Easy and Person Surveillance Monitoring System via Cloud

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Abstract. The research presents the surveillance monitoring system, a webcam based with a program via cloud for security purpose. The interest of this particular system is to protect a person and monitor his activities in a designated and privacy or personalization environment. Detecting and tracking human motion in real time is the essential goal to understand such activities whether there is a stranger or housebreaker, where the result of interpreting this image (by the digital image processing program) will feed another system at the watcher side (with connect via cloud) to invoke necessary security precaution or action. The system captures images and stores pictures even when the intrusion does not happen. The system has features lead to easy for user connects to Internet with personal computer which has a camera (one or more) or (note book computer) at the observation area. The image processing program at observing side was written and plug to the main program. The main program was made by using Flash application for connecting the camera and cloud. PHP and HTML language for writing webpage (the member registration part) and MySQL DBMS for data contents of membus and authentication. In order to evaluate the performance of the system, tests were carried under two scenarios, in house testing in real-time with different computer and webcam under unconstrained in door environment. The tracking image with webcam program provide intelligence relating to the intrusion. This, in turn, can be used as an evidence for the event.

Keywords: Surveillance monitoring ; cloud computing; easy, personalization; security; intrusion

1. Introduction

Cloud computing is an emerging commercial infrastructure paradigm that promises to eliminate the need for maintaining expensive computing hardware. Through the use of virtualization and resource time-sharing, clouds address with a single set of physical resources a large user base with different needs. Thus, clouds promise to enable for their owners the benefits of an economy of scale and, at the same time, reduce the operating costs for many applications [1]. In principle cloud computing can deliver existing types of computer services. Virtualisation is a key enabling technology for cloud computing and scalability. Virtualisation can take place at both the platform and application level, making it easier for researchers to develop and use new applications while hiding the complexity of the low-level infrastructure and reducing manageability overheads [2]. In Thailand, the performance of the production cloud services offered by ISP over time can alter significantly the performance and cost profiles of large-scale and different applications. This leads to implement a surveillance monitoring system via cloud.

The surveillance monitoring system is a system that notifies the security breach in the premises or detects unwanted intrusion at a secured place. This can also be enhanced to capture images to track down criminals. Researcher developed a low cost system using a personal computer or notebook computer as the standard hardware platform for connecting to Internet. This is connected with a webcan for collecting the image of the intruder. Researchers wrote down the digital image processing program for taking the picture from the webcam. The written program provide the member registration and simple steps for observing side. The program connected to the webcam is devided into 2 parts : the live video and the recorded capture image part. Image obtained is processed by applying image enhancement algorithms for motion detection system.

The tracking image (with webcam) program provides significant variants security breach such as hitting an alarm and trap generation to the watcher side.

2. Cloud Programing and Some Research

Cloud computing is a technology that uses the Internet and central remote servers to maintain data and applications. Cloud computing allows consumers and businesses to use applications without installation and access their personal files at any computer with Internet access. This technology allows for much more efficient computing by centralizing storage, memory, processing and bandwidth. A simple example of cloud computing is Yahoo email, Gmail, or Hotmail etc. We don't need a software or a server to use them. All a consumer would need is just an Internet connection and we can start sending emails. The server and email management software is all on the cloud (Internet) and is totally managed by the cloud service provider Yahoo, Google etc. The consumer gets to use the software alone and enjoy the benefits. Cloud computing is broken down into three segments: "application" "storage" and "connectivity" Each segment serves a different purpose and offers different products for businesses and individuals around the world. In June 2011, a study conducted by VersionOne found that 91% of senior IT professionals actually don't know what cloud computing is and two-thirds of senior finance professionals are clear by the concept [3], highlighting the young nature of the technology. In Sept 2011, an Aberdeen Group study found that disciplined companies achieved on average an 68% increase in their IT expense because cloud computing and only a 10% reduction in data center power costs [4]. Many production clouds, including the largest publicly-accessible commercial clouds such as the Amazon Web Services and the Google App Engine, use virtualized resources to address diverse user requirements with the same set of physical resources. Virtualization can introduce performance penalties, either due of the additional middleware layer or to the interaction of workloads belonging to different virtual machines.

There are some researchs and achievement about cloud. The research namely "Designed CAMEO, a framewok for continuous analytics for massively multiplayer online games (MMOGs) using cloud resources", the finding finds that : continuous for MMOGs on cloud resources is feasible and shows good premise of being cost effective [5]. The research namely "within edutain@grid, analyzed the fesibility of running massively multiplayer online games (MMOGs) on cloud resources", the researchers have analyzed [6, 7] the potential gains of running MMOGs on cloud resources, based on an ideal cloud/data center model. The researchers have started to investigate [8], the impact of virtualization on running MMOGs on cloud resources. The finding finds that Dynamic resource allocation from clouds can lead to a tenfold reduction of the platform operation costs for massively multiplayer online games (MMOGs) [6,7].

