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Wireless Automated Video Surveillance System Using Motion Detection Method

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ABSTRACT

In recent times the leakage of personal information and commercial secrets has increased by leaps and bounds. According to statistics in 2007 average no of victims for leak of personal information were 7, 85,568 and average no of victims for leak of commercial secrets were 2, 94,794. Of course these figures are not at all good for a developing company and nor for a company which is developed. Wireless Surveillance System has the solution to this problem.

Wireless Surveillance System model consists of IR transmitter and receiver, microcontroller board, computer (with internet), webcam, mobile. In this model when IR is interrupted the signal is send to the microcontroller which is connected to the computer, the computer then disables the keyboard, mouse also activates web cam simultaneously and sends live video to the GPRS enabled mobile. It also sends SMS messages in case the administrator is unable to view online images due to lack of internet connection of less speed.

This system is good as compared to other surveillance system because it does not require continuous monitoring the user is alerted by sending SMS followed by live video using video streaming. This system has a good future because it can also be used in banks, schools, government organizations etc.

Keywords: **Correlation technique, Motion detection algorithm, RSA encryption algorithm, Sensors.**

1. INTRODUCTION

In this project, IR transmitter passes rays continuously to receiver, which in turn is connected at the top of the entrance of the door and will be connected to the PC which has webcam and internet connection. If there is no interruption between the transmitter and receiver, the receiver will receive rays continuously, and this will be monitored by the PC continuously. If any obstruction occurs there, the passage of rays will be disconnected, and that will be detected by the hardware connected to the PC. If there is any obstruction, the webcam will start recording the video and simultaneously the SMS will be send to corresponding person and the keyboard, mouse of the PC will be disabled and doors will be shut down and many more application can be controlled.

To view the live events happening at a site we need to connect to the PC with which the webcam is connected and the server part of this application should be running there in. Next we can start the client part loaded in the mobile and we need to specify the PC to be connected by passing its IP address where in the server part should be running. We can also specify the format for the images/snapshots to be taken and the corresponding time will be stored with that picture. We can choose view webcam option to see the live video. So we can connect to any location or the PC through this application which must fulfill the requirements specified above.

In case user has access to another system, he can also remotely log on to the server using authentication and start remote monitoring and control of the entire premises. The system would behave as if monitored and controlled from the server itself. Since a PC can provide with much more functionality than a mobile phone exact replica of server can be created for clients hence providing complete remote monitoring and control architecture. Hence the user can select the mode of monitoring he needs. User can select between a basic control and monitoring using SMS or a complete control and monitoring (including real time video feed) using a client computer.

2. RELATED WORK

In many video surveillance systems that are in use, user will come to know what is happening in his private area where he installed the surveillance system but though he can see the wrong thing is happening in his area, he cannot abort the activities of intruders and he fails to protect his valuable data, documents and other things. So our system provides user the real time images as well as a strong security to his data. To avoid loss of data our system encrypts important files and sends them to the user's email-Id. In addition to this, system rings burglar alarm to avoid unwanted activities of intruders.

The system acknowledges entrance of intruders using two techniques. First technique is motion detection in which a security camera identifies the motion using motion detection algorithm with the help of correlation formula. The another technique to find the entrance of intruder using infrared sensors in

which a photo diode is set on one side of place and a photo transistor is set in front of photo diode. When the entrance of intruder is detected by any of the technique specified above, the system takes necessary actions to protect the data and unwanted activities of intruder. As soon as the intruder is detected the burglar alarm gets activated. The live images captured by camera are sent to the user's mobile. The important files on our system gets encrypted and sent to the user's email-id and deleted from system.

Infrared circuit and burglar alarm are implemented using IC80c59 microcontroller. The code for alarm and infrared sensor is embedded in IC80c59.The circuit contains component like MAX232, ULN2809, OP07.MAX232 is used for synchronization between hardware and system.ULN2809 is used as device drivers for buzzer.

Encryption is done using RSA algorithm. Address of important files is given to system and when intruder gets detected the files are encrypted and sent to the specified email-id.

3. PROPOSED METHOD

Motion detection algorithms aim to detect moving objects whilst suppressing false positives caused by lighting changes, moving background, shadows. We introduce a novel technique for handling motion in front of camera.

In motion detection method of detecting motion in front of camera, we set a standard template or a standard image. After every 0.25 seconds, camera captures the image. New image that is captured by camera is compared with standard template and change is identified. According to the degree of change we can detect the motion [2].

Fig1 .Comparison of two images to detect motion

We are proposing an algorithm to compare images captured by camera and identify the motion. We are using correlation formula to identify the change in images and to calculate the percentage of motion. In this algorithm we take two images to compare and convert those images into arrays of pixels. These arrays are passed to correlation formula.

