolymer concrete. Also, investigation focuses on incorporation of three different fibers namely polypropylene fibers(PF), coir fibers(CF) and hybrid fibers(HF) in different percentage of proportions such as 0.5%,1%,and 1.5% to determine the maximum strength properties of GPC.

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 recently achieved state-of-the-art performance on a number of image

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recognition benchmarks, including the ImageNet Large-Scale Visual Recognition Challenge (ILSVRC-2012). The winning model on the localization sub-task was a network that predicts a single bounding box and a confidence score for each object category in the image. Such a model captures the whole-image context around the objects but cannot handle multiple instances of the same object in the image without naively replicating the number of outputs for each instance. 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. We are able to obtain competitive recognition performance on VOC2007 and ILSVRC2012, while using only the top few predicted locations in each image and a small number of neural network evaluations. Object detection is one of the fundamental tasks in computer vision. A common paradigm to address this problem is to train object detectors which operate on a subimage and apply these detectors in an exhaustive manner across all locations and scales. This paradigm was successfully used within a discriminatively trained Deformable Part Model (DPM) to achieve state-of-art results on detection tasks [6]. The exhaustive search through all possible locations and scales poses a computational challenge. This challenge becomes even harder as the number of classes grows, since most of the approaches train a separate detector per class. In order to address this issue a variety of methods were proposed, varying from detector cascades, to using segmentation to suggest a small number of object hypotheses [14, 2, 4]. In this paper, we ascribe to the latter philosphy and propose to train a detector, called "DeepMultiBox",' which generates a few bounding boxes as object candidates. These boxes are generated by a single DNN in a class agnostic.

3. PROBLEM ANALYSIS

3.1 EXISTINGAPPROACH:

Security is always a main concern in every domain, due to a rise in crime rate in a crowded event or suspicious lonely areas. Abnormal detection and monitoring have major applications of computer vision to tackle various problems. Due to growing demand in the protection of safety, security and personal properties, needs and deployment of video surveillance systems can recognize and interpret the scene and anomaly events play a vital role in intelligence monitoring.

3 Drawbacks

SSD Used

3.2 Proposed System

This paper implements automatic gun (or) weapon detection using a convolution neural network (CNN) based SS D and Faster RCNN algorithms. 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

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accuracy, but their application in real situations can be based on the trade-off between speed and accuracy.

3.2.1 Advantages

which is poor compared to faster RCNN.SSD provided real time detection due to faster speed but Faster RCNN provided superior accuracy..

3.3 Software And Hardware Requirements

SOFTWARE REQUIREMENTS

The functional requirements or the overall description documents include the product perspective and features, operating system and operating environment, graphics requirements, design constraints and user documentation.

The appropriation of requirements and implementation constraints gives the general overview of the project in regards to what the areas of strength and deficit are and how to tackle them.

- **Python idel 3.7 version (or)**
- **Anaconda 3.7 (or)**
- **Jupiter (or)**
- **Google colab**

HARDWARE REQUIREMENTS

Minimum hardware requirements are very dependent on the particular software being developed by a given Enthought Python / Canopy / VS Code user. Applications that need to store large arrays/objects in memory will require more RAM,

whereas applications that need to perform numerous calculations or tasks more quickly will require a faster processor.

Operating system : windows, linux
Processor : minimum intel i3
Ram : minimum 4 gb
Hard disk : minimum 250gb

3.5 Algorithms

CNN Working Procedure

To demonstrate how to build a convolutional neural network based image classifier, we shall build a 7 layer neural network that will identify and separate one image from other.

This network that we shall build is a very small network that we can run on a CPU as well. Traditional neural networks that are very good at doing image classification have many more parameters and take a lot of time if trained on normal CPU. However, our objective is to show how to build a real-world convolutional neural network using TENSORFLOW.

4. SYSTEMDESIGN

UML DIAGRAMS

The System Design Document describes the system requirements, operating environment, system and subsystem architecture, files and database design, input formats, output layouts, human-machine interfaces, detailed design, processing logic, and externalinterfaces.

Global Use Case Diagrams:

Identification of actors:

Actor: Actor represents the role a user plays with respect to the system. An actor interacts with, but has no control over the use cases.

