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Automated Video Surveillance

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Abstract - *With increased technology and population, surveillance is becoming key area in research. The best utilization of technology for the surveillance is the focus area today. The focus of the project would be to automate the detection of actions performed in front of camera. Monitoring the events on camera manually will not be possible. Even if the event had happened in the past, searching the same event in the video manually would cost a lot time. There is scope for automation which should detect those events and provide detailed textual result which can be processed easily. This project also considers effective way to store the video surveillance data consuming as small memory as possible along with smart index information. Video surveillance is an important security asset to control theft, traffic monitoring, banks, department stores, highways, crowded public places and borders.*

Key Words: *surveillance*, *automation*, search, compression, video data index.

1. INTRODUCTION

Automated video surveillance system is most important in the field of security. The task of surveillance is to detect and track moving objects in the video sequence. Now-a-days, video surveillance system is an important security asset for commercial, law enforcement and military applications. In video surveillance, detection of moving objects from a video is necessary for object classification, target tracking, activity recognition as well as behavior understanding. Automated Video Surveillance (AVS) technologies provide the capability of automatically detecting security incidents or potentially threatening events taking place within the view of cameras. Simple systems detect motion in a camera's field of view. More advanced systems offer features such as object identification, tracking and analysis, perimeter intrusion detection, and abandoned/removed object recognition.

Automatic video surveillance of dynamic and complex scenes is one of the most active research topics in Computer Vision. It aims to automatically detect, recognize and track people and objects from image sequences in order to understand and describe dynamics and interactions among them. Computer vision and video based surveillance have the potential to assist in maintaining public safety and security. Virtually all public spaces and critical infrastructures in the European Community have a multiple sensor surveillance system installed, many of which claim to have automatic surveillance features. Typical application domains for video surveillance include public areas (city streets, school campuses, museums), transport (airports, train stations, underground, motorways), retail (theft prevention, understanding shopper behavior), and financial institutions (banks and casinos).

Background Over the last few years due to globalization a major change has been occurred indifferent sectors worldwide such as business, security, health etc. One of their important sectors which are now concern worldwide is security. Due to the emergence of protecting premises, providing security is one of the most important tasks. Thus in order to providing security, video surveillance system was introduced. A video surveillance system is used to monitoring of the behavior, activity or other information generally of people in a specific area. The application of video surveillance is now not only limited to provide security of an area. Such systems are now implemented in different sectors like hospital for monitoring patient, in industry and process plant to monitor the activity of the production line etc. Generally a video surveillance system consists of a video camera for capturing video footage and a monitor to see the capturing footage. Early model of such system had some limitation. Thus in order to improve this system research has been conducted and more developed system has been arrived in the market. Current systems that are available in the market have different features such as video capturing and recording. A new feature which has been introduced in this type of system over the last few years is transmission of video footage using wireless communication. This feature has given an advantage to place this system into any area. Thus it is now possible to monitor any place where human presence is not all time attainable. It is still now expensive to build this type of system and also the implementation of such system with fully 33automation. This project aims to design and construct of a standalone video surveillance system which is capable movement detection of any object, record video footage of that object and transmits that video footage using Ad-Hoc network to a server.

Video surveillance has been a popular security tool for years. And thanks to new breakthroughs in technology, security cameras are more effective than ever before; Banks, retail stores, and countless other end-users depend on the protection provided by video surveillance; Fortunately,

advances in digital technology have made video surveillance systems far more cost-effective, flexible, and simple to operate; Security systems using IP (Internet Protocol) cameras are easy to install and maintain, and can be customized and scaled to perfectly match your specific needs.

1.1 CURRENT STATUS

(a) International Status:

Research on this topic is in boom in international market. Companies like Siemens, Samsung are investing into this project. Everyone have their own proprietary solutions in the market.

(b) National Status:

Digital India, the initiative of government of India has e-surveillance as main item in the agenda. Video surveillance is part of it. Government is very much serious about this initiative and taking it to the next level.

Video surveillance is one of the fastest growing areas of commercial application of computer vision and machine learning techniques and a very lively area of academic research.

