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Image Processing Algorithms For Detecting Alarm Events For Automated Video Surveillance Systems

Ahmed Othman Khalaf[1], Shaimaa Khudhair Salah[2], Waleed Rasheed Humood[3]
[1, 2, 3]*(Department of Computer Science, College of Education, Mustansiriyah University, Baghdad, Ira)*

Abstract
Security is a fundamental need for both nations and individuals. Day by day, more and more security systems are incorporating emerging technology. Particularly, security cameras are essential. However, keeping track of all the security cameras would not be practical or sustainable. Smart security systems are required as a result. The necessity of developing intelligent security systems employing image processing methods for incident prevention cannot be overstated. In this work, images from two security cameras are analyzed, and an intelligent security system is created that, when a potentially harmful picture is identified in the image, takes the appropriate safeguards.

Keywords:*Image processing; Intelligent Security System; Security*

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I. Introduction

Today, security cameras are often employed. However, it frequently happens that nobody constantly monitors and provides commentary on security cameras. Systems that analyze security camera footage and take the appropriate actions are required. Automatic image processing is crucial for border post surveillance cameras, traffic-control cameras, and security cameras guarding specific areas. Without image processing, a security camera just captures occurrences. Threats and suspicious activity can be identified and foreseen with image processing [1].

Environmental issues that affect image processing, such as low security camera resolution, inadequate lighting, moving objects, variable object distance, rain, fog, and snow, make our task challenging [2]. clever surveillance cameras, They are able to automatically find, examine, and identify relevant information in recorded videos. Applications for video surveillance have many different purposes.

The application areas for smart security cameras include interior and exterior security, crime prevention in public and private spaces, traffic control, accident foreseeing, patient tracking, elderly and child monitoring, highways, train stations, airports, parking lots,stores shopping malls, and offices [3].

The need for intelligent security systems is rising daily. Very little can be accomplished with a single camera in terms of distance detection and picture processing. Multiple cameras and intelligent security systems have shown significantly more success [4-6].

After hours of observation, visual examination of video data can be time-consuming and error-prone. Effective solutions that might simplify this difficult work are therefore highly desired.

A video summary is a condensed version of the original video that keeps the key images while omitting the uninteresting spatiotemporal portions. Using an object detection technique, security camera footage and photos may be searched for specific things[5].

The issue of security affects social cohesion and economic growth on a worldwide scale. Therefore, everyone should be interested in the effort done to solve security issues. In other circumstances, security issues put significant financial losses, human lives, and even national security in peril [7]. Applications for computer vision have increased during the past two to three years. Security, computer gaming, robotics, automated guided vehicles, and machine vision all employ intelligent surveillance systems.

When processing pictures from smart security cameras, complexity, scale, resolution, mobility and disruptive impacts make it difficult to collect reliable findings. These issues are being addressed by employing more than one camera. Using many cameras presents a compatibility issue between the cameras.

Camera bypass is a yum and transition method between cameras. The interpretation of pictures in the camera according to time is more successful as a result of these algorithms. Camera bypass techniques are now in use. Is it feature-based, geometry-based, or hybrid?

Based on techniques, it may be divided into three categories [8]. Color is used in feature-based techniques or any other identifying characteristics of monitored items 2 are matched on camera-captured photos [9-11].The scope of this attempt is to identify potential interesting region locations. [12].

Face recognition, ear recognition, medical diagnosis, autonomous driving, mammography, industrial use, diabetic retinopathy, and many other applications are among the computer vision applications of AI and ML[13]. The picture obtained with two cameras was analyzed in this work, and a distance and area computation technique was devised. Furthermore, the system's alarm with hardware support.

II. Material and Method

The software required for the smart alarm system was made using Delphi seen in Figure 1. A computer is in charge of the system. The picture from the cameras is analyzed in the system, which is developed with two cameras as a prototype, and in the event of a danger, the siren sounds and an e-mail is sent based on the security parameters selected by the user.

However, these parameters are also used to operate the led projector. A remote control can also be used to operate the system.