Graphical representation:

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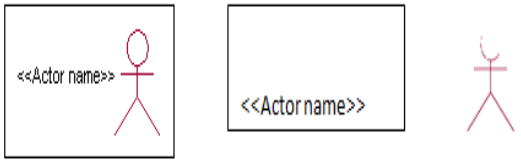

Actor

An actor is someone or something that:
Interacts with or uses the system.
Provides input to and receives information from thesystem.
Is external to the system and has no control over the use cases. Actors are discovered by examining:

Fig 1: Use Case Diagram

USE CASE DIAGRAM

A use case diagram in the Unified Modeling Language (UML) is a type of behavioral diagram defined by and created from a Use-case analysis. Its purpose is to present a graphical overview of the functionality provided by a system in terms of actors, their goals (represented as use cases), and any dependencies between those use cases. The main purpose of a use case diagram is to show what system functions are performed for which actor. Roles of the actors in the system can be depicted.

CLASS DIAGRAM

In software engineering, a class diagram in the Unified Modeling Language (UML) is a type of static structure diagram that describes the structure of a system by showing the system's classes, their attributes, operations (or methods), and the relationships among the classes. It explains which class contains information.

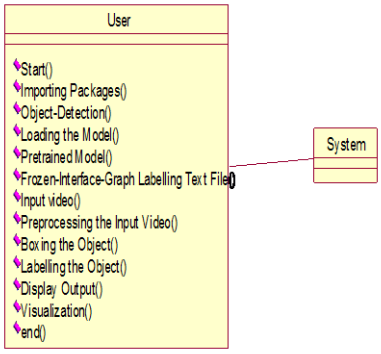

Fig 2:Class Diagram

SEQUENCE DIAGRAM

A sequence diagram in Unified Modeling Language (UML) is a kind of interaction diagram that shows how processes operate with one another and in what order. It is a construct of a Message Sequence Chart. Sequence diagrams are sometimes called event diagrams, event scenarios, and timing diagrams.

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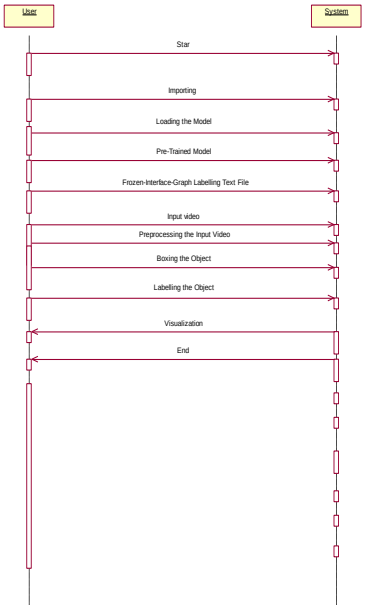
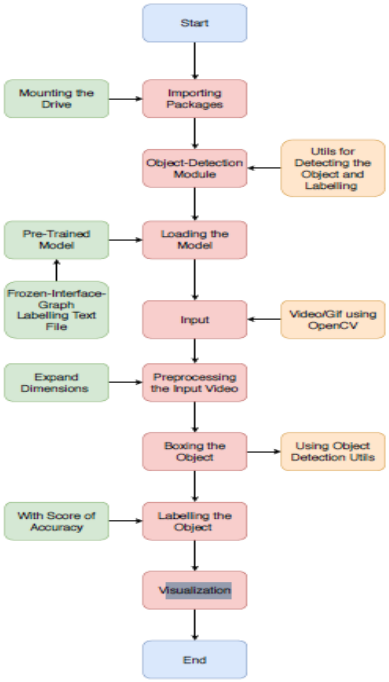


Fig 3: Sequence Diagram

5. IMPLEMENTATION

5.1 FLOW CHART:



8. CONCLUSION

SSD and Faster RCNN algorithms are simulated for pre labeled and self-created image dataset for weapon (gun) detection. Both the algorithms are efficient and give good results but their application in real time is based on a tradeoff between speed and accuracy. In terms of speed, SSD algorithm gives better speed with 0.736 s/frame. Whereas

Faster RCNN gives speed 1.606s/frame, which is poor compared to SSD. With respect to accuracy, Faster RCNN gives better accuracy of 84.6%.

Whereas SSD gives an accuracy of 73.8%, which is poor compared to faster RCNN.SSD provided real time detection due to faster speed but Faster RCNN provided superior accuracy.

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FUTURESCOPE

Further, it can be implemented for larger datasets by training us ing GPUs and high-end DSP and FPGA kits [16] [17].

8. REFERENCES

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