

ANALYSIS OF SMART VIDEO SURVEILLANCE SYSTEM FOR HOSPITALS

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Abstract : *This paper presents a novel approach for smart video surveillance and automatic recognition of human activities from video sequences. The paper discusses about video surveillance systems, their applications and types of video surveillance techniques. But major emphasis is given on smart video surveillance technique because it provides video based behavioral analysis capabilities. Paper also presents a case study of smart video surveillance system in hospitals which actually improves the patient experience, for example, there can be centralized patient observation, remote monitoring of emergency departments, defend against false accidents and many more benefits can be given to patients and doctors by using smart video surveillance system.*

Keyword: *Video Surveillance, Smart Video Surveillance, Computer Vision, Artificial Intelligence, Object Tracking.*

INTRODUCTION

Machine learning and understanding of human actions is a challenging area that has received much attention within the past years. Video Surveillance is one of the active research topics in Image Processing. Initially analogue CCTV systems were used to capture the video and gather information by monitoring people, events and activities. Then the digital video surveillance systems came, which were good to capture, store and distribute video. But the task of threat detection and alarming the human operators left unresolved in these systems. For any human it becomes a challenging task to monitor the video and detect the multiple activities in real-time video for long time. Thus the Intelligent video surveillance system is emerged. The analytics software processes video flow images to automatically detect objects (people, equipment, vehicles) and event of interest for security purposes.

In real time, smart video surveillance systems detect situations in video flow that represent a security threat and trigger an alarm. Observing or analyzing a particular site for safety and business purposes is known as video surveillance. Security and crime control concerns are the motivating factors for the deployment of video surveillance cameras. Video surveillance cameras are used in shopping centers, public places, banking institutions, companies,

hospitals, homes, pedestrian identification and ATM machines. Nowadays, researches experience continuous growth in network surveillance. The reason being is the instability incidents that are happening all around the world. Therefore, there is a need of a smart surveillance system for intelligent monitoring that captures data in real time, transmits, processes and understands the information related to those monitored. The video data can be used as a forensic tool for after-crime inspection. Hence, these systems ensure high level of security at public places which is usually an extremely complex challenge. As video cameras are available at good price in the market, hence video surveillance systems have become more popular. Video surveillance systems have wide range of applications like traffic monitoring and human activity understanding. In video surveillance system we demonstrate a system which analyses activity in the monitored space in real time, and makes the events available for generating real time alerts and content based searching in real time.

VIDEO SURVEILLANCE SYSTEM:-

In the present era, virtually every municipality, agency, educational institution, mass transportation center, financial institution, utility plant and medical center must plan for threats and protect the security

of its property, employees, customers, citizens and IT infrastructure. The best way to keep an eye on each and every activity that is going on around you is to implement a video surveillance system. Organizations have used surveillance for decades as a discouragement to criminal activities such as theft, fraud, and violence. In the last twenty years, surveillance technology has been developed that not only helps organizations detect and respond to threats sooner, but also helps them focus on improving the operations.

There are many advantages of implementing the video surveillance systems. Few of them are:-

- 1) Video surveillance systems are rapidly being placed in public spaces to strengthen public safety.
- 2) The law enforcement community is increasingly relying on video surveillance for crime prevention and community safety.
- 3) Using video surveillance systems, office managers and business owners are able to monitor their employees' efficiency.
- 4) Video surveillance systems are also cost effective when compared with hiring a full-time security officer.

The three generations of surveillance are often described as:

- Analog
- Digital
- Smart or intelligent

But this paper only focuses on Smart or intelligent video surveillance systems.

Smart surveillance is the name given to the type of video surveillance which generally applies automated signal generation and pattern recognition to video cameras and sensor with the goal of automatically extracting "usable information" from video and sensor streams. Human monitoring of surveillance video is a very labor-intensive task. Detecting multiple activities in real-time video is difficult in manual analysis. Thus the Intelligent video surveillance system emerged. The analytics software processes video flow images to automatically detect objects (people, equipment, vehicles) and event of interest for security purposes. In real time, smart video surveillance systems detect situations in video flow that represent a security threat and trigger an alarm.

