

**FIELD OF THE INVENTION:**

This invention relates to the method of an automatic image archive as well as security system. The device is the automation of the manual CCTV based security system, where no need to employ a security person to monitor the display. The system is also capable to store the images of the persons and objects, which are being moved, in the restricted area or security zone. The system is also capable to filter out unnecessary images in order to reduce searching time of a particular image in the emergency situation and it can send the suspicious images into web repository so that image data can not be destroyed by destroying local system.

**BACKGROUND OF THE INVENTION:**

Security threats are the main headache for organizations as well as the Govt. of a country. According to U.S. DOS data and RAND/MIPT data international and domestic terrorism increases rapidly (<http://www.johnstonsarchive.net/terrorism/intlterror.html>)

Security threats are classified into two major groups, data Security threats and physical Security threats.

Software is available to protect data similarly CCTV surveillance and employing security person are required to protect the organization from physical damage and Security threats. Human fatigue ness and boredom decreases the attentiveness of human beings is the main drawback of the manual CCD camera monitoring system.

By influencing or by drawing attention of the security person by making causes it is possible to enter in a security zone. The details are shown in different movies time to time. Automatic surveillance system is preferable to avoid this type of challenges.

Some lesser based automatic surveillance system exists, in this method laser source emits laser beam that is received by the receiver. This lesser is invisible because of the single direction property. When an object comes in between the line of the sight of the transmitter and receiver, then receiver is unable to receive the light so it sets the circuit to raise an alarm.

But this system can be escaped by spraying aerosol. Aerosol contains small particles which are floating in the air and deflect small amount of lesser when they are in the line of the sight of the lesser transmitter and receiver. These small particles do not create enough obstructers in between transmitter and receiver. So no alarm is set. But introducer can easily visualize the lesser beam and escape them. The details are shown in the film "Quamat".

Till now there is no automatic system exists that archive the visitor's images and surveillance the area by examining the images obtained by the camera.

U.S. Patent 4,584,639 , U S Patent 8,035,515 , U S Patent 8,063,936 describes different security System. However, none of the system is similar to this system. Here, a novel system for Visitor's image archive for security purpose, based on automatic image analysis has been reported.

The present invention differs from earlier work due to novel optimum design and many new advantages that has been incorporated in the present design, the system has following advantages (1) fully automated image analysis system for surveillance, (2) once installed no unnecessary cost involved, 3) it can send suspicious images into web repository (picture data damaging is difficult), 4) it reduces searching time fo a particular image in the emergency situation.

#### **OBJECTIVE OF THE PRESENT INVENTION:**

The objective of the invention is to provide a simple and inexpensive automatic system to monitor or surveillance an area along with the provision to archive the images of visitors who have come to the visible range of the system.

The foregoing objects are achieved and the other aspects of the present invention will be clear from the following description which is purely by way of understanding and not by way of any sort of limitation.

**SUMMARY OF THE INVENTION:**

This invention provides a new and useful system for capturing images of the visitors and also automatic surveillance procedures in which the invention includes multiple image sensing transducers to capture images from different sites. The system also includes the provision to move the image sensing transducer's direction automatically. The system captures the images and compares them with reference images. Calculate the index value based on the differences between captured image and reference.

Further, such systems include special arrangements that are easily adapted for use in the invention. CCD based image transducers are used for capturing snapshots, Laplacian filtering technique is used to reduce noise. To reduce computation time HSI color space is used. The HSI color model represents every color with three components: hue (H), saturation (S), intensity (I),

Other features and advantages of the invention is described by the following description of a preferred embodiment and the accompanying drawings:

**BRIEF DESCRIPTION OF THE DRAWINGS AND IMAGES:**

Figure 1 illustrates the block diagram of the device

Figure 2 illustrates the driver circuit of the alarming device.

Figure 3 illustrates the driver circuit for the stepper motors for omni direction movement

Figure 4 illustrate the engineering drawing of the mechanical setup for omni direction movement.

Figure 5 shows Base image captured by the transducer.

Figure 6 shows the gray image of the Base image shown in Figure 5.

Figure 7 shows the Incoming image captured by the transducer.

Figure 8 shows the gray image of the Incoming image shown in Figure 7.

Figure 9 shows the Difference image between base image and incoming image.

Figure 10 shows the repository where suspicious images are stored.

Figure 11 shows the screen shot where suspicious images are send via email

Figure 12 shows the system along with its innovators.

## DETAILED DESCRIPTION OF THE INVENTION:

The following describes the preferred embodiment of the present invention which are purely for the sake of understanding the performance of the invention and not by way of any sort of limitation.

