Smart video surveillance system

ISE Project Report

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Revision History:

|  |  |  |  |
| --- | --- | --- | --- |
| Name of Person | Date | Description of change | Version |
| Abrar Ul Abdin | 08/01/2022 | Document Created | 1.0 |
| Sahil and Mushahid | 10/02/2022 | Added Non-functional requirements | 1.1 |
| Faiq Nawaz | 11/02/2022 | External Interface Requirement | 1.2 |

1.0 Introduction

The project Smart Video Surveillance System is an automated surveillance system for general use in surveillance necessities. It eases the tasks of the security personnel and related authorities.

The main Objective of this project is to provide the solution for security and surveillance which involve monitoring of CCTV recording and streaming on a 24×7 basis to carry out those security related tasks. The CCTV camera is a video camera that streams images at real time.

This software is a desktop-based application and can be used in the cross-platform environment. It also provides a clean and user-friendly interface to the users.

* 1. ***Purpose***

This document describes, the constraints, document conventions, product scope, perspective, operating environment, system features, non-functional requirements and all other dependencies needed and used in SVSS*.*

* 1. ***Project Scope/Product Features and system features***

The final product will enable the users to automate the surveillance functions using Object Detection and on-time Notification while providing many cost benefits.

The Object Detection will be of certain predefined limited objects and will be defined as initial timing of system by the user.

* 1. ***References***
* [1] Commercial Video Security Products

https://www.supercircuits.com/security-nvr-storage-calculator

* Divya, P., S.Shalini, R. Deepa, & Baddeli Sravya. (2017). Inspection of suspicious human activity in the crowd sourced areas captured in surveillance cameras. *International Reasearch Journal of Engineering and Technology (IRJECT)*.
* Kumar, H., Bhattacharya, S., Thomas, S. S., Gupta, S., & Venkatesh, K. (2015). Design of Smart Video Surveillance System for Indoor and Outdoor Scenes.
* Miao, Z., Zou, S., Li, Y., Zhang, X., Wang, J., & O B, M. H. (2016). Intelligent Video Surveillance System Based Moving Object Detection and Tracking. *International Conference on Information Engineering and Communications Technology (IECT).* College of Command Information System, PLA University of Science and Technolog, Nanjing, China, 210014.
* Rai, M., Hussain, A., Maity, T., & Yadav, R. K. (2014). Advance Intelligent Video Surveillance System (AIVSS): A Future Aspect.

**2.0 Overall System Description**

***2.1. Project Perspective***

The evolution of video technology can be traced back to 1895 to the first camcorders in the 1980s; the whole concept of video has gone through a paradigm shift. Today, the concept of video has reached a different level to 4k resolution and stereoscopic 3D graphics. The pioneers of video technology have continued to invent the new and exciting way to create and capture moving images for better quality. Video was first developed for mechanical television systems that got upgraded to cathode ray tube systems and later it was replaced by flat panels of different types with better display and output quality.

With the advancement in technology, the whole concept of video has changed and reached a dimension of modern digital output which not only provides better quality but also enhances interactive features.

Moving object detection plays an important role in other related fields as in computer vision research (Miao, et al., 2016).Object classification in videos is also very important for applications in intelligent visual surveillance system. The video surveillance systems has become an important area of research due to increased demand for security (Rai, Hussain, Maity, & Yadav, 2014). The process of classifying objects into predefined and semantically meaningful categories using its features is called object classification.

A surveillance system is a system capable of capturing images and videos that can be compressed, stored or sent over communication networks whereas an object classification system is the system that separates the objects based on some predefined attributes. An Intelligent Video Surveillance System censored the performance, happenings, or changing information in terms of human beings, vehicles, indoors, outdoors and any other object from a distance by using an electronic equipment such as camera (Rai, Hussain, Maity, & Yadav, 2014).

Few years back many organizations were in great trouble with the storage problem. A single camera, which records and streams video twenty-four by seven, required huge storage capacity to save the recordings. Organizations had to install big hard drives and storage servers to keep this work going. Now technology has changed drastically.

During these drastic changes different devices have been introduced and it has changed the standards and that change has produced several issues in the devices or the systems.