This will provide an overview of techniques for visual monitoring, including video surveillance, meeting mining, and human activity understanding. The course examines the basic techniques of processing video from static cameras, starting with object detection and tracking. The word 'surveillance' means to observe a specific area or to monitor the activities of individual or a group. It is very useful to the government to maintain social control, monitor and recognize threats, and investigate criminal activity.

Using video cameras for monitoring and surveillance is common in both federal agencies and private firms. Most current video surveillance systems share one feature: they need a human operator to constantly monitor them. The first CCTV system was installed by Siemens AG at Test Stand VII to observe the launching of rockets. And later on, it was used for observing public area. During 1990, digital multiplexing allowed more than one camera to record at once which has increased the use of CCTV. It was commonly used in Banks to record the evidence of criminal activity. To overcome these limitations of traditional surveillance methods, a major effort is under way in the computer vision and artificial intelligence community to develop automated systems for the real-time monitoring of people, vehicles, and other objects.

1.2 BENEFITS OF VIDEO SURVEILLANCE

1) Less manpower required
2) Effective Monitoring
3) Auditing Capability
4) Cost effective
5) Ease of adopting new security trends
6) Fast processing & video processing ability

1.3 ORIGIN OF RESEARCH PROBLEM

India started using video surveillance in late 19th century. Initially it was small number of cameras which can be monitored by the responsible security person. As the use of surveillance increased from private use to the public sector like governments, municipal corporations, large companies etc. it became difficult to monitor it manually. The scope for the automation increased.

This project is combination of electronics and computer science. Good quality cameras will be connected to the high configuration computer. Camera will send the recording to the computer. Computer will perform two operations, one is to store the video and the other is to process and report the actions identified in the processing. The storing operation will use the methodologies which take minimum storage space which in turns saves cost of storage. Technology stack is yet to be decided. It will be decided based on the compatibility, fast processing, and video processing ability.

2. OBJECTIVES

The objective is to build an effective open framework which can be used across different domains and technologies. The framework has different aspects. The first aspect is to build an effective storing mechanism. It should be secure & memory efficient. From securities point of view each recording device will have an option to configure public key using which it will encrypt the video before saving it to the disk. Private Key is known to the actual owner of the security system. It means stealing the video recording device will not leave your information out. Now a day each security provider creates their own video storage format. They spend a lot money doing research on those formats. Instead we propose to build an open format with public key encryption. With this more contributors can add their ideas to the efficiency and security of the framework.
Another aspect is to detect the events from the recording. This is the most challenging part of the framework. It will include the algorithms to detect movements. Artificial intelligence will be implemented into the framework so that it can learn from the ongoing recordings. Using artificial intelligence it will have the knowledge on daily routine and it will help framework make decision about abnormal behaviour. This will also have an input, e.g. each reported abnormal behaviour needs acknowledge from human. The acknowledge input can be in the form of correctness index. With each acknowledge input framework will learn and correct itself for future decisions. With respect to time framework will deliver higher quality results. Application of this can be traffic monitoring, heart monitoring appliances, brain signal monitoring application, military appliances, home security systems, satellite monitoring etc.

Another aspect of the framework is to create a textual index from video. Using this index our framework will add a search feature which can be used to search video data of really long time. The best example of this is vehicle search. You can search if some vehicle with XYZ registration number has visited city or some area in the city. The implementation approach will use the image processing capability to capture the meta-data of video. A lot research needs to be done on this aspect to effectively gather maximum information from the recording. A benefit of keeping textual index is its storage efficiency, search efficiency, ease of applying intelligence.

3 METHODOLOGIES

Capturing –

For capturing video at the time of development a computer web camera will be used. For the final product a CCTV camera with motion detector will be used. Advanced cameras with high resolution video, noise reduction audio and night vision are best for use as it provides more inputs to search index and artificial intelligence.

Storing –

For storing the video H.265 format will be used as it stores the same video in half of the size compared to regular MPEG format. There are lots of implementations available for H.265 encoding. One example is NGCodec.

