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Quick Surveillance using IP Camera

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Abstract: ***IP cameras are heavily used in every corner around the world for 24 Hr. surveillance. But in the running world it is next to impossible for an individual to sit in front of the screen for the check, also it takes a large efforts to check any suspicious activities going on as the sample (24 Hr. video) is too large. This idea focusses on reducing the data sample (i.e. 24 Hr. video) into a video sample which can be accessed within minutes. The idea works on the basic principle of screenshots. A large video of a complete day surveillance can be brought down to minutes of surveillance using screenshots thus giving a quick access to the user to skim through the entire day.***

Keywords: IP camera, Security, Image Processing, Video

1. Introduction

Samples of surveillance video can be taken by taking screenshots say, a screenshot in a minute. Using this principle a screenshot is taken at every minute of the entire day. These screenshots are saved and after completion of 24 Hr. they are compiled together in form of video. In this video the sample taken every minute is displayed in form of video, where every screenshot is shown for a 1 second. Using this a large data of 24 Hr. video can be entirely accessed within minutes. This system has immense benefits. Firstly a user can save time, user need not sit continuously for a check of day surveillance. Secondly any suspicious activities can be spotted using this system, if we consider a big security threat to be taking place in a particular area there will be signs for the same taking place in that area. Now, user may not sit for entire day to capture such activities, using this system user can spot such activity as the user just has to skim through minutes of surveillance video instead of hours. Lastly there is a large data compression as the data is down-sampled and can be stored for longer time in SISO based system memory.

2. Working Principle

Following is the block diagram of the quick surveillance on IP based system:

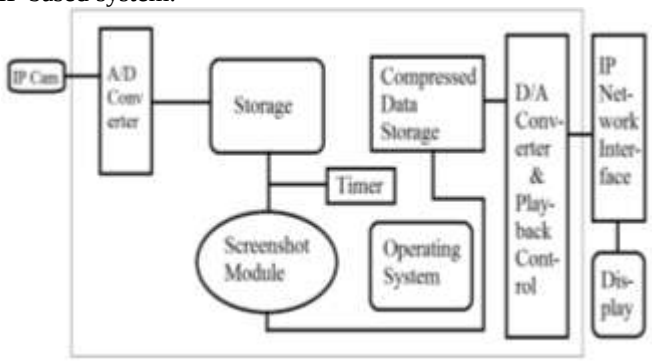

Figure 1: Block diagram of quick surveillance using IP Camera

IP Camera: It is the IP based surveillance camera which is to be fitted on the site of surveillance.

A/D Converter: The A/D converter is used to convert the analog input by the IP camera to digital output for processing. The digitized data is used because the processing, compressing and storing can be executed easily.

Storage: It is the SISO (Serial In Serial Out) based memory which is been employed to store the data. The data here is in the form of video which is been captured by IP camera.

Timer: A basic timer which is used here is employed to trigger (the trigger time can be varied according to the user, here considered trigger time to be one minute) the stored signal and screenshot module. This timer will trigger stored signal and screenshot module each minute, with this screenshot module will take screenshot after every minute and again save it on SISO based memory. The memory in which this data is saved is compressed data storage.

Screenshot Module: This is the module which will take screenshot every minute as triggered by the timer. The screenshot process is as follows: (1) when triggered the system will take note of the pixels of that particular triggered frame. (2) system makes a copy of those pixels and saves it as an image frame. In this way the screenshot is taken every minute.

Timer: A basic timer with precise crystal oscillator can be used. The timer employed should be compatible of configuring the trigger timing. The trigger timing for screenshot module can be justified by the user.

Operating system: A basic operating system can be employed which can perform the following: memory handling and storing, data flow in the system, time synchronization of each component, handling and troubleshooting of entire system, maintenance and security of the system.

Compressed data storage: This is again a SISO based memory system which will store the compressed data in form of screenshots which are taken by screenshot module.
D/A converter & playback control: This is digital to analog converter interfaced with playback control. The digital to analog converter converts the digital data in form of analog data which can be used for display. The playback control takes the each screenshot image frame and makes a video with each frame delay of one second. In this way screenshots are formed in a form of video where each screenshot is displayed for a second.

