

REAL-TIME ANOMALY DETECTION USING VIDEO SURVEILLANCE FOR ENHANCING THE SECURITY

DHAWALASHREE B K¹, ARPITHA G², SHREYAS M³, VISHRANTH K H⁴,
Dr. J AMUTHARAJ⁵, Dr. NEHA SINGHAL⁶

¹ UG Student, Dept. of Information Science & Engineering, RRCE, Bangalore, Karnataka, India

² UG Student, Dept. of Information Science & Engineering, RRCE, Bangalore, Karnataka, India

³ UG Student, Dept. of Information Science & Engineering,, RRCE, Bangalore, Karnataka, India

⁴ UG Student, Dept. of Information Science & Engineering, RRCE, Bangalore, Karnataka, India

⁵ Vice Principal & Professor, Dept. of Information Science & Engineering, RRCE, Bangalore,
Karnataka, India

⁶ HOD & Professor, Dept. of Information Science & Engineering, RRCE, Bangalore,
Karnataka, India

ABSTRACT

For a real-time video surveillance system, AED (Anomalous Event Detection) is especially helpful in terms of safety as well as security. Today, monitoring objects and movement in low resolution video is a particularly challenging task due to the loss of specific viewpoint in the external appearance of moving objective article. Additionally, the demand has not been met by the number of strangeness kinds that real-time machine checking could detect. The identification of abnormalities is extremely important and usually becomes absolutely necessary in high-risk situations. When the system discovers or detects any unexpected or anomalous actions while video surveillance is being conducted in real-time, alerts are generated. The suggested remedy may also be used by any source and doesn't require a high limit of capacity structure to achieve the best outcome. The arrangement also includes a simple but sophisticated approach to deal with the rapid alerting and anomaly detection framework of today. Object recognition and tracking, which is widely employed in many industries such as medical care observation, autonomous driving, irregularity identification, and so forth, is one of the most important and difficult fields in computer vision. Due to its numerous practical applications in various domains, including event analysis, human-computer interaction, crowd analysis, video surveillance, behavior analysis, etc., the tracking of moving objects in movies has been extensively explored during the past 20 years. We can satisfy the requirements to give the citizens of the nation the essential security with the use of machine learning algorithms. Additionally, we can somewhat reduce the global crime rate. Nowadays, it is extremely dangerous to walk down the street, even in broad daylight, so the proposed system will help to reduce all anomaly activities.

Keyword: - Anomaly Detection, Deep learning (DL), Graphics Processing Unit (GPU), Surveillance video, Artificial Intelligence, Machine Learning, Image Processing, CNN, Object detection.

1. INTRODUCTION

In recent years, interest in surveillance films for public security has increased as a result of anomaly event identification in congested areas [2]. Due to three key factors, anomaly event identification in crowded settings is particularly difficult. The first concern is the tiny sample size of the datasets, the second is the lack of objectives and definitions for anomalies, and the third is temporal complexity. Anomaly detection is essential, followed by anomaly

recognition and quick response to lessen the effect of the abnormality [6]. Anomaly events are therefore of utmost significance in the contemporary context.

Machine learning algorithms are the greatest choice for enhancing security since they can use video surveillance to instantly spot suspicious activity. By creating effective, quick algorithms and data-driven models for real-time processing, machine learning may produce extremely exact findings and analysis. The advancement is however constrained by the challenging acquisition of anomalous data and the laborious hand labeling.

1.1 Proposed System

It is a challenging endeavor to detect strange actions or incidents in low-resolution, but the proposed approach will be able to do so. The local police station or the appropriate authorities are notified by this technology, which does more than merely detect. The cops may act immediately to stop the aberrant actions before they worsen or before people's lives are in danger since an instant message will be delivered. The suggested system may be put into use in a variety of locations where there is severe requirements for security.

1.2 Objective

The objective of the proposed system is to improve or to enhance the security for the citizens in crowded and in lonely areas. As the system is going to detect the anomaly activity automatically and also sends message, it is going to avoid any criminal activity and also it erases the fear in the minds of the people as they can go anywhere at any-time to anyplace without any fearing.