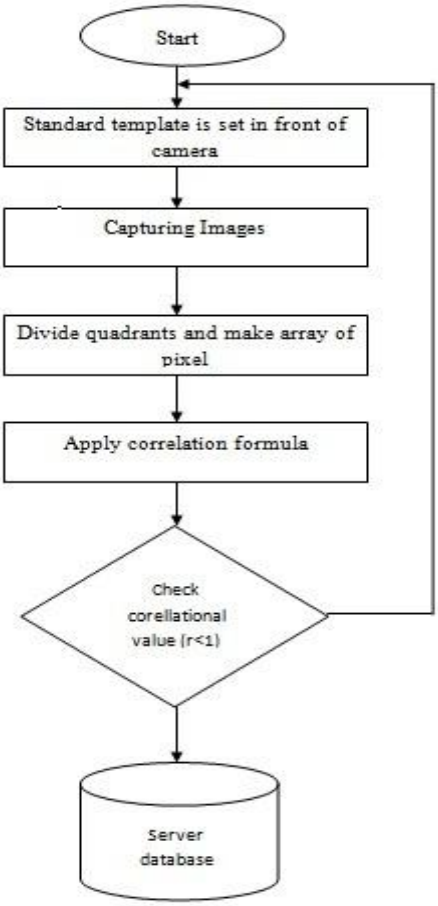

Fig 2. Correlation Algorithm

$$r = \frac{\sum_m \sum_n (A_{mn} - \bar{A})(B_{mn} - \bar{B})}{((\sum_m \sum_n (A_{mn} - \bar{A})^2)(\sum_m \sum_n (B_{mn} - \bar{B})^2))^{\frac{1}{2}}}$$

Here,
r = Correlation value
A = matrix representing pixel values of first image
B = matrix representing pixel values of second image
Such that
Size (A) = Size (B)
$\bar{A}$ = Average of (A)
$\bar{B}$ = Average of (B)

In above formula we get the correlation value (r). This value ranges from -1 to 1. If this value is -1 then motion is zero. When value increases towards 1 from -1, motion gets increased.

4. ENCRYPTION ALGORITHM

The proposed system uses public key for encryption and private key for decryption so most suitable algorithm is RSA encryption algorithm because this algorithm uses a pair of public key for encryption and a pair of private key for decryption. In cryptography, RSA (which stands for Rivest, Shamir

and Adleman who first publicly described it) is an algorithm for public-key cryptography.It is the first algorithm known to be suitable for signing as well as encryption, and was one of the first great advances in public key cryptography. RSA is widely used in electronic commerce protocols, and is believed to be secure given sufficiently long keys and the use of up-to-date implementations.

4.1 KEY GENERATION

RSA involves a public key and a private key**.** The public key can be known to everyone and is used for encrypting messages. Messages encrypted with the public key can only be decrypted using the private key. The keys for the RSA algorithm are generated the following way:

1. Choose two distinct prime numbers p and q.
For security purposes, the integers p and q should be chosen uniformly at random and should be of similar bit-length. Prime integers can be efficiently found using a primality test.
2. Compute $n = pq$.
n is used as the modulus for both the public and private keys
3. Compute $\varphi(pq) = (p - 1)(q - 1)$. ($\varphi$ is Euler's totient function).
4. Choose an integer e such that $1 < e < \varphi(pq)$, and e and $\varphi(pq)$ share no divisors other than 1 (i.e., e and $\varphi(pq)$ are coprime).
• e is released as the public key exponent.
• e having a short bit-length and small Hamming weight results in more efficient encryption. However, small values of e (such as $e = 3$) have been shown to be less secure in some settings.
5. Determine d (using modular arithmetic) which satisfies the congruence relation de=1 (mod φ(pq))
• Stated differently, $ed - 1$ can be evenly divided by the totient $(p - 1)(q - 1)$.
• This is often computed using the extended Euclidean algorithm.
• d is kept as the private key exponent.

The public key consists of the modulus and the public (or encryption) exponent. The private key consists of the private (or decryption) exponent which must be kept secret.

4.2 ENCRYPTION

The system performs encryption of important files. For this purpose public key is used.
Public key is :- (e,n)
Encryption function is :-c= m^e modulo n.
Where,
c=cipher text
m=plain text
e=public key
n=modulus

4.3 DECRYPTION

Private key is used for decryption purpose. The Decryption is done by user privately. So private key is known to only user
Private key is :- (d,n)
Decryption function is :-m= c^d modulo n.
Where,
m=plain text
c=cipher text
d=private key
n=modulus

5. CONCLUSION

The motion detection method using cross correlation led to the development of autonomous systems, which also minimize the network traffic. With good mobile ability, the system can be deployed rapidly in emergency. And can be a useful supplement of traditional monitoring system. With the help of J2ME technology, the differences of various hardware platforms are minimized. All embedded platforms with camera equipped and JSR135/JSR120 supported can install this system without making any changes to the application. Also, the system can be extended to a distributed wireless network system. Many terminals work together, reporting to a control center and receiving commands from the center. Thus a low-cost wide-area intelligent video surveillance system can be built. Furthermore, with the development of embedded hardware, more complex digital image process algorithms can be used to give more kinds of application in the future.

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