***2.2 User Classes and Characteristics***

The researchers have proposed smart surveillance systems with additional features for more accurate monitoring of events, but much attention is paid to make an efficient system that utilizes minimum resources (Kumar, Bhattacharya, Thomas, Gupta, & Venkatesh, 2015). This system is going to make the changes in conventional surveillance systems and add the multiple different capabilities like; Object detection, On-time Notification and Video Recording (Up-on the specified object detection)

The system will address to these problems by providing the system with the capability to intelligently monitor the objects appearing in front of the camera and make decision of recording based on the judgement criteria specified by the user. In this way only specific type of object will be recorded and rest frames will be ignored by the system. Discarding the unconcerned frames will cause to reduce video size which will impact in both storage as well as cost reduction.

The system smartly monitors the video frames and identify objects and notify user when any user specified object is detected which will provide some relaxation to the person monitors streaming. Last but not the least problem of scanning time. In existing passive system, the entire recording is scanned/browsed to find any specific event / object in the saved video. The system provides solution to this problem by recording only concern frames which will save scanning/browsing time and the event in which user is interested can be find with minimal efforts.

The end product would be a system that is Smart and autonomous. It won’t need a person for its most of the operations.

***2.3 Operating Environment***

This system will work on common machines people use in their routine. Minimum supported hardware recommended is core i3 with 8GB RAM. Other things included in operating environment are following:

* Operating System: Windows and Linux
* Runtime monitoring: Camera (Medium level pixels camera is recommended)
* Program execution: Python (3.7 is recommended)
* Image pre-processing: Open CV library
* GUI: Kivy or Python Tkinter Python Libraries
* Camera connection: Drivers compatible with OS

***2.4 User Documentation***

User manual will be made available for help. Also, this will represent as a full backup of the system. The user manual will contain detailed information about the usage of the product from a layman perspective.

***2.5 Assumptions & Dependencies***

* + User have sufficient knowledge of operating systems mentioned in section 1.9
  + The users know the English language, as the user interface will be provided in English
  + User is able to connect cameras with the system and able to install its drivers

**3.0 External Interface Requirements**

***3.1 User Interfaces***

Our system contains different requirements for its various interfaces. These requirements can be understood better with the help context diagram below.

**DFD:**

A close up of a map

Description automatically generated

***3.2 Hardware Interfaces***

This project intended to user common computer hardware that people use in their daily routine work. Cameras should be compatible with the operating system installed on the computer

***3.3 Software Interfaces***

Following are the software to be used for Smart Video Surveillance System (SVSS)

|  |  |
| --- | --- |
| *Software Used* | *Description* |
| *Software Platform* | Desktop based application is chosen because of high processing task. Users also prefer to browse videos in large screens to find specific information from the video that also influence us to choose this environment. |
| *Keras* | Keras is widely used library for neural networks. This system will use Keras for model training. |
| *Anaconda* | Anaconda IDE is chosen for developing application’s demo. Jupyter notebook will be used for writing code. |

**4.0 Non-functional Requirements**

So far, we have identified following non-functional requirements. We think while working on this software, we will encounter some more non-functional requirements and, will add the time.

***4.1 Performance Requirements***

The system must be interactive, user friendly and the delays involved must be less. So, in every action-response of the system, there are no immediate delays.

In real time video surveillance, system should be fast enough to capture and process every frame efficiently. While storing frames system must be capable of properly store frames in the form of video. Notification should be fast enough so that user can take appropriate actions.

***4.2 Safety Requirements***

Not-Applicable

***4.3 Security Requirements***

As we all know that everyone need security. In most of the cases, security is very critical in which cameras play a vital role to monitor environment. Surveillance system should fast and intelligent enough to restrict any unwanted person in restricted areas.

**5.0 Project Schedule and Budget Schedule**

***5.1 Gantt Chart***

***5.2 RACI Matrix***

***5.3 Budget***

Estimated project cost: 5000 USD

**6.0 Appendix**

Sequence Diagrams

A screenshot of a cell phone

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Flow chart

A close up of text on a white background

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Class Diagram

A close up of a piece of paper

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Use case diagram

***A close up of a map

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**Data Flow Diagram:**

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**7.0 Team Members**

Abrar Ul Abdin (CS191007) Team Lead

Faiq Nawaz (CS181019) Supervisor

Sahil Birjani (CS172020) Software developer 1.1

Mushahid Khan (CS182038) Software developer 1.2