PEDESTRIAN IDENTIFICATION

One of the important implementations or application areas of smart video surveillance is pedestrian identification. Observing crowds and pedestrians manually in such large amount of data is cumbersome and often impractical which makes automated methods extremely favorable for this purpose. Automatic tracking of pedestrians is one of

the required abilities for computerized analysis of such videos. The density of pedestrians significantly impacts their appearance in a video. For instance, in the videos with high density of crowds, people often occlude each other and usually few parts of the body of each individual are visible. On the other hand, the full body or a significant portion of the body of each pedestrian is visible in videos with low crowd-density. These different appearance characteristics require tracking methods which suite the density of the crowd.

Various methods have been proposed to the pedestrian detection for last decades, such as Histograms of Oriented Gradients (HOG) Feature, Integral Channel Feature (ICF), SVM Classifier (SCC), and Local Binary Patterns (LBP).

The integral channel feature (ICF) can be traced back to the computer vision research. It has been used to efficiently compute the histograms of oriented gradients. The histogram can be computed by quantizing an image into multiple channels. Histograms of oriented gradients divides the original image into dependence blocks where each block is further divided into smaller cells. In each cell, the histograms of oriented gradients are computed. From the cell to block, all HOG are connected to a total histogram of oriented gradient for the original image. The SVM classifier trains a set of classifiers from simple and complex detection windows. The detection windows beyond the target are left, and the complex and hard detection windows are delivered to SVM classifier. This approach saves the computing consume and sorting time. Only the positive sample needs to compute its feature which improves the computational efficiency. The local binary pattern (LBP) is used to describe the texture of image feature. The selected pixels are considered as the threshold value which is assigned either 1 or 0. The probability value of 8 pixels is 256 and it counts the value of histograms of oriented gradients of each image area when using LBP method.

CASE STUDY OF VIDEO SURVEILLANCE SYSTEMS IN HOSPITALS

Video surveillance in hospitals can help provide high-quality, affordable healthcare. This paper, intended for hospital executives, explains how hospitals can use Smart Video Surveillance to lower costs and improve patient safety:

Following are few use cases for smart video surveillance in hospitals.

1 - Centralized Patient Observation

Healthcare facilities hire patient observers (sometimes called patient sitters) or assign staff to monitor patients at risk for falls or on suicide watch. Some healthcare facilities must ask the patient's

family to provide sitters, imposing a burden for working family members.

Healthcare organizations can lower the costs of patient observation using high-definition (HD) smart video surveillance and two-way communications. Trained staff in a central operations center can observe multiple patients over the facility's existing network, quickly alerting staff when intervention is needed.

2 - Remotely Monitor Emergency Department

- Counting the number of people who enter and exit, and alerting security personnel when crowds exceed a defined size.
- Creating an accurate count to help make sure everyone has left the building if evacuation is necessary.
- Detecting when a person crosses the threshold of a room: Hospital personnel receive an alert on a desktop or mobile device, and can either visit the room or view real-time video to see if the visitor is authorized. The system can also be programmed to send an alert if the threshold is not crossed for a defined period of time, indicating that a clinician has not checked the patient at the prescribed interval.

3 - Defend Against False Accident Claims

Unnecessary healthcare costs result from false claims filed by workers or patients reporting falls, needle sticks, and so on. Without a way to refute false claims, hospitals often must pay. By deploying video surveillance cameras in lobbies, hallways, and other areas, hospitals can refer to video evidence to defend against invalid claims.

CONCLUSION

Smart video surveillance system significantly contributes to situation awareness. Such systems transform video surveillance from data acquisition tool to information and intelligence acquisition systems. Real-time video analysis provides smart surveillance systems with the ability to react in real-time. Our system senses the intrusion and sends notifications to authorized persons so that action can be taken in response to the intrusion

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In crowded emergency departments, there is a risk that busy personnel might not notice when a patient loses consciousness in the waiting room, or when an admitted patient has not been checked at the required frequency. More risk occurs when large groups crowd the lobby to wait for news about friends or family.

Smart video surveillance analytics software serves as an additional set of eyes:

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