

Providing Security for ATMs Using Digital Image Processing for Abnormal Incident Detection

G.Himaja, B.Rambabu, B.Malakonda Reddy

Abstract— This paper is designed by using PIR (Passive Infrared Radial) sensor to provide high security in ATMs. The sensor is basically a pyroelectric device. When the PIR is exposed to infrared radiation, it generates an electric charge. This electric charge triggers the camera. Camera starts capturing video, and then this video is processed by DSP processor for abnormal incident detection (misbehavior with ATM system). Once it occurred, corresponding signal is sent to microcontroller. The microcontroller is programmed to send SMS through GSM & GPS module to the near police station, at this time door will automatically lock. Then the thief will be inside the ATM room.

Index Terms— DSP (digital signal processor), GSM & GPS, PIR Sensors.

I. INTRODUCTION

1. PIR Sensor: PIR Sensor is a type of Infrared sensor. Instead of infrared or laser transmitters and receivers, PIR (Passive Infrared Radial) sensors are used in this circuit. The sensor is basically a pyroelectric device. When the device is exposed to infrared radiation, it generates an electric charge. The device is made of crystalline material. According to the change in the amount of infrared striking the element, there will be a change in the voltages, which is measured by an on-board amplifier.

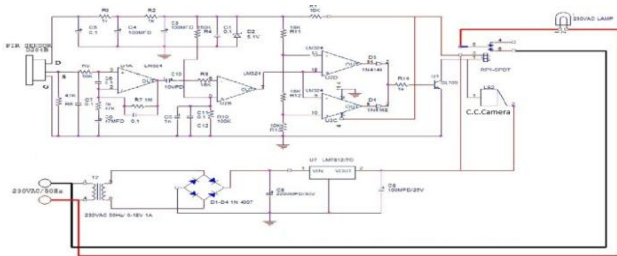


Fig: PIR Sensor

PIR sensors allow you to sense motion, almost always used to detect whether a human has moved in or out of the sensors range. They are small, inexpensive, low-power, easy to use

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G.Himaja, Electronics and communication engineering, BVSR Engineering college., Ongole, INDIA, Phone/ Mobile No:9985780137.

B.Malakonda Reddy, Electronics and communication engineering, BVSR Engineering college., Ongole, INDIA, Phone/ Mobile No:9492338958.

B.Rambabu, Electronics and communication engineering, BVSR Engineering college., Ongole, INDIA.

and don't wear out. For that reason they are commonly found in appliances and gadgets used in homes or businesses. They are often referred to as PIR, "Passive Infrared", "Pyroelectric", or "IR motion" sensors.

Working—The PIR sensor itself has two slots in it, each slot is made of a special material that is sensitive to IR. Fig: 3.2.contains the lens used here is not really doing much and so we see that the two slots can 'see' out past some distance (basically the sensitivity of the sensor). When the sensor is idle, both slots detect the same amount of IR, the ambient amount radiated from the room or walls or outdoors. When a warm body like a human or animal passes by, it first intercepts one half of the PIR sensor, which causes a positive differential change between the two halves. When the warm body leaves the sensing area, the reverse happens, whereby the sensor generates a negative differential change. These change pulses are what is detected. The IR sensor itself is housed in a hermetically sealed metal can to improve noise/temperature/humidity immunity.

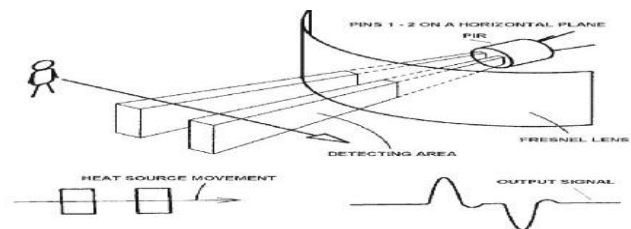


Fig: PIR Sensor signal transmission

The lens is just a piece of plastic, but that means that the detection area is just two rectangles. Usually we'd like to have a detection area that is much larger. To do that, we use a simple lens such as those found in a camera: they condense a large area (such as a landscape) into a small one (on film or a CCD sensor). For reasons that we would like to make the PIR lenses small and thin and moldable from cheap plastic, even though it may add distortion.

