Remote Based Security System

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***Abstract*— Background Subtraction is one of the vital image handling steps for video surveillance and many computer vision difficulties such as recognition, classification, activity investigation &tracking. Detection of moving objects in video streams is the relevant step of info extraction in several computer vision applications. This paper deals with the performance of different techniques of Background Subtraction. Mainly there are three features has been extracted from each moving objects such as centroid, area, average luminance. The proposed approach uses k-means comparison for frame change, Approximate Average and Combination of Gaussian method and this attempt proves that the chosen method has good performance under dynamic circumstances for real time tracking. Finally the similarity function is applied to tracking. After detecting the moving object the Short Message Service (SMS) will send to owner's mobile. The user can see the images on any remote computer.**

Keywords- Background Subtraction, k-means, Object detection, Short Message Service, Remote Access.

I. INTRODUCTION

The development of monitoring is a major trend in future, it is the important research content of security field, recently, monitoring system has became commonplace. So, study on its related technology has great significance. Extracting the moving objects, in particularly, are interesting and important in monitoring system, because that it can contribute not only to theoretical insights but also to practical application. Computing the moving objects of the monitoring system could be applied to a wide variety of problems, including criminal identification, real time control system, traffic control, industry and civil monitoring, etc..

Unfortunately, that extracting the moving objects quickly and exactly from a real time stream image or monitoring video is quiet difficult, because of the following reasons:

Intricate of objects: All kinds of the moving objects can be detected by the object detection process, and they have different sizes and features, which is quiet difficult to be processed in the later processing.

Intricate of the environment: The monitoring systems are alleyways inevitably exposed in a real time and variety of environment, including in the dithering of the background, or in the brightness of the environment, or in the chromatist between the foreground color and background color.

Intricate of the device: All of the device including input devices and processing devices make the image signal

susceptible to noise, which makes the later processing complex. Therefore, moving objects detection is the key technology of the monitoring. Because of the simple principle and the simple implement, the image difference method is widely used for detecting the moving objects in the monitoring system. The algorithms of moving objects can be divided into the following categories:

Background subtraction: Background subtraction is a commonly used class of techniques for segmenting out objects; it involves comparing an observed image with an estimate of the image if it contained no objects of interest.

Frame difference: Frame difference is to look at the difference between two consecutive frames to detect a cut, and a large number of difference metrics has been defined to estimate frame differences, the straightforward approach is to measure the differences between the particular pixels consecutive frames, but this approach is very sensitive to object motion, camera motion, brightness changes and noise. This paper surveys the background subtraction algorithm which was introduced above, discusses the problem of the algorithm, and proposes the resolve of the problem. This algorithm was implemented to evaluate their relative performance under a variety of different operating conditions. From this, some conclusions are draw about what features are important in the algorithm.

II. PRINCIPLE OF BACKGROUND SUBTRACTION

Background Subtraction

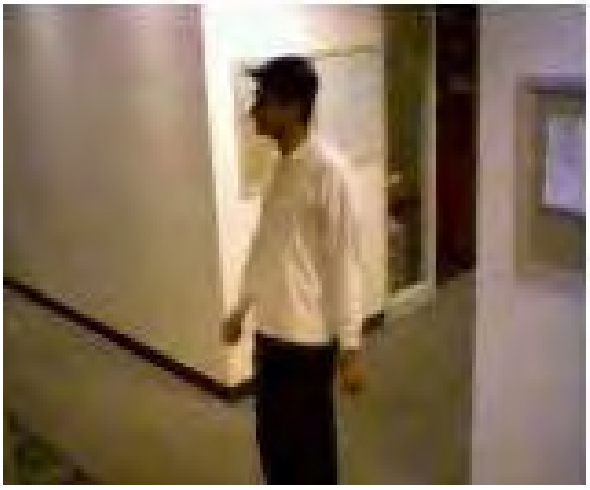
Extracting moving objects from a video sequence is a fundamental and critical task in monitoring applications, a commonly method used to segment the moving objects form video is background subtraction, which extracts moving objects from the portion of a video frame that differs significantly from a background model. Let $frame_i$ be a frame obtained from a video or a real time data stream, which was produced from a monitor. Let $background_j$ be a background frame image extracted from the real time environment. Let $foreobject_i$ be the foreground object, which is the result of the algorithm. Then, the algorithm of background subtraction can be presented by the following formulate.

$$foreobject_i \; . \quad frame_i \tilde{} background_j |$$

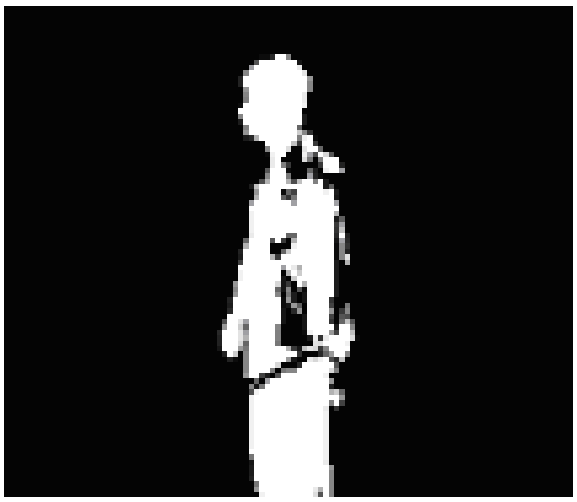
For example

Figure (a) shows a background frame, we can remove the background from a frame image of a video as shown in Figure (b). Figure (a) is the original frame; Figure (b) is the moving object frame, which is obtained by the above express.