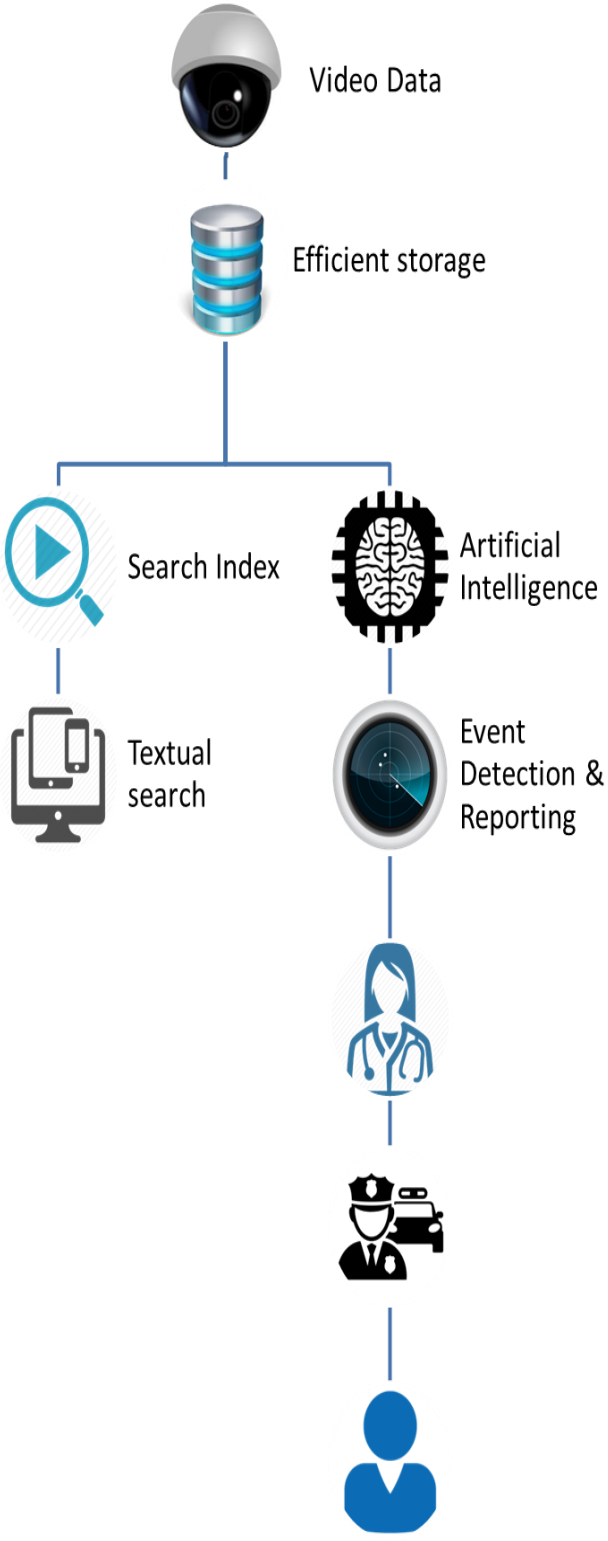
Search Index –

Matlab will be used to write a code to find the textual information from video which can be indexed and used for search. Matlabs computer vision system toolbox is a good tool for image/video processing. Audio data of the video recording will also be considered for creating search index. Audio information actually provides precise information for index. It will create the textual index of human language and known things like bomb explosion, music etc.

Artificial Intelligence –

Computer programs will be written using the best suitable language/tool which with the help of behavioral analysis can understand routine things. It will learn with respect to time and will start reporting things which are abnormal. These abnormal things will further be reported to different entities like police or doctor or an individual to analyses. The inputs from the individual will help AI program learn and make correct decisions in future.

4. DATA FLOW IN PROJECT



5. ADVANTAGES:

The presence of CCTV camera system reduces crimes.
1) Today security camera is a much needed thing to protect us and to preserve valuable properties.
2) Along with the home improvement people are spending more money for security surveillance system.
3) Security cameras are the image capturing devices varieties of security camera are found in the present day due to its increasing demand
4) Security camera creates the safety environment for the children, elder people.
5) Many companies have set up the security camera in the workplaces to measure the performance of the employee.

6. CONCLUSIONS

By using this project can build an effective storing mechanism which should be secure & memory efficient. And it will to detect the events from the recording as well as it will create a textual index from video. In this project, effectively gather maximum information from the recording takes place. It gives advantage of keeping textual index is its storage efficiency, search efficiency, ease of applying intelligence.

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