Two security issues advantages for users when using cloud resources, the first issue, user need not run (or update) the program, since the setting can be updated every second as cloud providing. The second issue, users resources such us memory will not be wasted since cloud do the path finding via remote server.

3. Surveillance and Monitoring Issues

There are many questions asking; why do we need such a home (office) video surveillance system? The answer is simple. Such a tool gives us peace of mind. It has almost all webcam security features. And with the addition of remote streaming and video broadcast capabilities, many scenarios can be accomplished, here are two possible scenarios. We are in the office and worried about home, could there be someone who sneaked into our room? The webcam is the total solution. The watcher program running on home PC attached with the webcam will monitor any motion detected. It will call our hand phone or office phone or email us when a motion is detected. Upon receiving such a call, we can immediately launch our Internet explorer to check out images published by our webcam. We can also launch our webcam software in our office and connect to Internet to check out what's going on at our home by watching real-time video. Even if we cannot use the software at that time, the program will record the event into video clips for us to view later. Another example such as, both we and our wife are busy and cannot take care of 3-months old baby during the day. Only the maid looks after the baby after both of we left home for work. But we love our baby so much and want to take a look at her/him from time to time to make sure that everything is all right. Using the webcam software at our home together with the Internet running at our home PC, we can do it anytime,

alternatively, put watcher in broadcasting mode, and use Internet Explorer to view what's going on from anywhere in the world. From many reasons, so a   webcam for home (or indoor) security with a remote viewing features has in the news lately. It is positive and shows the amazing life saving power of a home security surveillance camera. So this research concerns the issue that the system can easily be figured as an inexpensive multi-cam solution. The system has the broadcasting capability, where the user can broadcast the images captured from the webcam on to the Internet. Moreover, broadcasting can be performed simultaneously with monitoring.

4. Methodologyand Result

4.1. The Overview of the System

The users can watch the screens of any computers they are monitoring, all from Internet. This works as if we have a surveillance camera pointed directly (or wide range scatter around) at the concern area, capturing anything or anybody does online from that side, and transmitted LIVE to the watchers' computers for permission persons to watch. It can record the activities and provide to broadcast on a single computer or for multi-user monitoring computers. The system consists of hardware and image processing program which are in fig. 1.
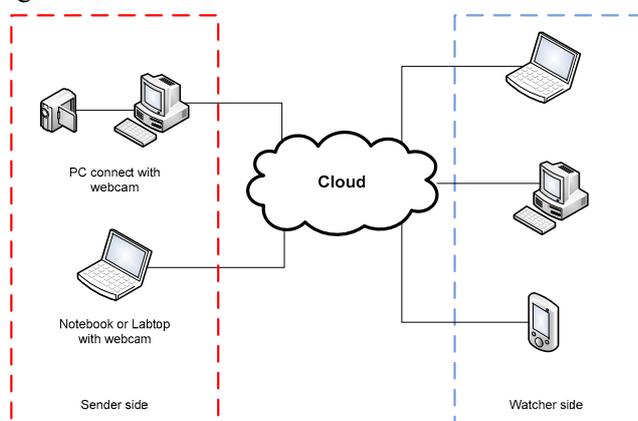

Fig. 1: Scenarios of the system for surveillance monitoring.   Fig. 2: The homepage of the program.

The written program (which are the website and motion detection technic of the image processing program) must be called on the sender side computer from Internet. The system uses the programs and languages which are Apache server, Adobe Flash, Text Editor and MySQL Server, and PHP, HTML and Flash Action Script. The Homepage of the system is shown in fig. 2. Since the system divided the users into 2 parts: the admin and member, so there are the screens of the methodic steps.

4.2. The Overview of the System Connecting A Web Cam to A Computer

Webcam or web camera is the equipment which we familiarize, we use it for chatting in MSN, moreover we use it for loading image to process. There is a tremendous amount of models available with prices ranging from the extremely affordable to the very high end. In this research, for practical implementation any computer with only Internet connecting and Logitech webcam were used. So, for those seeking a more economical solution this combination of personal computer and webcam offers a budget-friendly alternative. By using motion-detection technology, a webcam can capture and upload images via cloud for review both by the computer's owner (at sender side or watcher side).

4.3. Motion Detection

Digital image processing is the use of computer algorithms to perform image processing on digital images [9]. In this research there is the process to convert the raw data from the image sensor into a color-corrected image in a standard image file format. Researchers use the form of mechanical motion detection on which in the form of trigger. Image activities of the intruder once detected, and then there is a call function to send that image with alert signal via (Internet) cloud to the monitor. There are many approaches for motion detection in a continuous video stream. All of them are based on comparing of the current video frame with

one from the previous frames or with something that we'll call background. One of the most common approaches is to compare the current frame with the previous one. It's useful in video compression when we need to estimate changes and to write only the changes, not the whole frame. Assume that we have an original 24 bpp RGB image called current frame (image), a grayscale copy of it (current Frame) and previous video frame also gray scaled (background Frame). First of all, let's find the regions where these two frames are differing a bit. For the purpose we can use Difference and Threshold filters.

```
_src = v;
if ( _now != null ) { _now.dispose(); _old.dispose(); }
_now = new BitmapData( v._width, v._height, false, 0 );
_old = new BitmapData( v._width, v._height, false, 0 );
```