The present invention herein describes is the Visitor's image archive as well as security device as illustrated in Fig 1. Presence of visitor or violation of security can be determined by observing the changes in the image. This concept is used here.

The image acquisition transducer is mounted upon the omni direction mechanical setup shown in figure 4, to rotate the image acquisition device at any direction. The omni direction movement is achieved by using two stepper motors.

A stepper motor is an electromechanical device which converts electrical pulses into discrete mechanical movements. The shaft or spindle of a stepper motor rotates in discrete step increments when electrical command pulses are applied to it in the proper sequence. The motors rotation has several direct relationships to these applied input pulses. The sequence of the applied pulses is directly related to the direction of motor shafts rotation. The speed of the motor shafts rotation is directly related to the frequency of the input pulses and the length of rotation is directly related to the number of input pulses applied.

Standard hybrid stepping motors have 200 rotor teeth, or 200 full steps per revolution of the motor shaft. Dividing the 200 steps into the  $360^\circ$  of rotation equals a  $1.8^\circ$  full step angle. Normally, full step mode is achieved by energizing both windings while reversing the current alternately. Essentially one digital pulse from the driver is equivalent to one step.

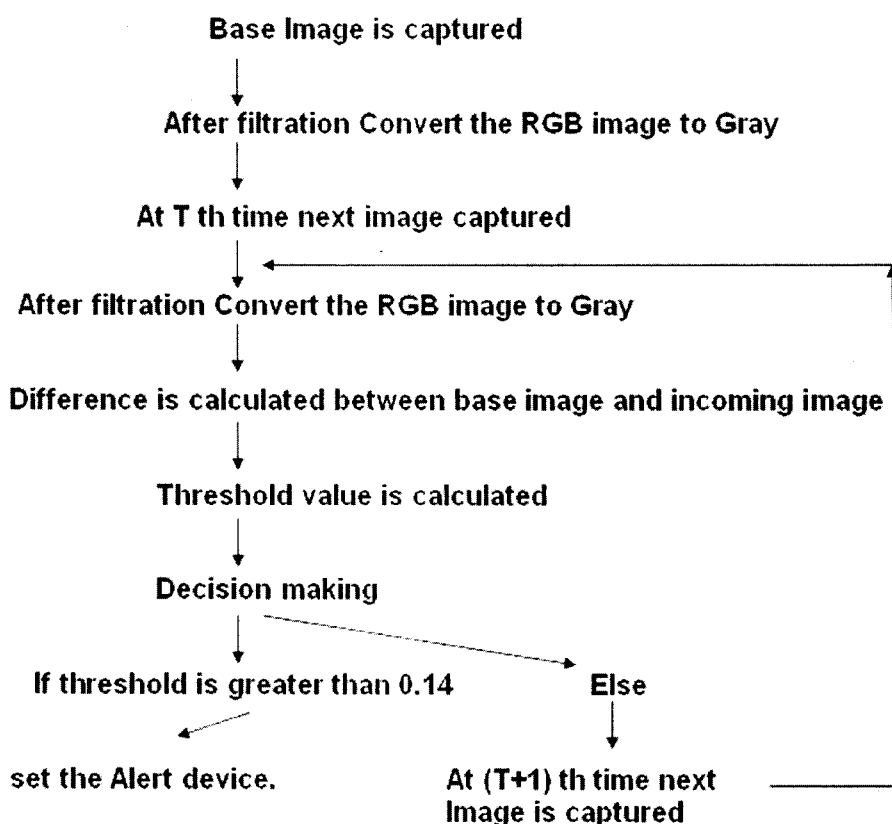
The computing unit and control unit will determine the movement of the mechanical setup to change view angle of the image acquisition transducer. The control unit can not directly control the stepper motors through LPT1 port. The driver circuit is required. Figure 3 shows the driver circuit. In this circuit 20 transistors are used. CL100 is the preferred one. Diodes D1 to D 16 are used to bypass the reverse EMF, created by the motor coil.

The sensed images are send to the computing unit for computation, the work flow as follows.

The images obtained from the transducer are not of good quality. Laplacian Filter is used to sharpen the edges of the objects in the image. The Laplacian gradient at a pixel position (x,y) is denoted by  $\nabla^2 f(x,y)$  and it is defined as.

$$\nabla^2 f(x,y) = \frac{\partial^2}{\partial x^2} f(x,y) + \frac{\partial^2}{\partial y^2} f(x,y) \quad (1)$$

This expression is implemented at all points (x, y) of the image through convolution. The Laplacian filter is applied separately on Red, Green and Blue components of the colour images obtained from the CCD transducer. After that, the images are converted into gray scale image by simple average of three components namely Red, Green, and Blue. Flow 1 shows the Data processing flow.