2. METHODOLOGY

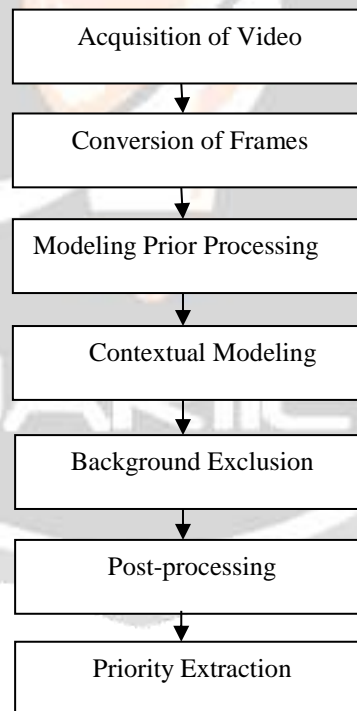


Fig -1: Steps involved in methodology

1. Acquisition of Video: The first stage entails gathering the video using any of the available tools, such a USB camera, CCTV camera, handheld camera, or mobile camera.

2. Conversion of Frames: After the video is captured, it is turned into frames so that convenient processing may be done.

3. Modeling Prior Processing: To lessen the noise, preliminary processing is done to the video frames. Preprocessing techniques include things like smoothing, dilation, erosion, and median etc.

4. Contextual Modeling: After the first processing is complete, contextual/background modelling is used to give a static or dynamic backdrop that is suited for the current situation. In order for the system to carry out some picture subtraction operations, background modeling is a crucial step. It is a feature that all background subtraction systems have by default.

5. Background Exclusion: This is the system's major step for background subtraction. The backdrop model is used to identify any substantial changes in the picture region, and the pixels that make up such regions are then tagged for further processing. To find linked areas that relate to the item, the connected component labelling algorithm is typically used.

6. Post-processing: Post-processing is then carried out to enhance the outcomes. After backdrop modelling and removal, a variety of post-processing methods can be applied. These methods are intended to enhance foreground mask..

7. Priority Extraction: The procedure that removes the moving object from the frame concludes with this step. The outcome of this stage aids in determining how effective the background subtraction mechanism is.