This is the result of motion detector. We can highlight the motion regions if needed. The result is below :
```
vararea:Rectangle = _now.getColorBoundsRect( 0xFFFFFFFF, 0xFFFFFFFF, true );
            _act = ( area.width>( _src._width / 100) * _min || area.height> (_src._height /
100) * _min );
                if ( _act )
                {
                    _box = area;
                    x = _box.x + (_box.width / 2);
                    y = _box.y + (_box.width / 2);
                }
```

On this step we'll get an image with white pixels on the place where the current frame is different from the previous frame on the specified threshold value. It's already possible to count the pixels, and if the amount of it will be greater than a predefined alarm level we can signal about a motion event. But most cameras produce a noisy image, so we'll get motion in such places, where there is no motion at all. To remove random noisy pixels, we can use an Erosion filter, for example. So, we'll get now mostly only the regions where the actual motion was.

```
_now.draw( _src, _mtx );
_now.draw( _old, new Matrix(), null, 'difference' );
_now.applyFilter( _now, _now.rectangle, new Point(), _col );
_now.applyFilter( _now, _now.rectangle, new Point(), _blr );
_now.threshold( _now, _now.rectangle, new Point(), '>', 0xFF333333, 0xFFFFFFFF );
_old.draw( _src, _mtx );
```

4.4. Process of Image Streaming Send and Receive via Cloud

There are the flowcharts which are the processing at sender or observing area and watcher monitoring side via cloud (shown on figs. 3-5).
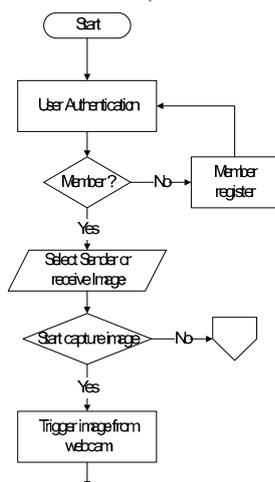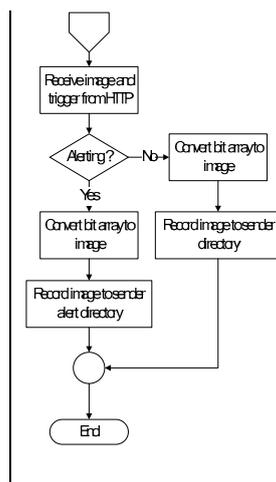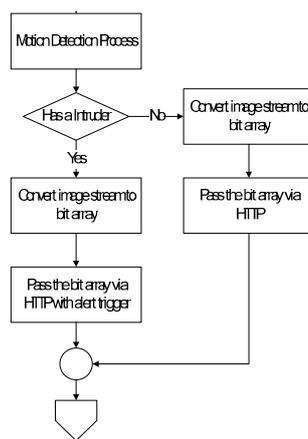

Fig. 3: Image analyzing and sending
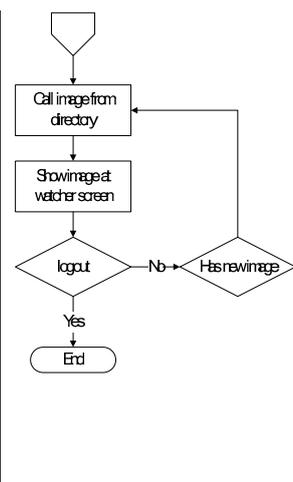
Fig. 4: Image receiving and recording by cloud

Fig. 5: Image watching by watcher

4.5. Practical Testing

Researchers did the testing at 2 scenarios; first with personal computer and webcam at outdoor at a security office of researchers' university, second with notebook computer for indoor taking care children. The figures are shown in figs. 6-7. The result shows that there is a remarkable output and efficiency achieved by this technique.

5. Conclusion

Nowadays computer technology is used for overall security protection, such as in working offices or in houses. But most need expert for installation, and the expenses for the equipments are quite high. This program is easy to use online video, surveillance and monitoring system. It was made using the cloud computing technology, so user only register at the screen of the personal computer which has a camera (one or more), or the notebook computer, then with need not install any program, the user can easily and quickly use the system. The system need not any hardware such as router, DVR or signal transformation and it is not waste the RAM space. The system gets rid of the vagueness in using so it is suitable for the person who has little computer knowledge. This program work as it directly connected with the server. The program works as it is serving on the network. The development of the program is on the web browser so the users can use any operating system. The program was made by using Flash application for connecting the camera and cloud, PHP language for writing webpages (the member registration part) and MySQL DBMS for data content of members and authentications, video pictures history, real-time motion detection and alerts. So the program is considered as people ware, easy and personally use for surveillance and monitoring.

Fig. 6: The outdoor testing system with PC and webcam.

Fig. 7: The testing system with notebook.

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