Figure 1. Intelligent security system

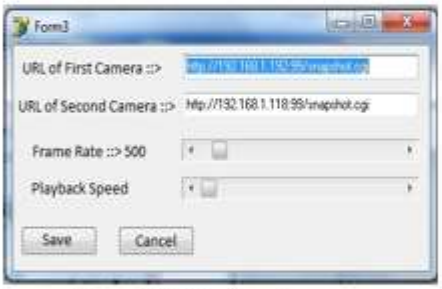

Figure 2. Identification of cameras

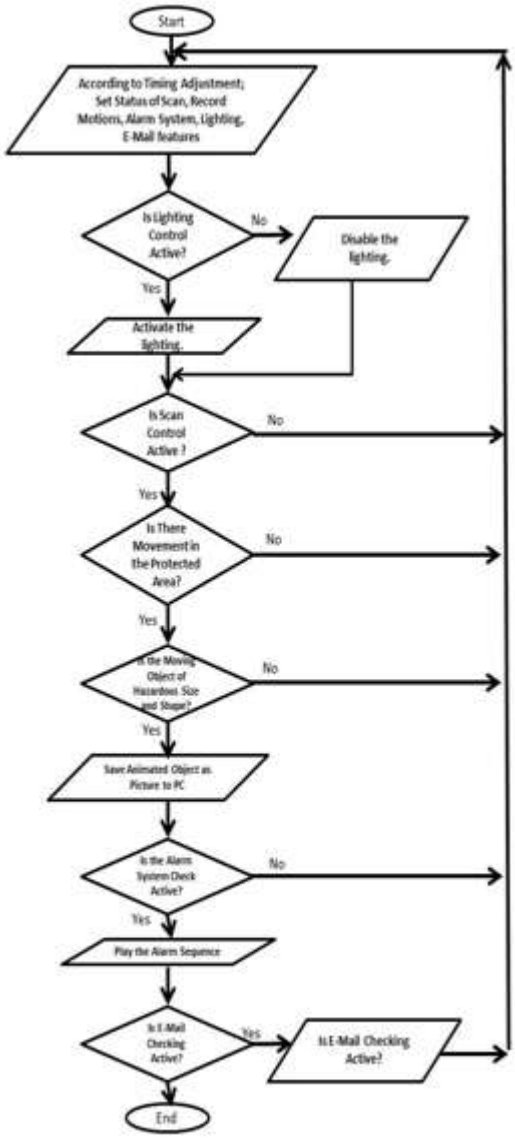

Figure 3. Flow chart of the system

The system flow diagram is shown in Figure 3. The application software made use of two IP cameras. Because each camera's resolution is 640x480, a total of 614400 pixels must be regulated. Due to the volume of transactions, this will create a delay. Because the system operates in real time, the transaction cells must be completed without delay.

To avoid the aforementioned issue, the control operation was conducted at 16 pixel intervals, reducing the number of pixels to be controlled to 2400. To put it another way, the scanning speed has grown by 256 times.

As a consequence, the number of pixels the Height and Width of the item entering the camera's field of view are during the scanning process may be determined. Because the distances are known in advance, the application software may determine the real size of the item. Figure 4 depicts the smart security system's software interface.

Figure 4. Application Software

Protected Area Settings:

protected area setting IMPLEMENTATION OF THE PROGRAM, It is accessed via the Settings>Scan Settings menu. First, the camera image is divided into squares based on the desired sensitivity, and the areas affecting the protected area are marked.

If there is movement in any of these marked areas, the distance, dimensions, and shape of the object causing the movement are compared to determine whether it is dangerous or not. Figure 5 depicts the screen separating into cells.

Figure 5. Dividing the screen into cells

Timing Settings:

Timing Settings APPLICATION of the program, Settings>Schedule Settings from the menu is done.

Figure 6. Timing setting

It is an application software that allows scanning, movement recording, alarm system, illumination, and e-mailing capabilities to be enabled at specific time intervals or situations. This menu allows you to adjust desirable characteristics such as days and time intervals, or of the state's air blackout according to It may be enabled or disabled by checking the manual active, passive settings on the application program's main screen.

Figure 7 depicts the calculated distance in the protected zone. The location of the item in the image maybe calculated using a specifically built algorithm. More accurate findings are obtained by identifying theitem whose location is calculated. The item appears small from the perspective, and reliable information about its size cannot be gained. Figure 8 depicts position detection using the developed technique.

III. Findings and Discussion

In Figure 9, two security cameras collect a moving picture and estimate its location and size. The method has shown to be quite effective in testing at various speeds and forms. The machine is always running the program It is possible to categories the defined items as precisely as possible.

APPLICATION circuit, APPLICATION program with It is a circuit controlled by a microcontroller. If the Alarm System is enabled in the application software, the alarm sounds when the PC sends a signal indicating that an object of harmful size and form has entered the secure area. In addition, Based on the PC signal, the lighting system is either active or passive. The user can utilize the remote control to manually activate or disable the Alarm System, Scanning System, or Lighting System .It moves the feature to the point indicated in the timing settings, thereby making it the default.

The USB protocol is used by the application circuit to connect with the PC. The PIC18F4550 Microcontroller is in charge of the alarm system, lighting system, and indicators. The PIC16F628 Microcontroller decodes the RF signals supplied by the remote control and reports them to the PIC18F4550 Microcontroller. The LDR Sensor, on the other hand, regulates the brightness of the surrounding environment.

The indicator in the application circuit, on the other hand, is made up of leds that show whether there is a USB connection, whether the alarm is ringing, whether the scan is active, whether the alarm system is active, whether the lighting is active, whether the remote control interferes with the default settings, or whether a signal is received from the control. In this manner, the user may monitor the system's status.

IV. Results

This study found that analyzing photos with a computer in smart security systems produces more rapid, sensitive, continuous, and trustworthy findings. The project is a work in progress, and the number of cameras can be expanded. The quick review and utilization of security camera images will close a significant security gap.

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