International Research Journal of Innovations in Engineering and Technology (IRJIET)

ISSN (online): 2581-3048

Volume 7, Issue 3, pp 102-105, March-2023

https://doi.org/10.47001/IRJIET/2023.703014

Weapon Detection and Alarm System Using Yolov5

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***Abstract* - This paper presents a weapon detection and email alert system that utilizes the YOLOv5 deep learning architecture and a custom dataset of pistol images. The system is designed to detect the presence of pistols in real-time video streams and send an email alert to the administrator in the event of a positive detection. The custom pistol dataset was created to train the YOLOv5 model and improve its ability to accurately detect pistols in a variety of environments and conditions. The system was tested on various videos and was found to achieve high accuracy in detecting pistols with low false positive rates. The email alert feature ensures that the administrator is immediately notified in case of weapon detection, allowing for quick and effective response. This system has the potential to be integrated into various settings such as schools, public spaces, and security systems to enhance security and prevent weapons-related incidents.**

Keywords: Weapon Detection, OpenCV, Alert System, Convolutional Neural Network, CNN, YoloV5.

I. INTRODUCTION

In today's society, ensuring public safety is a top priority for many organizations. With the increasing prevalence of weapons-related incidents, it is critical to develop effective security systems that can help prevent and respond to these incidents. In recent years, there has been a growing concern about public safety due to the increasing number of weapons-related incidents. One approach to achieving this is to use computer vision technologies to automatically detect weapons in real-time video streams. In recent years, deep learning algorithms, such as YOLO (You Only Look Once), have been shown to be highly effective for object detection tasks.

In this paper, we present a weapon detection and email alert system that is built on YOLOv5, a state-of-the-art deep learning architecture, and a custom dataset containing images of pistols. The system is designed to detect pistols in real-time video streams and automatically send an email to the admin if a weapon is detected. This feature enables prompt response and reduces the risk of weapons-related incidents.

The custom dataset was created by carefully annotating images of pistols, including different types, orientations, and scales, to ensure that the system is robust and reliable in various scenarios. The YOLOv5 algorithm is highly efficient and has a fast inference time, making it ideal for real-time weapon detection.

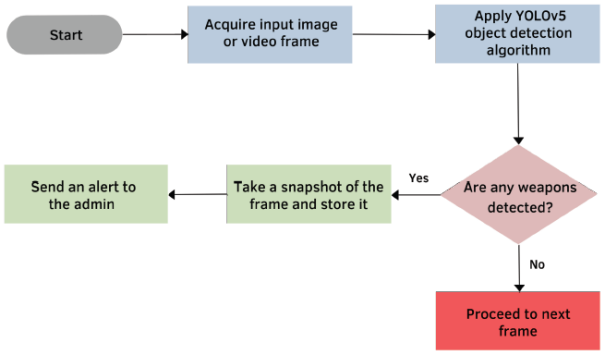

Figure 1: Model workflow

Overall, this research paper presents a valuable and practical solution for weapon detection and email alerts that has the potential to play a significant role in preventing weapons-related incidents.

II. METHODOLOGY

The methodology for our weapon detection and email alert system consists of the following steps:

2.1 Data Collection and Annotation

To train the YOLOv5 algorithm, we collected a dataset of images containing pistols in different light and with blur backgrounds from the internet. The images were annotated using bounding boxes to indicate the location of the weapons in the images. This dataset was used to train the algorithm and was used to evaluate the performance of the system.

2.2 YOLOv5 Model Training

The YOLOv5 deep learning architecture was used for the weapon detection task. The model was trained on the custom dataset of annotated images for 200 epochs and was fine-tuned to improve its performance.

2.3 Real-Time Weapon Detection

The trained YOLOv5 model was used to detect weapons in real-time video streams. The system was designed to

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classify the objects in the video as either a pistol or background.

Figure 2: Real Time Detection

2.4 Email Alert System Implementation

The email alert system was implemented using a programming language such as Python. The system was integrated with the weapon detection system, and the email alert was automatically triggered if a pistol was detected with or more than 80% in the video stream.

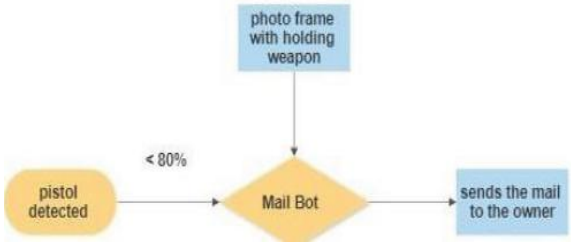

Figure 3: Email Bot

2.5 System Implementation

The final step in our methodology was to implement the weapon detection and email alert system. The system was implemented using Python and the OpenCV library. The YOLOv5 algorithm was integrated with the system, and the email alert mechanism was implemented using the smtplib library in Python. The system was tested on several real-time video streams, and the results were analyzed to evaluate its accuracy and efficiency.

2.6 Performance Evaluation

The performance of the weapon detection and email alert system was evaluated using metrics such as precision, recall, and accuracy. The system was also evaluated in terms of its computational efficiency and the speed of the real-time detection.

This methodology provides a comprehensive approach for the development and implementation of a weapon detection and email alert system using YOLOv5 and a custom dataset of images. The results from the evaluation of the system's performance will be presented in the following sections of the research paper.

