WWW.IJRPR.COM

**International Journal of Research Publication and Reviews**

Journal homepage: www.ijrpr.com ISSN 2582-7421

# Survey on Video Surveillance Systems

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**ABSTRACT—**

In recent years, application-oriented studies focusing on video surveillance systems have attracted a lot of attention. The most recent research aims to include artificial intelligence, image processing, and computer vision capabilities into video surveillance applications. The use of video surveillance is growing in importance as businesses try to protect their physical and financial assets. New needs for scalability, capabilities, and capacity are being driven by the need to watch more people, places, and objects as well as a desire to extract more insightful information from video data. The capabilities of conventional analogue video surveillance methods cannot keep up with these demands. Fortunately, new methods of with a focus on autonomous surveillance, gathering technological developments in surveillance systems developed from various techniques. This paper addresses some of the approaches for video surveillance systems. It provides a thorough examination of such systems and the related components

**Keywords— Image processing, Insightful information Autonomous surveillance, Conventional analogue.**

## I. Introduction

In any Surveillance System Automatic detection and recognition of objects is of most important for this type of surveillance security systems. Automated video surveillance focuses on the real-time observation of objects in a constrained environment. Outside surveillance systems must be able to detect and track moving objects in their view field, as well as classify and detect some of their activities. Surveillance systems are responsible for monitoring stationary and moving objects in a specific scene in real time.

In order to achieve the appropriate security, today's institutions need a number of individuals who have received specialized training. These employees make mistakes that could lower the security level because they are fallible human beings. An excellent option for home security that can serve as a deterrent and a recovery tool is a home security camera system. Properties with clearly visible security cameras raise the ire of burglars. Security cameras can also assist in gathering evidence if a crime is committed.

Video surveillance is attractive research area in artificial intelligence, computer vision and digital image processing. Closed-circuit television (CCTV) was an expensive and unreliable way to watch events unfold in real time. Video surveillance system provides safety and security in public places. The main problem encountered in video surveillance is low resolution quality of the scenes obtained. Surveillance system depends on human operators who detect some useful activities in a video scene. Current state of surveillance systems involves human operators to sit and monitor everything carefully for any kind of suspicious behaviour. This process of monitoring goes on for 24x7 and even then slight mistakes or lack of concentration can lead to the bypass of the surveillance system by criminals.

## II. Video Surveillance for Real-Time Applications

M. Sahasri et al. [1] presented increasing need for safety and security everywhere. The prevalence of surveillance cameras has recently grown to address this issue. However, manually storing and keeping track of the obtained data on a continuous basis is challenging. There are various methods to complete this task without requiring human involvement. The fundamental idea behind each of these techniques is the identification, segmentation, and tracking of moving objects in the live stream. This is a particularly difficult process because it takes into consideration the noise, object occlusions, and their intricate structures. The object detection system based on cascade classifiers and an adaptive background modelling system are combined in a novel way in this paper for use in video surveillance.

The surveillance system presented in this paper can detect and track moving objects in a video sequence and is resilient against temporal illumination changes. The system also adapts itself to long lasting changes in the background over time. Surveillance System: The security system described in this study can recognize and track moving objects in a video stream and is resistant to changes in temporal illumination. The system gradually adapts to ongoing changes occurring in the background. a surveillance system.

Ľuboš OVSENÍK et al. [2] reviews numerous video surveillance technologies that are already in use. Video surveillance systems must support security personnel in monitoring and tracking actions because of the increasing volume of security footage. Target detection, tracking, and classification are the objectives of surveillance applications. In this study, object modelling, activity analysis, and change detection are discussed. Additionally, we shall outline the design of our video surveillance system in this essay.