2. DSP Processor: Digital signal processing (DSP) is the mathematical manipulation of an information signal to modify or improve it in some way. It is characterized by the representation of discrete time, discrete frequency, or other discrete domain signals by a sequence of numbers or symbols and the processing of these signals. Digital signal processing and analog signal processing are subfields of signal processing. DSP includes subfields like: digital image processing, signal processing for communications, control of systems. With the fast computers and signal processors available in the 2000s, digital image processing has become the most common form of image processing and generally, is

used because se it is not only the most versatile method, but also the cheapest. Digital image processing allows the use of much more complex algorithms, and hence, can offer both more sophisticated performance at simple tasks, and the implementation of methods which would be impossible by analog means. Math Works signal processing products provide extensive tools and algorithm libraries that let you analyze, design, and simulate DSP systems in a fraction of the time it takes with traditional programming languages such as C and C++.

3. Working with MATLAB

Frame extraction: In this system, motion is used as the main cue for abnormal incident detection. It is henceforth obvious that the first concern is obtaining the images required from the source. In the circumstances described (subways, high security installations) usually a closed circuit television system is employed.

Any ordinary video systems use 25 frames per second. The system described here uses scene motion information extracted at the rate of 8.33 times per second. These amounts to capturing a frame once every two frames in the video camera system. In practical real time operation a hardware block-matching motion detector is used for frame extraction.

The difference image: There are two major approaches to extracting two-dimensional motion from image sequential optical flow and motion correspondence. Simple subtraction of images acquired at different instants in time makes motion detection possible, when there is a stationary camera and constant illumination. Both of these conditions are satisfied in the areas of application of our system.

A difference image is nothing but a binary image I_p , where non-zero values represent image areas with motion. Here we took the video called “person.avi”.

```

for k = 1 :nframes
    if (k <= nframes-1)
        i1=read (person,k)
        img1=im2bw (i1, 0.4);
        i2=read (person,k+1);
        img2=im2bw (i2, 0.4);
        Ip = imsubtract(img1,img2);
    end

```

Then the non-zero values in the difference image should be counted. If the count value exceeds the highest threshold, then microcontroller will be activated and the threshold varies with the images we have taken, we got a max threshold (maximum no of pixels in the difference image) of 2000 pixels.

```

[m n]=size(Ip);
inc=0;

```

```

for p = 1:m
    for q = 1:n
        if (Ip(p,q)<= -1)
            inc=inc+1;
        else
            inc=inc;
        end
    end
end

```

```

end
count(k)=inc;

```

The input video is read using the ‘mmreader’ function. The video is divided into corresponding no. of frames using the following loop,

```

for i = 1 : nframes
    img=read(people,i );
end

```

The images are converted to a binary image using the ‘im2bw’ function. Difference image is obtained by using “Imsubtract” function.



Then calculate difference between the consecutive images. Once difference value exceeds a threshold value then an interrupt signal is send to microcontroller. In microcontroller has an AT commends to send SMS through GSM & GPS module. The door will be lock automatically.

4. Global Positioning System (GPS): The Global Positioning System (GPS) is a space-based satellite navigation system that provides location and time information in all weather conditions, anywhere on or near the Earth. A GPS receiver calculates its position by precisely timing the signals sent by GPS satellites high above the Earth. Each satellite continually transmits messages that include.

- the time the message was transmitted
- satellite position at time of message transmission

The receiver uses the messages it receives to determine the transit time of each message and computes the distance to each satellite using the speed of light. Each of these distances and satellites locations define a sphere. The receiver is on the

surface of each of these spheres when the distances and the satellites locations are correct. These distances and satellites locations are used to compute the location of the receiver using the navigation equations. This location is then displayed, perhaps with a moving map display or latitude and longitude elevation information may be included. Many GPS units show derived information such as direction and speed, calculated from position changes. A number of applications for GPS do make use of this cheap and highly accurate timing. These include time transfer, traffic signal timing, and synchronization of cell phone base stations.

