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Mobile Surveillance System with Motion Detection

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Abstract

In the traditional surveillance system there is the weakness of over-reliance on monitoring environment, poor mobility and so on. Hence we propose a monitoring scheme based on android device terminal. By collecting data at one terminal, sending data to android device terminal it reaches the purpose of monitoring the target site anywhere and anytime and enhances the flexibility of surveillance system greatly.

Keywords: Security, Surveillance System, Mobile

1. Introduction

Surveillance [1] is the monitoring of the behavior, activities, or other changing information, usually of people for the purpose of influencing, managing, directing, or protecting them.[2] This can include observation from a distance by means of electronic equipment (such as CCTV cameras), or interception of electronically transmitted information (such as Internet traffic or phone calls.

Surveillance is very useful to governments and law enforcement to maintain social control, recognize and monitor threats, and prevent/investigate criminal activity. With the advent of programs such as the Total Information Awareness program and ADVISE, technologies such as high speed surveillance computers and biometrics software, and laws such as the Communications Assistance For Law Enforcement Act, governments now possess an unprecedented ability to monitor the activities of their subjects.[3]

2. Video Surveillance

Video Surveillance is monitoring an area with the help of Video Camera(s). Video Camera is basic unit of the Video Surveillance system. Surveillance cameras are video cameras used for the purpose of observing an area. They are often connected to a recording device or IP network, and may be watched by a security guard or law enforcement officer.

Cameras and recording equipment used to be relatively expensive and required human personnel to monitor camera footage, but analysis of footage has been made easier by automated software that organizes digital video footage into a searchable database, and by video analysis software (such as VIRAT and HumanID). With cheaper production techniques, surveillance cameras are simple and inexpensive enough to be used in home security systems, and for everyday surveillance.

2.1 Traditional Surveillance System

Originally video surveillance was done based on analog technology closed circuit television (CCTV) and recording on video tapes. This was fine for recording what was going on, but it didn't broadcast actual live information, so it wasn't practical for monitoring stores, for instance, from a remote location. It simply provided what happened after the fact. The picture quality wasn't great and it relied on human reliability as well -someone had to remember to change the tapes regularly, etc.

With the Internet revolution and the ever-increasing presence of Local Area Networks, technology took great strides in video surveillance in the 1990′s. Analog camera tubes were replaced with CCD (Charged Coupled Devices) and digital cameras became affordable for most people.

This combination meant that video surveillance could do two things: go live over the Internet or a closed network for surveillance and provide clearer, crisper images that could be tracked and manipulated easily. For law enforcement, digital surveillance meant it was much easier to zoom in on images, track particular scenes and enhance features.

Although with the Internet revolution, there were some drawbacks with the Traditional surveillance system like- Keeping an eye on the monitoring site continuously, active alert system, low bandwidth for transmission etc.

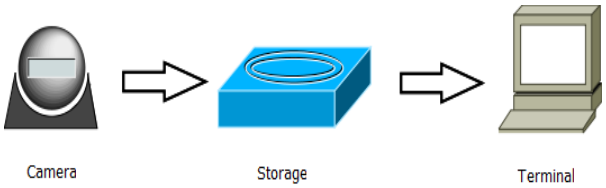

Fig. 1 Old Surveillance System

3. Proposed System

The proposed system collects data at one terminal, sends data to mobile device terminal and it reaches the purpose of monitoring the target site anywhere and anytime and enhances the flexibility of surveillance system greatly. It keeps track of the movement of the people using the motion detection algorithm implemented.

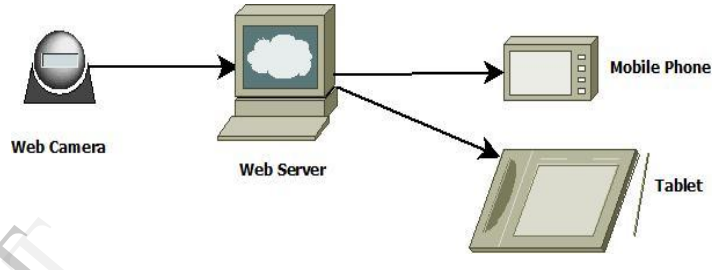

Fig. 2 Proposed Surveillance System

4. Feasibility of the project

The project development has been planned from the point of view of users' requirements in today's environment. The apparatus for this project will be only those that are easily affordable for any user. A simple computer can act as a server, with an additional webcam for the surveillance and an mobile device to deploy the application. They all will be integrated together. One of the problems that can be faced here is the power failure. To tackle this, it is suggested that an UPS be used.

This project has the advantages of mobility and no need for an observer at the server, over the traditional surveillance systems.

The cost for the entire product will be minimal because of use of most of easily available resources.

The services of this surveillance system will benefit both the residential users and corporate users.

5. Module Design

The project can be divided into two main components. One consists of a server, which will serve as a site for surveillance and responsible for detecting motion. The second will be the client, which can be any mobile device with the associated application installed. Through this application, the user will be able to view the video feed.

