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Suspicious Activity Detection and Alert System using Raspberry Pi

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Abstract:- An important branch of computer science called computer vision processes digital photos and movies to increase the intelligence of machines. Activity recognition, which automatically classifies an agent's behavior, is a significant use of computer vision. Uncovering a person's actions through a series of observations while considering many difficult contextual conditions is the goal of the key application of suspicious activity recognition. The internet tells the user or commando when the surveillance system's motion detection and tracking are activated.

I. INTRODUCTION

Due to recent rapid technology breakthroughs, automated human activity identification has gained popularity as a research area. Applications for video surveillance include spotting regular and unusual activity, such as gaming, human-computer interaction, exam monitoring, chaos detection, sports analysis, crowd behaviour forecasting, and more. It is important for guaranteeing safety both inside and outside of the border.

The volume of video data that needs to be analysed and the rapid pace of invention make manual intervention not only impossible but also error-prone. Also, maintaining regular surveillance of critical areas is a very difficult endeavour. Deploying intelligent video surveillance systems that can track people's movements in real-time, classify them as regular or odd behaviours, and produce alerts accordingly is therefore essential.

Radar, cameras, and cell phones are just a few of the sensors used in a variety of applications, including security, surveillance, human-computer interface, and monitoring suspicious activity. Nowadays, the majority of systems use CCTV cameras to record video material that can be used in criminal or violent act investigations. It would be preferable to have a system that can proactively recognise anomalous or unexpected occurrences and warn the authorities as soon as they occur.

II. PROBLEM STATEMENT

- The present CCTV system only helps to identify criminals after the fact, making it ineffective at spotting suspicious activity before a crime takes place.
- The current system depends on recording CCTV data, making it labour- and time-intensive to continuously monitor the data manually.

III. OBJECTIVE

- To convert video to image.
- To frame segmentation using K means clustering.
- To extract frame by background subtraction and frame sequence.
- To detection the object.
- To action recognition using Deep Belief Network (DBN).
- To classify normal activity or suspicious activity with trained dataset.
- To alert a security.

IV. EXISTING SYSTEM

The term "object detection" describes a technique for spotting real-world things like cars, bikes, TVs, flowers, and people in pictures and videos. This method facilitates the identification, localization, and detection of numerous objects existing in an image, allowing for a thorough comprehension of an image or video. In essence, it enables the identification of distinctive things in a visual medium.

It is usually utilized in applications like image retrieval, security, surveillance, and advanced driver assistance systems (ADAS). Object Detection is done through many ways:

- Feature Based Object Detection
- Viola Jones Object Detection
- SVM Classifications with HOG Features
- Deep Learning Object Detection

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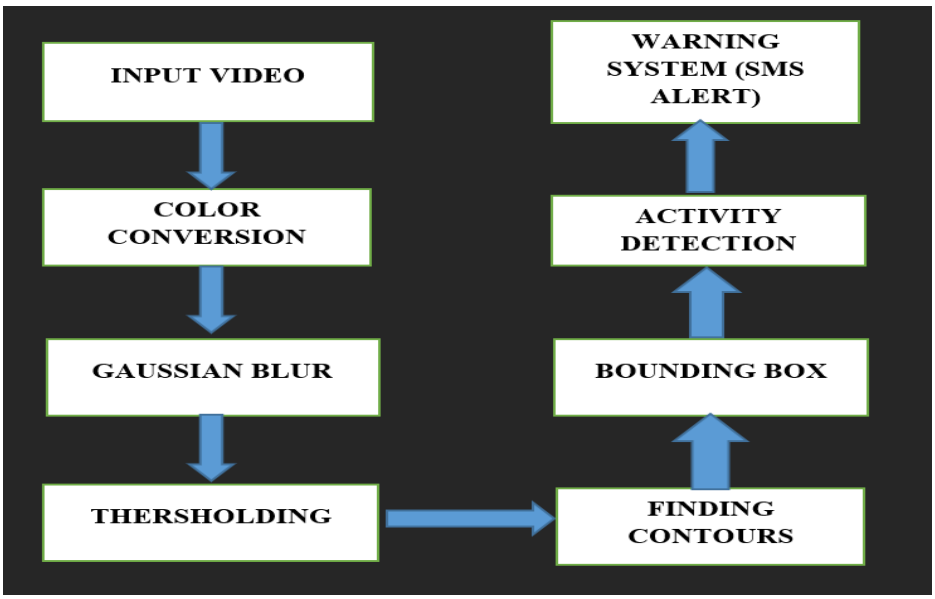

Fig. 1: Advanced driver assistance systems (ADAS)

V. PROPOSED SYSTEM

Depending on the system components used, activity recognition can be divided into two categories: sensor-based and vision-based activity recognition. Using a network of sensors, sensor-based activity recognition keeps track of both the actions of a person and outside factors. Important information can be extracted from the data collected by these devices after it has been processed and aggregated. Additionally, the model is frequently trained using methods from machine learning, deep learning, and data analytics.