5. Global System for Mobile Communication (GSM):

GSM was designed with a moderate level of service security system. The system was designed to authenticate the subscriber. Communications between the subscriber and the base station can be encrypted. GSM is a cellular network, which means that cell phones connect to it by searching for cells in the immediate vicinity. Cell horizontal radius varies depending on antenna height, antenna gain and propagation conditions from a couple of hundred meters to several tens of kilometers. The longest distance the GSM specification supports in practical use is 35 kilometers. The transmission power in the handset is limited to a maximum of 2 watts in GSM 850/900 and 1 watt in GSM 1800/1900.

6. Door Locker: Door Locker can be used at ATMs, when any interrupt is given to microcontroller from DSP processor. When the microcontroller sends a signal to the locker, it converts the electrical signal to mechanical signal, and then door will be locked permanently. The locked door opens by a password.

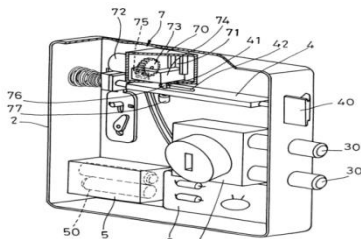


Fig: Door Locker

II. WORKING PROCEDURE

PIR sensor is activated when a person enters into room, Then camera starts capturing video. The video is processed by the DSP processor. The processor first divides video into the corresponding frames then it is calculate difference between the consecutive images. Once difference value exceeds a threshold value then an interrupt signal is send to microcontroller. In microcontroller has an AT commends to send SMS through GSM & GPS module. The door will be

lock automatically. The block diagram and flowchart are shown below,

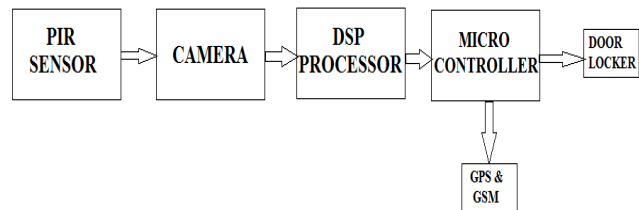


Fig: Block Diagram

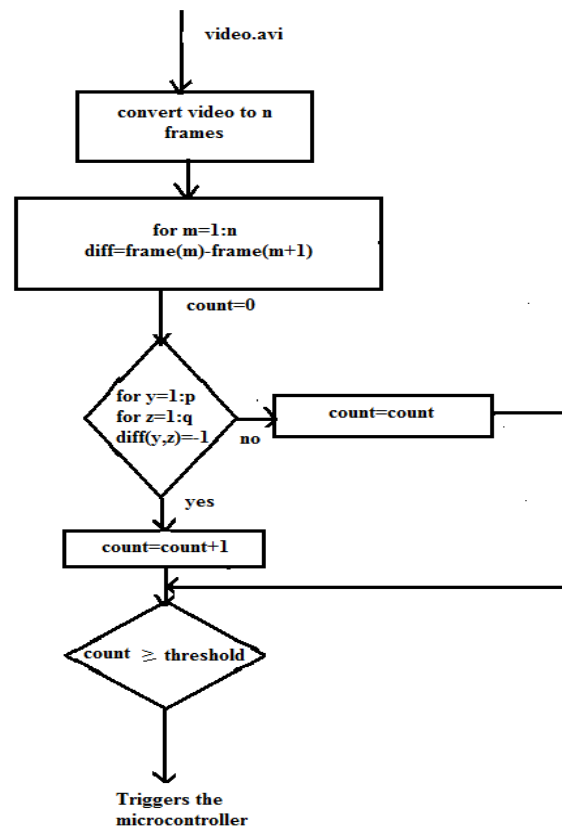


Fig: Flow Chart

III. CONCLUSION

This paper shows how to prove a high security for ATMs from robberies at any time, when a abnormal incident occurred it change the environment around the ATMs. It will alert the police and the thief cannot escapes from ATM room. In this way, we can provide high security for the people's money.

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