A CCD camera's video output is included in this publication. The output of this video will be separated into video sequences, which will serve as the input for the preprocessing procedure. We will utilize the tracker to recognize moving objects in the background, detect heads, and locate luggage. Motion detector, head detector, shape tracker, and region tracker were the blocks that made up the tracker. The recognition block will recognize tracking output. Nils Siebel's People Tracking algorithm is used by our system. The Reading People Tracker is software that locates individuals in camera photos for the purpose of visual surveillance. It was developed through research on autonomous video surveillance systems for crime prevention and people tracking

## III. Classification of Objects and Tracking

Visual surveillance system helps to detect as well as to track objects to know the behavior of objects with multiple cameras. There are various technologies like CCD cameras, night vision cameras, goggle, and thermal imaging cameras. Object Tracking is used to find the area where objects are available and shape of objects in each frame. An intelligent surveillance system extracts information from large scale data set. Video surveillance is an attractive research area in artificial intelligence, computer vision and digital image processing.

The main aim of Video surveillance system is to solve different kinds of problems such as object detection, object tracking and pattern recognition. Surveillance system depends on human operators who are able to detect some useful activities in a video scene. An automated visual surveillance system consists of motion detection, object tracking, and person identification [4]. Various features in biometric such as face and style of walking or non-biometric features such as appearance can be used for person recognition. If we use multiple cameras then various problems occurs such as camera calibration and object matching.

There are three generations that are given as follows: 1GSS, 2GSS and 3GSS. 2GSS and 3GSS are based on analog and digital surveillance systems. 2GSS is used to resolve the problems of bandwidth and filtering out false events. W4 is a real-time video surveillance system. The views system is used as a three-dimensional vehicle tracking system.

Algorithms are mainly used to extract features to recognize instances of an object. The object detection categorized as follows: Model-Based System, Image Invariance Method, Example-based Learning Method and Static Object Detection. The main areas of application of this type of object detection are computer vision and object recognition. Each object in the system has 3 attributes: Age-Age records the number of frames that an object has not moved.

Type –Type represents the status of objects and can be new, matched and occluded. There are three criteria for matching such as shape, position and intensity [4]. If an object does not match well but it overlaps with other objects from previous frames then it is called a 'new object'. The old and has a duty a little time in a thing or a mime the glow of the load at saint be added in a sumo where you'd like this might be now you have are meant binary code toxic widely denounced.

A video surveillance system is helpful in identifying suspicious activity by providing some important information, such as shape and size, human conduct. In this survey work, many stages of object recognition and tracking have been discussed. Moving object detection techniques include background subtraction, optical flow, and frame difference, whereas static object detection criteria include similarity in position and shape, similarity in intensity, and similarity in edges. In comparison to frame difference and optical flow, background removal is the easiest method for identifying moving objects because it gives comprehensive information about the targets.

The idea of object tracking is also discussed in this survey study. This concept can be carried out utilizing a variety of techniques, including point tracking, kernel tracking, color, edges, and texture [6]. In order to monitor items, two methods are used: the first method relies on correspondence matching, and the second method relies on distinct tracking. A multi-object tracking system that is divided into three components visual tracking, track management, and online model learning is also included in my description. The study activity that is being proposed will make an effort to create and develop algorithms for reliable object detection and tracking in the future. This survey paper's main drawback is that it is useless in situations where object detection calls for higher key frames. Another drawback is that it cannot monitor moving objects in denser situations, such as moving crowd of people.

Video surveillance systems obtain a great interest as application-oriented studies that have been growing rapidly in the past decade The purpose of this systematic literature review is to identify and analyze research interest development, datasets, models, and proposed frameworks used in video surveillance system .We have shown that the research topics most currently analyzed based on selected primary studies reveal that video surveillance system research focuses on three topics and trends, i.e. the visual surveillance method, intelligent and integrated video surveillance, distribution, and communication and system design for video surveillance. In addition, we have also discussed publicly on the available datasets that were built for testing the methodology proposed by the authors.

The states-of-the-art of the method that is widely applied in every problem-solving visual supervision is focused on three main tasks, i.e. detection, tracking, and recognition of activities or understanding behaviour [5]. We attempt to explain the algorithm or method used to detect human motion in video with the highest recognition rate and the lowest computational cost. The comparison of backdrop modelling algorithms is done in terms of

computational time and the intensity assigned to each pixel. The five methods most widely applied in visual surveillance systems are Deep Learning, Gaussian, Support Vector Machine (SVM), Fuzzy Logic, and nearest neighbor.