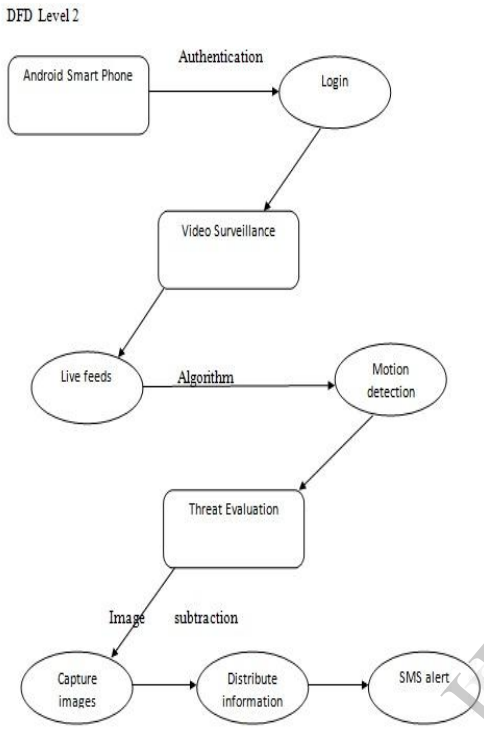

Fig.3. A Data-Flow Diagram explaining the working

5.1. Motion Detection

The objective of this module is to detect any motion in front of the camera and thus pass the control to the server. This is handled by the Image Subtraction method.

The video feed captured from the camera is converted into frames. A buffer of size three is used to store consecutive frames captured from the camera. If any substantial difference is found between the frames in the buffer, the server will flag it as motion and the recording of the video will start. Also, as soon as the recording starts, a separate sub-module at the server will alert the mobile device user through SMS.

Similarly, if no motion is detected over a period of time, the recording will stop if it has been triggered before.

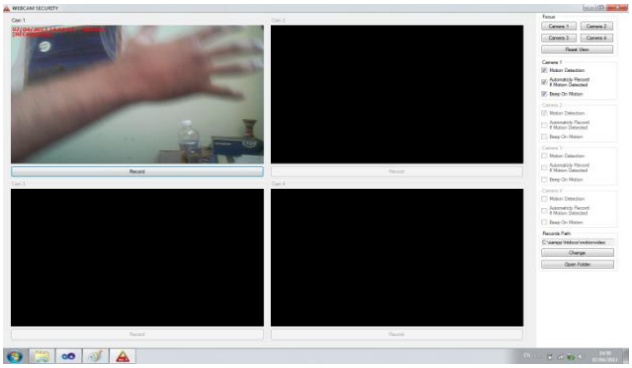

Fig.4. Motion detected on server side

5.2. Mobile Device

The Mobile device application needs to be installed on the Android device, could be either a Mobile phone or a Tablet. The mobile device user will be alerted by the means of a message/SMS, after which he/she can check the video feed from the application.

The application will access the video feed and display it on the mobile device interface.

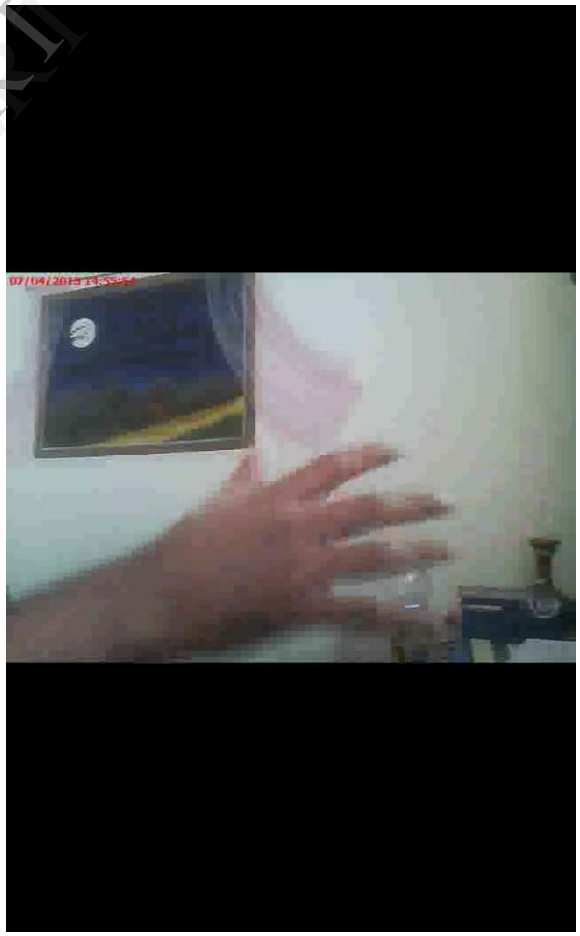

Fig.5. Video feed on the Mobile device

6. Features

6.1. Motion Detection

The video libraries will check the amount of motion that has occurred in front of the camera and with the proportion given the server will trigger the motion. The purpose behind setting the proportion for movement in the frames is to eliminate minimal movements which could set off a false alarm.

Another point to be noted is that, if night-vision cameras are used for the surveillance in the darkness, the visibility reduces even in the vision that is provided by the night-vision. This can hinder the operation depending on the frames captured by the server. That is, if in such a case the server captures frames with sudden change in the brightness of the frames, it will trigger the alarm and record the video while simultaneously alerting the Mobile device user linked to the server application.

6.2. Mobile Device

After the SMS is received by the user, the user can then access the video through the application. As the video needs to be transferred over the Internet the bandwidth available on the Mobile device should be high enough to support the video transfer.

The Mobile device application will then access the video stored at the server, which means that the video will only be buffered on the Mobile device and not saved or downloaded. The application launches the server link in the mobile browser and then it can be played in one of the media players. The video frame-rate should be increased to more than the usual 30 fps in order to make the video size smaller, thus it will be easy to transfer it to the client.

An important point to be noted is that the Android device cannot access the latest video unless it has been saved on the server. That would require the server to stop the recording in order to save the video.

If in a case, the movements in front of the camera don't stop, the server won't save it, but keep on recording it. To avoid this conundrum, it is feasible to place a session-time for the recording after which the recording will stop and hence the video can be made available to the users.

10. References

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[8] Video motion detection (VMD)