IP Network Interface: This is the basic network interface module used for sending data to various display (PC, Phone etc.) over internet. It is the kind of a router which will route the data.

This is an entirely hardware based system with software working can be handled by the operating system used.

3. Calculations

Considering a screenshot to be taken every minute: Therefore, 60 screenshots in an hour are taken:
1 hour = 60 Screenshots;
24 hour = 60 x 24 screenshots = 1440 screenshots.
Each screenshot is displayed for a second, therefore for 1440 screenshots display 1440 seconds will be taken,
Number of minutes of video = 1440 / 60 = 24 min.

Thus 24 hour surveillance can be down-sampled to a 24 minute video.

4. Expected Results

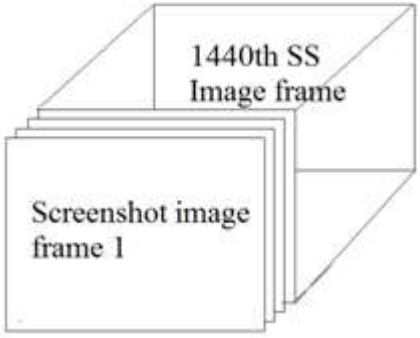

Figure 2: A 24 minute video frame of 1440 screenshots taken at every minute. Each screenshot is displayed for a second

The frame sync can be managed my playback control which will make sets of 1440 screenshot frames every 24 hour. After making a set of 1440 screenshot frames an image enhancement can be done for each screen shotted image frame. Image enhancement will enhance the image which will be best suited for user viewing. Here, a software defined image enhancer can be used, this is because not all screenshots will require same algorithm of image enhancement, different screenshots will require different types of image enhancement. Thus using software defined image enhancer different image scan be enhanced as required. After enhancing each image frame playback control assigns each frame a one second delay for displaying in the video and there 1440 frames each with a second delay form a 24 minute video surveillance.

Hardware Requirements:
- IP Camera with day and night vision.
- A/D and D/A converters.
- Memory based on SISO algorithm.
- IP Network interface (Router/Switches/Internet/IP Supported devices).
- Playback Controller device.
- Screenshot Module.
- Displays.

Software Requirement:
A basic operating system can be designed keeping in mind the following requirements;
- Time Synchronization of every module.
- Data flow management.
- IP and network interfacing.
- Data storage management.
- Maintenance and Security.

5. Summary and General Assessment

This is a general proposed idea which can be employed for security in day to day IP based surveillance. The main idea behind this system is to save users time to spot the threats wherever possible. Surveilling a 24 hour data is very time consuming and though these days we can have a live surveillance over our phones but still we are not free enough to have a check over it always. Considering to major scenarios, firstly say if any particular suspicious threat is to be taken place at a site, if the security threat is big enough it will be planned and it won't take place in a day. The signs of such threats will be seen days before it will take place. Since we do not survey a 24 hour video each day using this system a user can have a look of entire day activity in just 24mins. Using this such signs of threats can be spotted. Consider a second scenario wherein a threat has already taken place at a particular time of the day. Now the user is unaware of at what exact time has it taken place. Now using this system user can go through 24 min of entire day video and can spot at what exact time has the activity has taken place. Thus the system saves time and in such scenario quick actions can be taken. This entire idea can be implemented at a very low cost just bay adding a screenshot module and timer in the general IP based surveillance system and making minor changes in the operating system of the same.

The application of the system lies everywhere the surveilling systems are used. The data generated can be routed over IP interfaces thus making it available for multi authority accesses. Using IP interfaces the data can be stored on cloud storages. These cloud storages can be made accessible directly to security authorities say, police. The entire idea of the system is to make surveillance quick and make it accessible quickly so that actions against threats can be taken as quick as possible. This system is just an triggering edge for next level of security systems.

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