Flow 1: Data processing flow diagram of the computing unit

The threshold value of the resulted matrix is calculated by the following steps:

- Step 1: Select an initial estimate for T (T=threshold value)
- Step 2: Segment the images using T. This will produce two groups of pixels:G1 consisting of all pixels with gray level values > T and G2 consisting of pixels with values <= T.

Step 3: Compute the average gray level values  $\mu_1$  and  $\mu_2$  for the pixels in regions G1 and G2.

Step 4: Compute a new threshold value :  $T = 0.5 * (\mu_1 + \mu_2)$ .

Step 5: Repeat steps 2 through 4 until the difference in T in successive iterations is smaller than a predefined parameter T0

N.B. : A good initial value for T is the average gray level of the image.

Practically it is found that if threshold value T is greater than 0.14 then major changes occur, i.e. a person is detected. If the value is less than that, then the situation is without any threat and it can be ignored. For example, it might be some small objects like insects. Once the object is detected, the system sets the alarm; the interfacing circuit is given next.

Figure 2 shows the circuit diagram that is used for controlling external device via LPT1 printer port of the computer.

Where, T1 is a 230volt AC primary to 0 -- 12 volt 200mA secondary (step down) transformer. Diode D1 through D4 are used to build bridge rectifier. MCT2E is an optocoupler, which provides optical isolation. It ensures total isolation of LPT1 port from power supply of 12 volt and 200mA.

Diode D5 is used to bypass the reverse emf. If it is not used then CL100 transistor may reach breakdown state.

CL100 is used to amplify current.

When optocoupler is in the state 'on' then maximum possible current supplied by the collector would be 28 mA but it is not sufficient to drive the relay where at least 160 mA current is required.

Capacitor C1 (470 uF) is used to sink AC component.

The system can send the suspicious images in the web server to protect images from local damage and destruction. In this present application, the google web picture repository "Picasa" is used. This repository supports Atom Publishing Protocol for data exchange. Before uploading in the "Picasa" repository authenticated Google Data requests are performed by adding an HTTP header to the request, which contains ClientLogin authentication token. Google Data APIs directly handles the username and password for authentication.

An authentication request for ClientLogin takes a username, password, and service name as form post variables. These variables are passed as the Email, Passwd, and service arguments, respectively. This request yields a response with several tokens, one of which can be used to make requests to the Google Data service. The value of the Auth (authentication) token from the response is the only value needed for authentication to Google Data services. The value of this token is formed into an HTTP header which is then used for each request to a Google Data service. After getting the authentication token the next step is to get the service url. Another client request have been made for this url by passing the service request "http://picasaweb.google.com/data/feed/api/user/default" along with authentication token to the google data api. Google data api returns the service url; for this example it is `<link rel='self' type='application/atom+xml' href='http://picasaweb.google.com/data/entry/api/user/brad.gushue/albumid/9810315389720904593' />`. Through this URL and authentication token suspicious images are send to google image repository "Picasa" and mail them.

Figure 5 shows the base image obtained by the image sensing transducer and gray image of this image (shown in figure 6) will be used as a reference image in the device. Figure 7 shows a sensed image during runtime and filtered gray image (shown in figure 8) of this image will be compared with the gray image of the reference image. Figure 9 shows the compared image. Threshold value is calculated upon the compared image. For this image threshold value is much high. So the system assumes that a visitor has come into visible area of the device. In this situation the control unit sends the images into web repository and email them shown in figure 10 and figure 11. figure 12 shows the device along with its innovators.

A preferred embodiment of the invention is illustrated in Figure. 1 to Figure 4. The invention can be embodied in forms other than those described above and there are situations in which other compact microprocessor-based units can advantageously be used.

Those skilled in the art also will recognize that the above-described operations and may be apportioned between one or more arrangement. For example, in some situations, the programmable microprocessor-based unit and the program cartridge used in practicing the invention may provide memory and signal processing capability that is sufficient for practicing the invention. The invention can be embodied to establish systems having different levels of complexity.

Different embodiments of the invention are possible to achieve the best method of performance and to obtain the effective device. It will be understood that the invention may be carried out into practice by skilled persons with many modifications, variations and adaptations without departing from its spirit or exceeding the scope of claims in describing the invention for the purpose of illustration.