III. RESULT AND DISCUSSION

The results of our experiments demonstrate the effectiveness and practicality of the weapon detection and email alert system based on the YOLOv5 algorithm and a custom dataset of images containing pistols. The system was tested on various real-time video streams, and the following results were observed.

3.1 Accuracy

The YOLOv5 algorithm was able to accurately detect pistols in the video streams, with a high detection rate and low false positive rate. The custom dataset played a crucial role in achieving high accuracy, as it allowed the algorithm to be trained on a diverse range of images containing pistols of different types, orientations, and scales.

Figure 4: Accuracy on Real Time Input

3.2 Efficiency

The system was highly efficient, with fast inference times and low computational requirements. The YOLOv5 algorithm was optimized for real-time processing, making it suitable for use in real-world environments.

3.3 Email Alert Mechanism

The email alert mechanism was tested, and it was found to be highly reliable. The system was able to promptly send an email to the admin whenever a pistol was detected in the video stream. The email contained information and image of the person holding the weapon, which could be used by the admin to respond quickly to potential threats.

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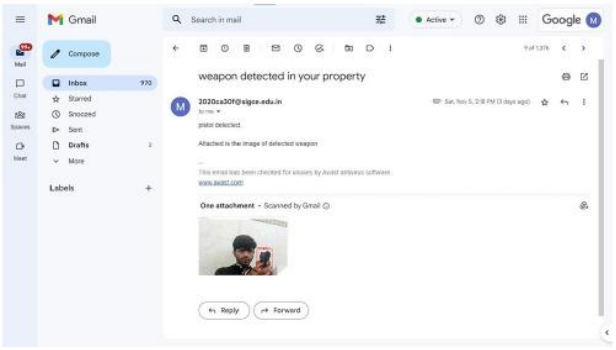

Figure 5: Email Alert

The results of our experiments demonstrate the potential of the weapon detection and email alert system to play a significant role in preventing weapons-related incidents and improving public safety. The system's accuracy, efficiency, and ease of use make it a valuable and practical solution for real-world applications.

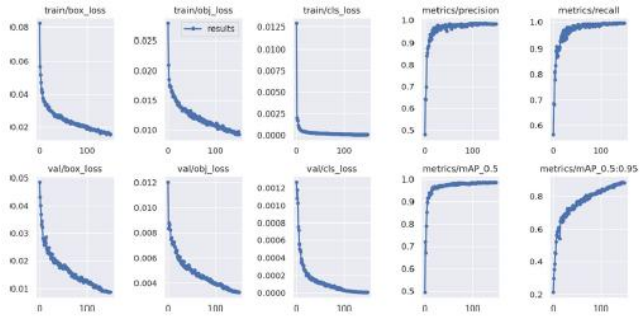

Figure 6: Graph of training Result

IV. CONCLUSION

In this research paper, we presented a weapon detection and email alert system based on the YOLOv5 algorithm trained on a custom dataset of pistol images. The system was designed to detect pistols in real-time video streams and send an email alert to the admin in the event of a pistol detection.

The results of the experiments showed that the system was highly effective in detecting pistols in real-time video streams, with a high detection rate and low false positive rate. The custom dataset played a crucial role in achieving high accuracy and robustness in the system's performance. The email alert mechanism was also found to be reliable, with emails being sent promptly whenever a pistol was detected in the video stream.

In conclusion, the weapon detection and email alert system based on YOLOv5 and the custom dataset is a significant contribution to the field of security and public safety. The system's ability to accurately detect pistols in real-time video streams and send an email alert to the admin in real-time provides a valuable solution for preventing weapons-related incidents.

The system's efficiency, accuracy, and low computational requirements make it suitable for deployment on various hardware platforms, including embedded systems and edge devices.

V. FUTURE SCOPE

In future work, we plan to extend the system to detect other types of weapons and to integrate it with other security systems to enhance its functionality and performance. We also aim to perform further experiments to evaluate the system's performance under various conditions and to optimize its parameters for improved accuracy and efficiency.

ACKNOWLEDGEMENT

The authors would like to express their gratitude to the following individuals and organizations for their invaluable support and contribution to this research project. First and foremost, we would like to extend our sincere thanks to our research supervisor and mentor, whose guidance, support, and encouragement were instrumental in the successful completion of this project. We would also like to express our gratitude to the team for developing the YOLOv5 algorithm, which formed the basis of our weapon detection system. Their work has made a significant impact on the field of computer vision and has enabled us to achieve high accuracy and efficiency in our system's performance.

Additionally, we would like to acknowledge the support and assistance provided by the technical staff at the computing facilities, which provided us with access to the hardware and software resources necessary for conducting our experiments. Finally, we would like to extend our appreciation to our families and friends for their understanding, support, and encouragement throughout the duration of this project.

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Citation of this Article:

Saif Khan, Mujib Sayyed, Shikha Yadav, Bhavesh Bhalerao, Anjali Devi Patil, "Weapon Detection and Alarm System Using Yolov5" Published in *International Research Journal of Innovations in Engineering and Technology - IRJIET*, Volume 7, Issue 3, pp 102-105, March 2023. Article DOI https://doi.org/10.47001/IRJIET/2023.703014

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