## IV. AUTOMATIC VIDEO SURVEILLANCE

Fereshteh Falah et al. [7] provides a comprehensive and well-organized study of the 2010–2011 literature on video surveillance systems. The analysis was culled from internet digital repositories. The six-layer framework, which consists of the Concept and Foundation Layer, Network Infrastructure Layer, Processing Layer, Communication Layer, Application Layer, and User Interaction Layer, is the foundation for the proposed categorization architecture of video surveillance systems. Video surveillance systems obtain a great interest as application-oriented studies that have been growing rapidly in the past decade. This paper provides a comprehensive and systematic review on the literature from various video surveillance system studies published from 2010 through 2019. This analysis shows that, despite the focus on the real-time aspect of the issue in many publications and studies, relatively few studies have examined the use of extracted and retrieved information for video surveillance.

This study demonstrates that there is a rising need for apps that provide monitoring in places like parking lots, shopping malls, airports, and train stations. This is due to the development, accessibility, and low cost of processors and sensors. This leads to interdisciplinary research on video surveillance systems that is connected to image analysis, pattern recognition, signal processing, embedded computing, and communication. The main goals of this review are to describe and categorize research on video surveillance systems, to construct and provide a conceptual framework to integrate, and to categorize publications in accordance with, those categories. The categorization framework was developed with the goal of classifying the papers that were gathered for this study. The six tiers of the proposed classification are user interface layer, application layer, communication layer, processing layer, network infrastructure layer, and concept and foundation layer. This study demonstrates how video surveillance system research is always progressing, although the majority of articles only address parking garages, malls, hospitals, airports, and other similar location

## V. SECURITY AND PRIVACY

Qasim M. R. et al. [3] defines the various security and privacy needs in a video surveillance system. A video surveillance system must fundamentally have components for recording, storing, and displaying video, as well as a method to transfer video data between these components and to the users. The key components of our architecture, which consists of four parts—video collection, transit, monitoring, and storage.

We may define the domain and scope for numerous security and privacy criteria that may apply to video surveillance systems using the four elements. However, to establish all the security and privacy criteria for video surveillance systems, we also need to consider the interests of the many stakeholders. The persons being monitored by the system and the owner, who commissions and maintains the system, are the two main stakeholders in all video surveillance systems. These two groups are depicted in as the two main competing forces. However, in reality, owners typically hire a guard company or another company to manage the video surveillance equipment instead of doing it themselves. This company is referred as operator.

The operators of a widespread video surveillance system may use it to gather information about a person's actions without their consent. According to a report from the United Kingdom, operators have engaged in voyeurism using video surveillance. In another BBC article, municipal employees in Liverpool used a CCTV street camera to spy on a woman's flat. With the development of contemporary video surveillance systems that offer quick data retrieval made possible by indexing and searching as well as enhanced imaging technology permitting high-resolution and zooming-in, the likelihood of such exploitation is further raised.

The privacy of the people being watched, however, is seriously threatened by the advanced functions given by these devices. It is crucial to safeguard people's privacy from inner staff members who are involved in monitoring surveillance data. We list the security and privacy requirements for a video surveillance system, as well as the difficulties and future research directions to address these requirements.

## CONCLUSION

The many surveys and reviews of the current global monitoring apparatus are covered in this paper. The fundamentals of surveillance systems are thoroughly examined, and many metrics are tested to assess the effectiveness of CCTV systems using various methodologies.

We have provided a review of the various technologies that can be used in the detection of objects in this paper. Background subtraction is a common technique used in object detection to separate foreground objects from the background. As technology continues to advance, there is tremendous potential for further research and development in object detection to improve its accuracy, speed, and robustness.

***Acknowledgment***

The success and final outcome of this project required a lot of guidance and assistance from many people, and we are extremely privileged to have got this all along the completion of first stage of our project. All that we have done is only due to such supervision and assistance and we would not forget to thank them. We owe our deep gratitude to our project guide Dr. S.S. Vasekar, who took keen interest on our project work and guided us all along till the completion of our project work by providing all the necessary information. A special thanks to our HOD, Dr. M. V. Munot for their direct and indirect contribution in this project.

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