2.1 SYSTEM ARCHITECTURE

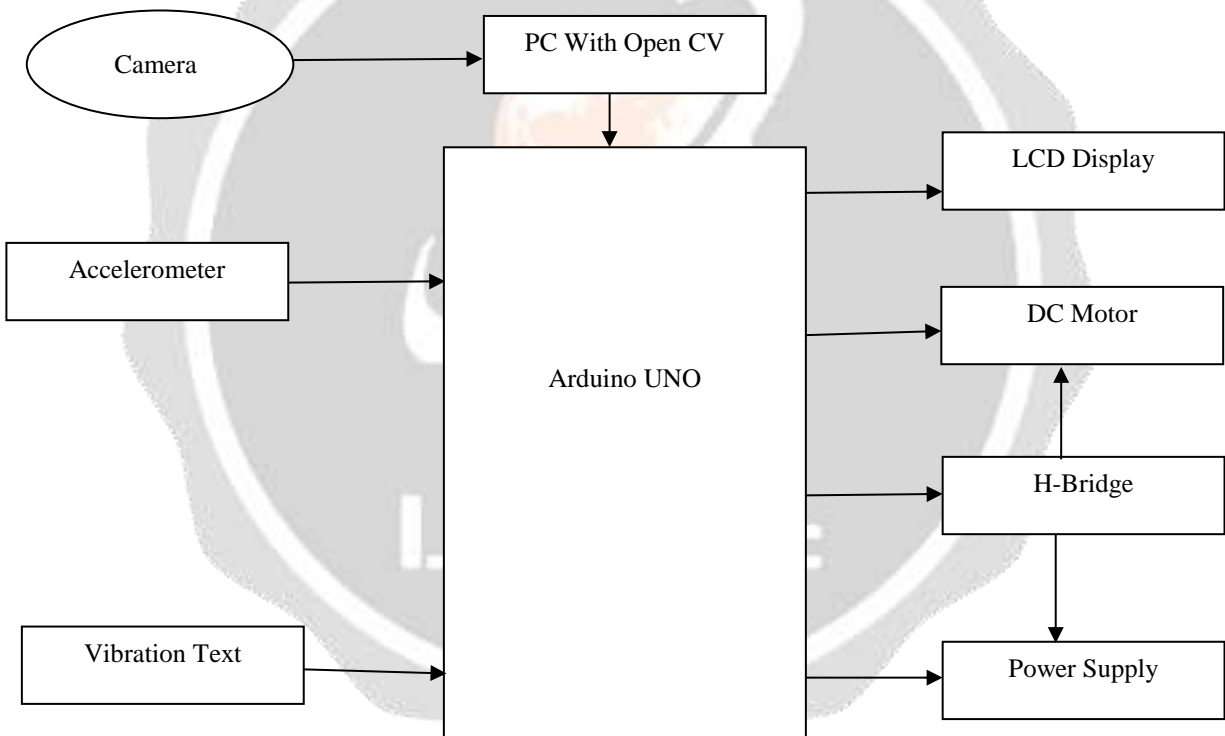


Fig -2: Architecture of the system

The camera identifies the anomaly event detection automatically and stores this information in PC/LAPTOP. This information will be passed to the Arduino board. If any unusual event happens in the crowded or lonely areas, automatically DC motor will be activated and the doors of the particular shops or buildings will be closed. If a particular shops or buildings doors are tried to open forcefully then accelerometer direction will change and control will be passed to DC motor, then DC motor will be activated and closes the doors. Once this unusual event happens, automatically it will detect and sends an immediate alarm message or vibration text will be sent to nearest police station or to any respective person or to any authorities.

LCD display will display all the anomaly activities such as –if a person robs or makes forceful entry holding weapon and wearing a mask or helmet to a place where high security is in demand, and it also detects if there is a fight happening and lastly this system will also detect the explosion.

3. REQUIREMENTS

i. Arduino UNO Board



Fig -3: Arduino UNO Board

As a controller, the Arduino UNO board is designed to manage other parts. A microcontroller board called Arduino UNO is based on the ATmega328P. 14 digital I/O pins are included. By using the Arduino programming language, which relies on wire and is managed by the use of Arduino software, commands are sent to the microcontroller.

ii. DC Motor



Fig -4: DC Motor

The DC Motor helps to automatically close or blocks the door when an unusual action or activity is detected. This automatic closing of door is done to prevent the intruder, stranger or any suspicious person from entering into any ATMs, Banks or any other places forcefully.

iii. LCD Display



Fig -5: LCD Display

LCD Display is used to display the message as soon as any anomaly activity is detected.

iv. Accelerometer



Fig -6: Accelerometer

Accelerometer is going to detect if a particular ATM machine or any other objects have moved forcefully or robbed.

v. H Bridge



Fig -7: H Bridge

H-Bridge will control the direction of the motor such as forward (closing the door) backward (opening the door)

vi. Power Supply



Fig -8: Power Supply

Power Supply will supply power to all the hardware components.

4. RESULT



Fig -9: Front Page

The front page has two buttons i) to upload a photo or video to detect abnormal activity, ii) to start the detection in real-time.

