Mini Project Report

On

Visual Surveillance Application

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CERTIFICATE

This is to certify that,

Ms. Sakshi Pakle, Ms. Sakshi Dawale, Ms. Srushtee Ingle, Mr. Satyam Badakh has successfully completed the Mini Project report entitled **"Visual Surveillance Application"** under my guidance, in the partial fulfillment of Bachelor of Engineering (Computer) of Savitribai Phule Pune University, Pune.

Date:

Place:

_____

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Abstract

“Visual Surveillance Application” application aims to provide security feature. It will capture if any object detected moving front of screen. It will play the sound as any movement happen. It also draws a rectangle around the object that found moving. It will capture the image or video if there any movement or suspicious activity. And ring the alarm. It will store the image/video on the local disk. It can be worked with/without internet. It will consume less space. It can be used in the various fields. We aim to keep the things secure by resting the responsibility to the “Visual Surveillance Application.”

This is the security application which aims to provide the security feature to maintain the privacy and security. It will capture the frame and then it will ring the alarm and captures the pictures as their movement occurs. It is useful for the security purpose. We can use it where there is need to protect things from others. We aim to keep the things secure by resting the responsibility to the “Visual Surveillance Application.”

This system can be effectively deployed across various domains including residential security, office monitoring, warehouse protection, and other critical areas where surveillance is necessary. It provides an affordable, reliable, and automated solution to the increasing demand for security in everyday environments. By leveraging simple yet powerful motion detection and recording techniques, the application serves as a dependable virtual guard.

Ultimately, the goal of the **Visual Surveillance Application** is to offer a strong layer of security by automatically detecting, alerting, and recording suspicious activities. It aims to reduce human dependency for surveillance tasks, ensuring that spaces remain secure at all times. Through this project, we aspire to contribute to safer environments by resting the responsibility of vigilance with the **Visual Surveillance Application**.

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Introduction

"Visual Surveillance Application" application aims to provide multiple security features as per requirements. It will capture the frame and make sound if there any movement or activity happens. And ring the alarm. It will store the image/video on the local disk. It can be worked with/without internet. It can be used in the various fields. We aim to keep the things secure by resting the responsibility to the "Visual Surveillance Application." The main focus of this application is to solve social security problem by providing the security feature. It will provide the multiple features as per the movement. This is the application which provides the security to maintain privacy. We aim to keep the intruders away from our things. We aim to work provide the alert about the intruders and keep the people safe. We aim to make the application which can be used in various fields like Home, Offices, Factory, Defence and many more. This application will be used to detect the movement of the object such as intruder and then capture the frame and make sound. We provide the service to awake the people and spread awareness. In an increasingly interconnected and security-conscious world, the need for effective surveillance systems has never been greater. Visual surveillance applications have emerged as a powerful tool for monitoring, analyzing, and enhancing security in various environments such as public spaces, private properties, commercial centers, and critical infrastructures.

This project focuses on the development of a Visual Surveillance Application designed to provide real-time monitoring, automatic threat detection, and intelligent analysis of video feeds. Leveraging advancements in computer vision, machine learning, and video processing technologies, the application aims to minimize human oversight, improve response times, and enhance overall situational awareness.

The core objectives of this project include designing a robust and scalable system capable of identifying suspicious activities, detecting intrusions, tracking individuals or objects, and generating alerts for security personnel. By integrating features such as motion detection, facial recognition, object tracking, and anomaly detection, the proposed system aspires to contribute significantly to modern security solutions.

Motivation

The conventional security systems that use the surveillance cameras to monitor the property are lacks the ability to notify the security administrator in the event of trespassing. This discusses the implementation of a cost effective, intelligent security system that overcomes drawbacks of conventional security cameras by utilizing a machine learning and image processing to identify trespassers and multiple object detection in real time. Which can be helpful to aware the people. In today's rapidly evolving world, ensuring public safety, protecting assets, and monitoring critical areas have become more essential than ever. Traditional surveillance methods are labor-intensive, prone to human error, and often reactive rather than proactive.

A **visual surveillance application** leverages advancements in computer vision, artificial intelligence, and real-time data processing to transform passive monitoring into active, intelligent observation. Such systems can detect unusual activities, recognize faces, track movements, and provide instant alerts, greatly enhancing security efficiency and response times. This project aims to contribute towards smarter, more reliable surveillance solutions that not only improve security but also optimize resource management across sectors like transportation, healthcare, retail, and public spaces. The rise of advanced computer vision and machine learning technologies offers an opportunity to automate and greatly improve surveillance systems. A visual surveillance application can enable real-time detection of anomalies, unauthorized access, suspicious behaviors, or emergencies, providing faster, more reliable, and intelligent decision-making support.