In contrast, vision-based activity recognition uses a camera-based system to examine and process video data in order to find and classify behaviours within a specific environment. The video, which is basically a collection of images, is often processed using digital image processing techniques to extract pertinent information.For this particular project, a vision-based system was utilized.

VI. BLOCK DIAGRAM

- SOFTWARE SIDE:
- HARDWARE SIDE:

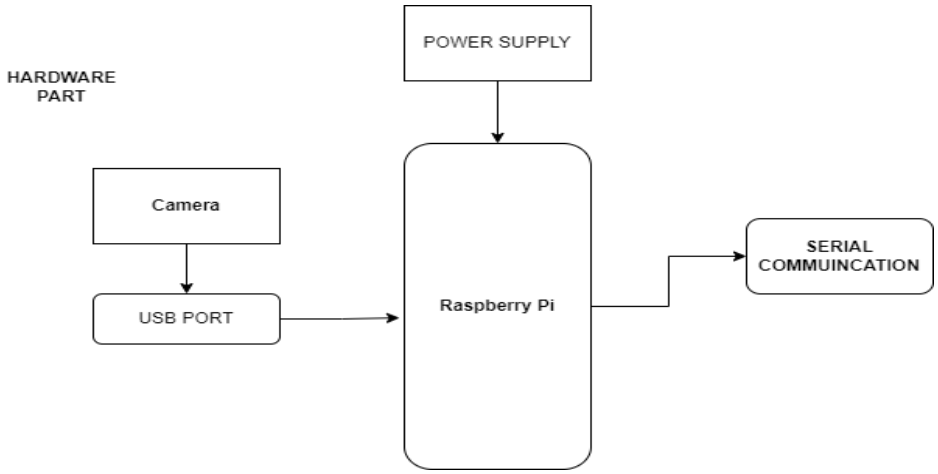

Fig. 2: Block Diagram Explation

VII. BLOCK DIAGRAM EXPLANATION

Using Python and the OpenCV library, a Raspberry Pi 4 and Raspberry Pi camera have been used to create a house security surveillance system. The system was tried by using the "raspistill -o image.jpg" command to take a picture after configuring the Raspberry Pi 4 with the Raspbian OS and connecting the camera.In order to increase functionality, extra libraries and dependencies were installed after the coding was finished in the terminal. In order to allow email notifications with an attached image when motion is detected, the mail.py file was configured with the user's and system's email addresses. The system constantly watches for movement and emails the user's email address an alert with the image it has just taken. This project was successful in giving users an easy method to spot activity and take the necessary action.

VIII. MODULE DESCRIPTION

The system's software converts the videos into frame pictures using data from the camera. Following that, these pictures are preprocessed using image processing methods. The data is stored in memory and the software has been trained using images. The system sends an alert message if it discovers any suspicious behaviour.

The Raspberry Pi receives information from the camera via the USB port in the hardware component. The user receives a text message via email if the system notices any suspicious behaviour.

A. HARDWARE REQUIREMENTS

- Raspberry pi
- Camera

B. SOFTWARE REQUIREMENTS

- Raspberry pi OS
- Python IDE
- OpenCV library

IX. OUTPUT RESULTS

The confidence curve and other result images are mentioned below.