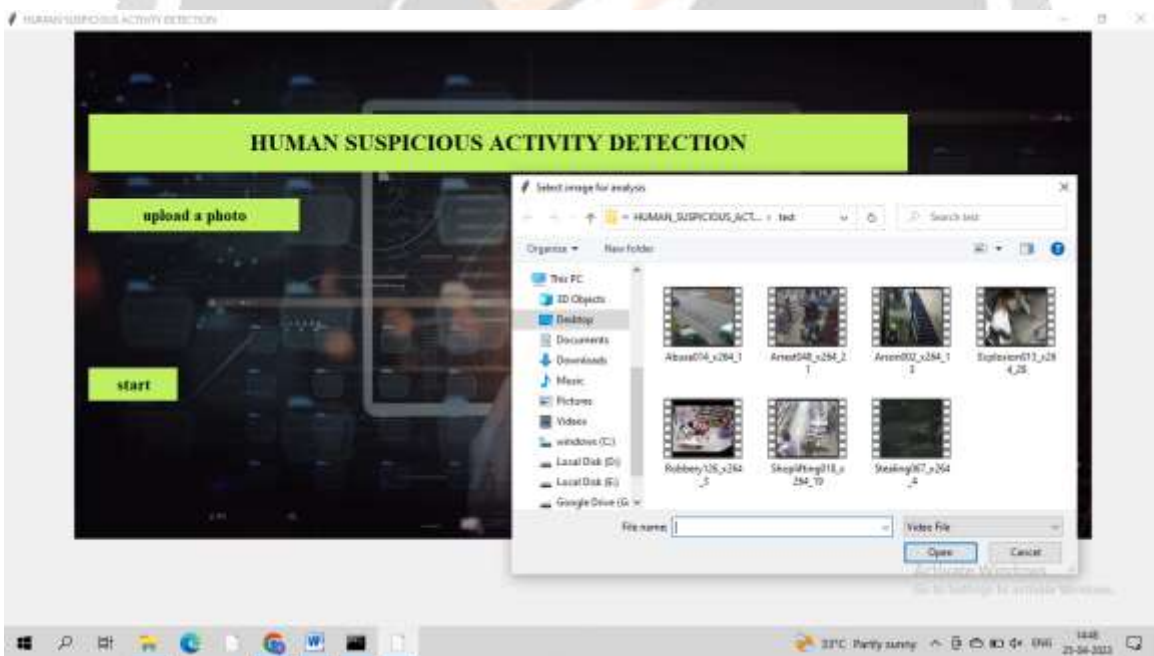


Fig -10: Uploading videos for detection



Fig -11: Weapon detection



Fig -12: Weapon detection alert message



Fig -13: Mask detection

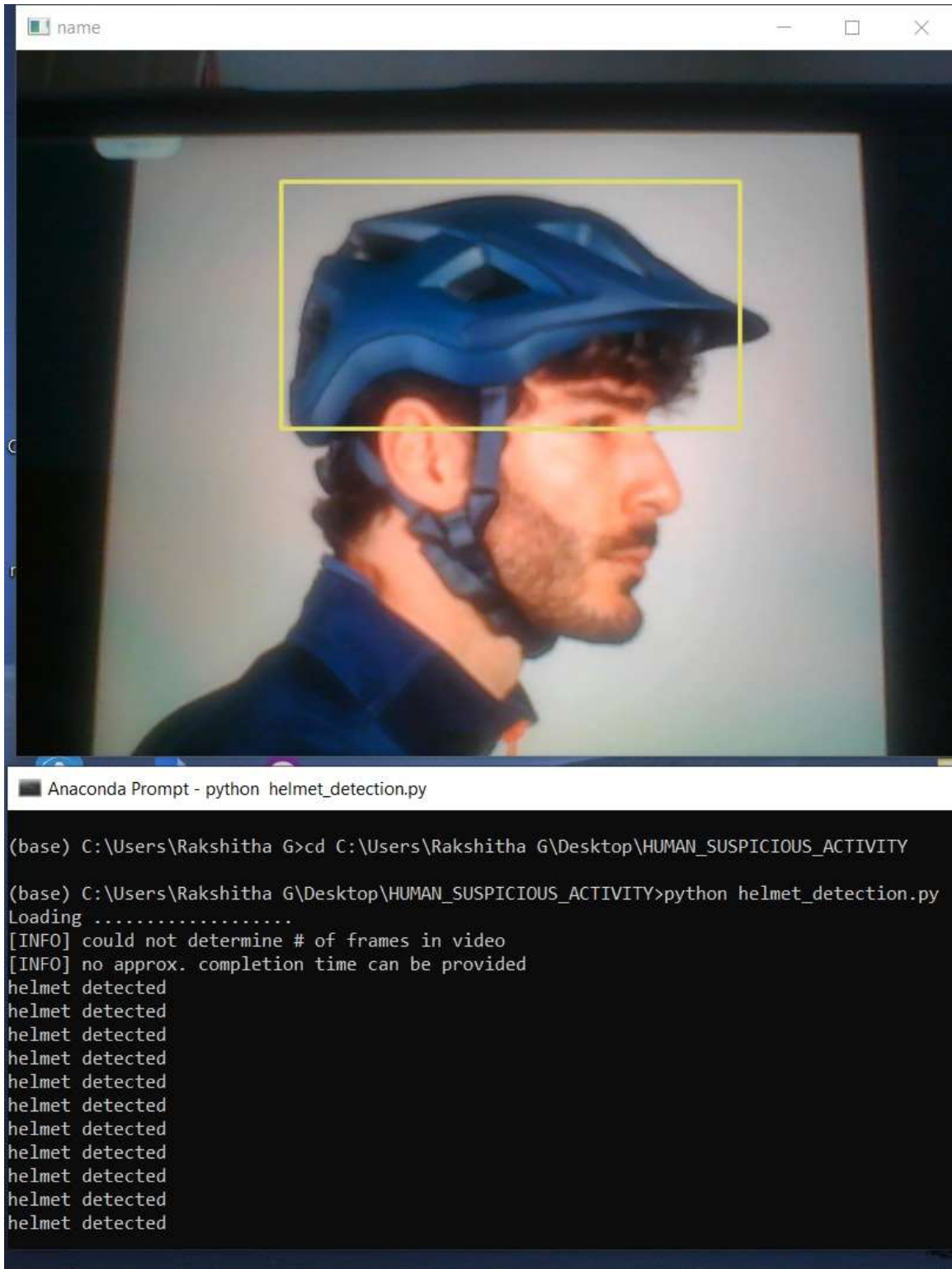


Fig -14: Helmet detection

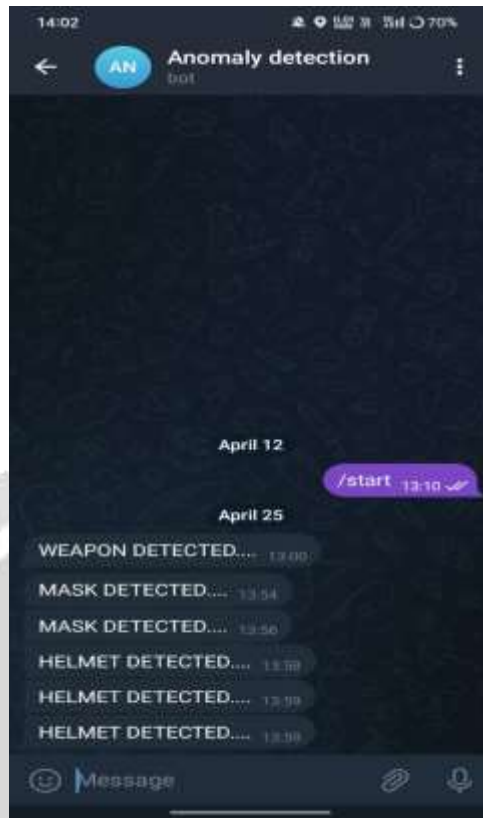


Fig -15: Mask and Helmet detection alert message



Fig -16: Arrest and normal alert message

5. CONCLUSIONS

The proposed system aims to enhance the security in crowded places and in lonely areas. The system will detect the anomaly activities whenever they take place in real-time and also automatically sends an immediate alarm or alert message to the nearest police station or to respective authorities or officials. The advantage of this system is that, it can detect abnormal or unusual activities in low-resolution and also it reduce manual work as it automatically detects as well as automatically sends message.

This device can be used as security system in most of the places such as- ATMs, Banks, Apartments, Houses, Schools, Colleges, Railway and Bus stations etc. which demands high security. This system will not only help to give security to the life, but it will also helps to secure valuable items from being robbed, to avoid fighting or murder, detects explosion and sends message etc., and it will also help to take an immediate actions to the person who is invading and robbing and threatening and abusing.

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