By developing a visual surveillance application, we aim to contribute to safer environments, optimize resource use, and reduce the cognitive burden on human operators. This project seeks to bridge the gap between traditional surveillance methods and intelligent automated systems, setting the foundation for scalable, responsive, and smart security solutions.

Problem formulation/Objectives

- To develop the application which we can used for the purposes of security.
- To aware the people if there is any suspicious activity is detected.
- To develop the application which can run with or without the internet.
- To make sound as per the object detection.
- To spread the awareness.
- To distinguish between normal and suspicious activities.
- To implement object detection and tracking algorithms to identify and follow persons

Problem Formulation

In today's world, ensuring the security and privacy of personal and professional spaces has become a major concern. Traditional manual surveillance systems often require constant human supervision, which can be costly, inefficient, and prone to human errors. Additionally, not every location has access to high-end security infrastructure or reliable internet connections. Therefore, there is a need for an affordable, lightweight, and autonomous system that can detect and record suspicious activities without requiring continuous human monitoring.

The **Visual Surveillance Application** addresses this gap by providing a motion-based detection system that works efficiently even without internet access. It captures real-time movement, triggers immediate alerts, and stores evidence locally, ensuring high security, minimal maintenance, and data privacy. This application aims to create a dependable security system that can operate independently in diverse environments such as homes, offices, warehouses, and restricted areas.

Objectives

- **To develop** a motion detection-based security application that monitors real-time activities through a camera feed.
- **To detect and highlight** any moving objects by drawing a rectangle around them.
- **To generate an audible alarm** whenever a movement is detected to alert the concerned individuals immediately.
- **To capture and store** images or videos of any detected movement on the local disk for future evidence and analysis.
- **To ensure offline functionality** by minimizing dependency on internet connectivity for capturing and storing surveillance data.
- **To optimize storage usage** by ensuring that captured data consumes minimal disk space.
- **To create a lightweight, efficient, and user-friendly application** suitable for various security needs in different sectors.
- **To provide a cost-effective security solution** for places that cannot afford or do not require high-end surveillance systems.

Literature Review

Name Of Confere/Journal	Author name, / Year	Paper title	Proposed method	Advantages of the system	Limitations
ICICV 2021	Suraiya Parveen, Javeria Shah	A Motion Detection System in Python and OpenCV	Motion Detection, OpenCV, MATLAB	Detects unusual movement in everyday life	Captures the frames only rather than storing it.
IEEE 9th Joint International Information Technology and Artificial Intelligence Conference 2020	Mingrui Zang1, Wenbing Zhao1.	Shadow Detection Of Moving Objects In Traffic Monitoring Video.	Gaussian mixture modeling, ViBe, frame difference method, Etc.	Detects shadows in videos	Sometimes fails to recognize shadows
IC4ME2 2019	Hasan Hashib, Md. Leon, Ahmed Mortuza Salaque	Object Detection-Based Security System Using Machine Learning	OpenCV, Raspberry Pi, XML, MATLAB.	Detects faces and bags, alarms on detection	Few training images, leading to false detections
International Conference on Communication and Signal Processing 2018	Apoorva Raghunandan, Mohanam Pakala Raghav, H.V. Ravish Aradhya	Object Detection Algorithms For Video Surveillance Applications	OpenCV, MATLAB	Useful in security, defense, and healthcare	Does not store detected objects

Recent studies have explored various approaches to enhancing visual surveillance systems using different technologies and methodologies. Parveen and Shah [1]
Developed a motion detection system utilizing Python and OpenCV, focusing on lightweight, real-time motion detection through background subtraction and frame differencing, suitable for small-scale surveillance applications. Addressing another challenge, Zhang et al. [2]
Proposed a shadow detection method to improve the accuracy of moving object detection in traffic monitoring videos, effectively separating shadows from actual objects under varying lighting conditions. Strbac, Gostovic, and Lukac [3]
Extended object detection capabilities by applying the YOLO algorithm across multiple cameras, enabling both real-time detection and distance estimation, which is critical for large surveillance areas with overlapping fields of view. On the hardware side, Hashib, Leon, and Salaque [4]
Presented a cost-effective security system combining machine learning algorithms with Raspberry Pi, demonstrating that affordable, portable surveillance systems can be implemented without sacrificing essential detection capabilities. Finally, Raghunandan et al. [5]
Offered a comparative analysis of popular object detection algorithms, including Faster R-CNN, SSD, and YOLO, highlighting that while YOLO is optimal for real-time surveillance due to its speed, algorithms like Faster R-CNN provide superior detection accuracy, albeit with higher computational demands. Collectively, these studies emphasize the importance of balancing accuracy, computational efficiency, and cost in the design and implementation of modern visual surveillance systems.[6]