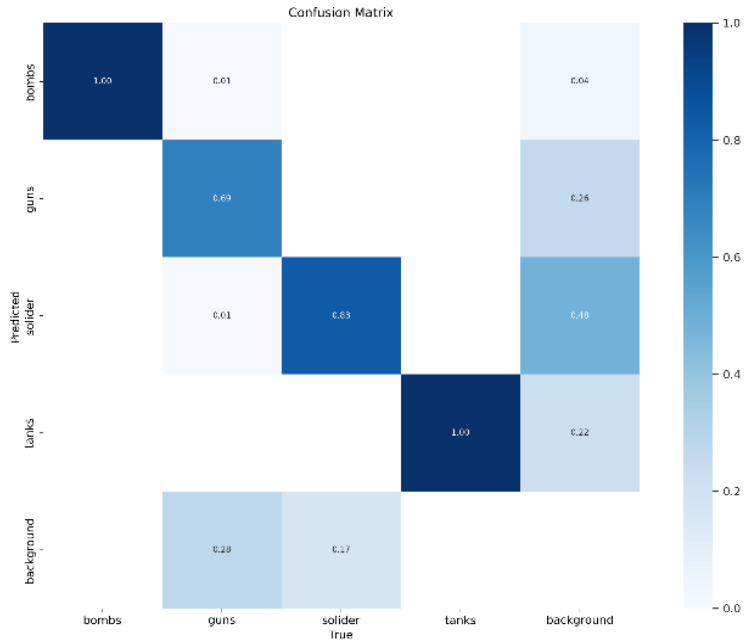

Fig. 3: Confusion Matrix

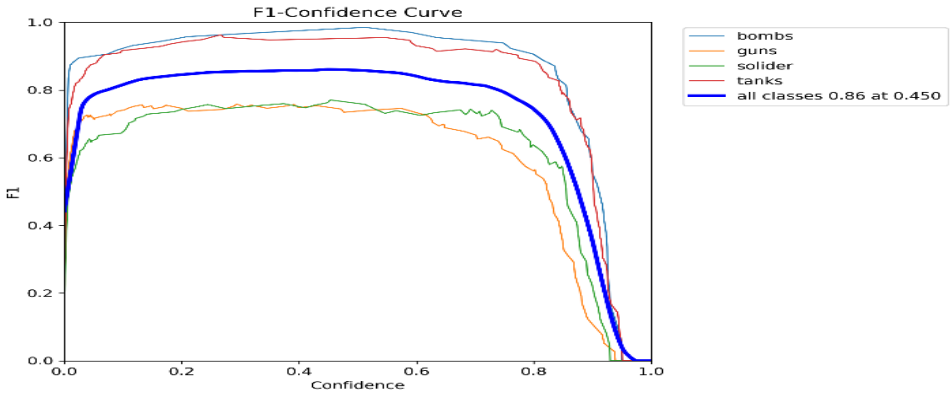

Fig. 4: F1 Confidence curve

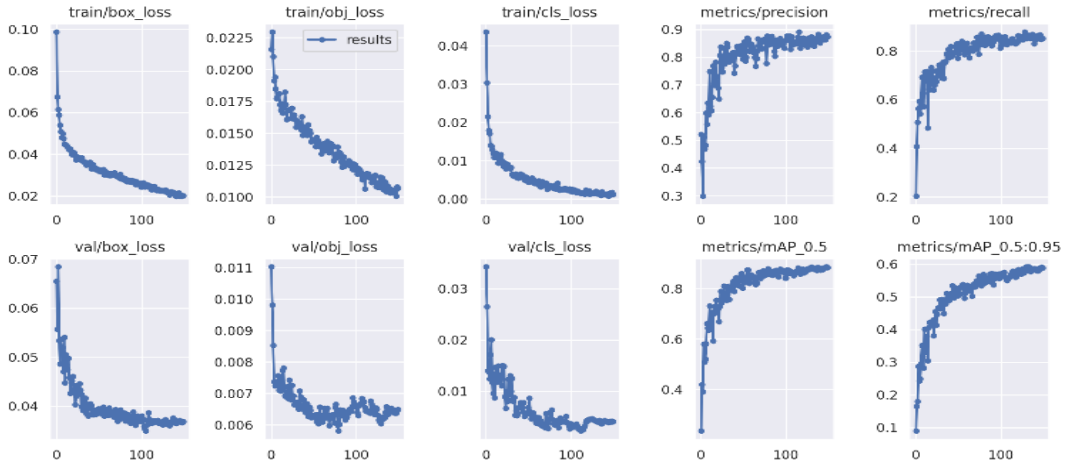

Fig. 5: Loss Graph

X. CONCLUSION

This model has produced results that are correct. Anorange frame is created to emphasize the area of motion when the camera detects motion. Quickly after being taken, a picture is sent to the user via Outlook. The USB Raspberry Pi camera used for this project provides clear images that make it simple to spot any suspicious activity. A sample output is shown in the below fig4.

Fig. 6: The expected classification of output

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