Feasibility Study

This project aims to provide the security features as per the requirements. We can use the application in various fields. We aim to maintain the privacy and security of the people by using this application. We need this application as we provide the security features which we can use to maintain the privacy and security. We can use the features of the application. We aim to capture the frame, ring the alarm. We aim to ring the alarm if there is any suspicious activity is captured in the camera. We can use this application to provide the security and maintain the privacy.

We used Image Processing for implementation of the project. We use the camera to capture the frame. We will use Speaker to ring the alarm. We will implement the project using Python OpenCV. The proposed project on developing a visual surveillance application aims to create an intelligent, automated system capable of monitoring environments through video feeds, detecting unusual activities, and enhancing security measures. The feasibility of this project is supported by several technical, economic, operational, and legal factors. Technically, the project is highly feasible as it leverages advances in machine learning, computer vision, and edge computing. Technologies such as deep learning models for object detection (e.g., YOLO, Faster R-CNN) and behavior analysis algorithms have matured significantly, providing reliable tools to build the core of the surveillance system. Moreover, the availability of high-quality cameras, GPUs, and cloud infrastructure makes real-time video processing achievable even with moderate resources. Economically, the project presents a strong case for investment; with increasing demand for security solutions in public and private sectors, the potential for revenue generation and cost-saving through automated monitoring systems is considerable.

The initial investment in development and deployment is expected to be offset by the reduction in the need for human guards and the increased security efficiency. Operational feasibility is also positive, as the system can be integrated into existing security infrastructures with minimal disruption. With user-friendly interfaces and scalable backend architectures, the application can be customized for various environments such as corporate offices, public spaces, schools, and residential areas. Additionally, the application could offer advanced features like facial recognition, crowd analysis, and license plate recognition to further enhance its utility.

Flowchart

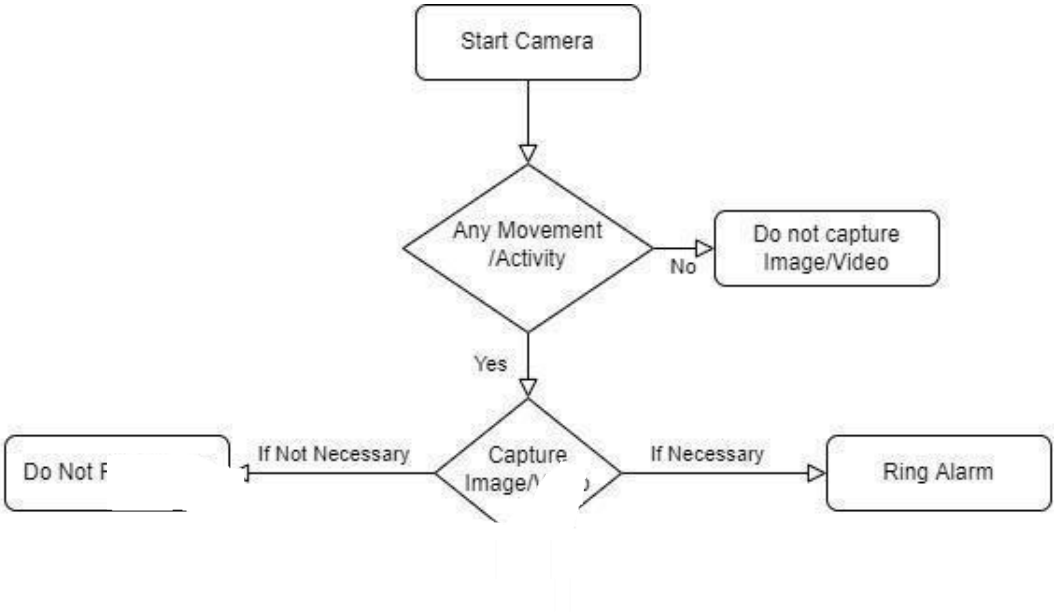

Fig. Flowchart For Visual Surveillance Application

System Requirements

1) Software Requirements :

Python.

Visual Studio code.

Pycharm.

Jupyter Lab.

Modules :

OpenCV

WinSod

2) Hardware Requirements :

RAM : At least 128 MB. Disk

Space : Min 250 GB.

Processor : Minimum Pentium 2 266 MHz processor.

Camera.

Speaker.

Software Requirements

The development of the **Visual Surveillance Application** requires a Python programming environment due to its flexibility and strong support for computer vision libraries. Integrated Development Environments (IDEs) such as **Visual Studio Code**, **PyCharm**, and **Jupyter Lab** are utilized for writing, testing, and executing the code efficiently. These IDEs provide a user-friendly interface and support for real-time debugging, making the development process smoother. The major modules required for the application include **OpenCV**, a powerful library for image and video processing, and **WinSOD**, which assists in handling motion detection and related operations.

Hardware Requirements

For the successful deployment and execution of the **Visual Surveillance Application**, basic hardware requirements need to be fulfilled. The system should have at least **128 MB of RAM** to handle basic processing tasks and a minimum **disk space of 250 GB** to store captured images and videos without running out of storage quickly. A **Pentium 2 processor with a speed of 266 MHz or higher** is sufficient for running the application effectively. Additionally, external hardware like a **camera** is essential for capturing real-time video feeds, and a **speaker** is required for generating audio alarms upon detecting any movement. These basic hardware components ensure the proper functioning of the surveillance system while keeping the setup cost-effective and easily accessible.

Program Code

```
import cv2
import winsound
cam = cv2.VideoCapture(0)
while cam.isOpened():
    ret, frame1 = cam.read()
    ret, frame2 = cam.read()
    count = 0
    diff = cv2.absdiff(frame1, frame2)

    gray = cv2.cvtColor(diff, cv2.COLOR_RGB2GRAY)
    blur = cv2.GaussianBlur(gray, (5, 5), 0)
    _, thresh = cv2.threshold(blur, 20, 255, cv2.THRESH_BINARY)
    dialated = cv2.dilate(thresh, None, iterations=3)
    contours, _ = cv2.findContours(dialated, cv2.RETR_TREE,
cv2.CHAIN_APPROX_SIMPLE)
    for c in contours:
        if cv2.contourArea(c) < 5000:
            continue
        x, y, w, h = cv2.boundingRect(c)
        cv2.rectangle(frame1, (x, y), (x+w, y+h), (0, 255, 0), 2)
        winsound.Beep(2000,400)
        print("Movement Detected")
    if cv2.waitKey(10) == ord('q'):
break
cv2.imshow("Cam", frame1)
cam.release()
cv2.destroyAllWindows()
```

Output

Fig. Movement Detection

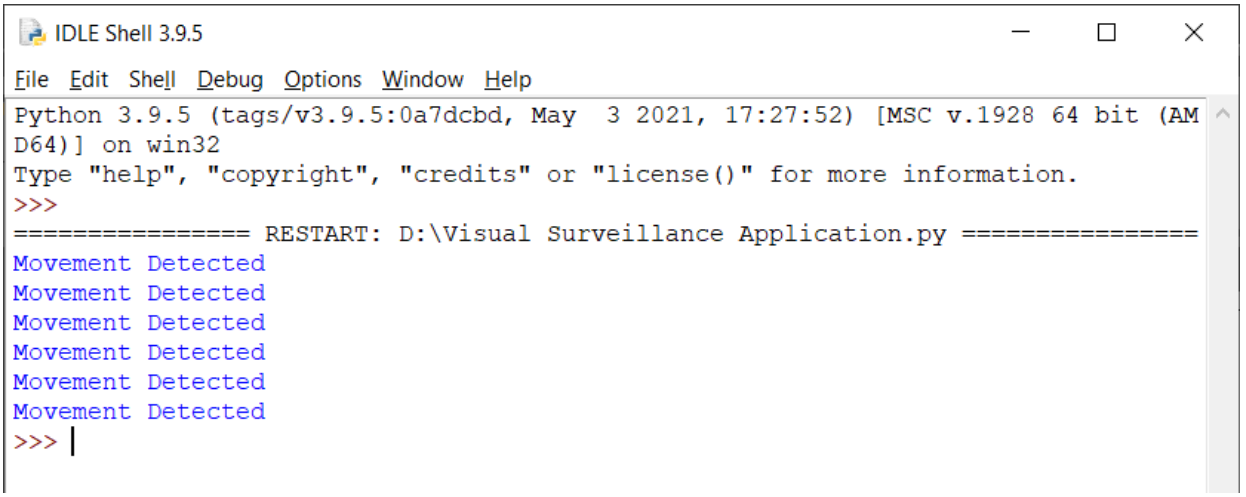

Fig. Detection Message On Console

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