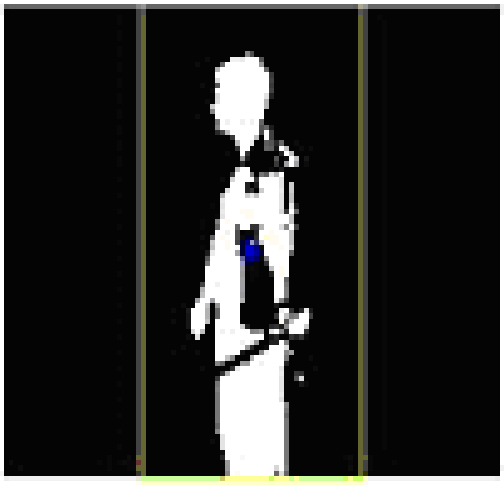
a. Reference Image



b. Single object move in background



c. Single object detected



d. Tracking of moving object

In this paper, a reference background is Initialized at the start of the system with the first few frames of video and it is updated to adapt the changes during the operational period. At each new frame, foreground pixels are detected by subtracting the intensity values from the background with a dynamic threshold per pixel. The reference background and the threshold values are updated by using the foreground pixel information. The detected foreground pixels usually contain noise due to image acquisition errors, small movements like tree leaves, reflections and foreground objects with textures coloured similar to the background. These isolated pixels are filtered. After this step, the individual pixels are grouped and labeled to create connected moving regions. These regions are further processed to group disconnected blobs and to eliminate relatively small sized regions. After grouping, each detected foreground object is represented with its bounding box, area, centre of mass and colour histogram which will be used in later steps.

Figure.1.

Gives the sequence of steps followed in this project. The first Step is the input video taken for pre processing. The pre-processing consists of colour and frame conversion, which is represented in the consecutive blocks. After that, the current frame is compared with the reference frame by considering the intensity variation. Then the Background Subtraction technique is implemented. The object detection method is used in different applications in which moving object detection is needed.

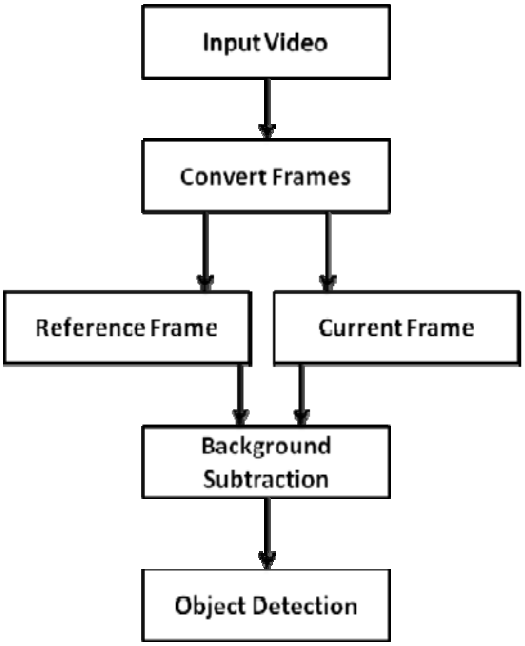


Figure. 1. Flowchart followed

III. ALGORITHM USED

k-means is one of the simplest unsupervised learning algorithms that solve the well known clustering problem. The procedure follows a simple and easy way to classify a given data set through a certain number of clusters (assume k clusters) fixed apriori. The main idea is to define k centers, one for each cluster. . These centers should be placed in a cunning way because of different location causes different result. So, the better choice is to place them as much as possible far away from each other. The next step is to take each point belonging to a given data set and associate it to the nearest center. When no point is pending, the first step is completed and an early group age is done. At this point we need to re-calculate k new centroids as barycenter of the clusters resulting from the previous step. After we have these k new centroids, a new binding has to be done between the same data set points and the nearest new center. A loop has been generated. As a result of this loop we may notice that the k centers change their location step by step until no more changes are done or in other words centers do not move any more. Finally, this algorithm aims at minimizing an objective function known as squared error function given by:

$$J(V) = \sum_{i=1}^{c} \sum_{j=1}^{c_i} \left(\left\| x_i - v_j \right\| \right)^2$$

Where,

'$||x_i - v_j||$' is the Euclidean distance between x_i and v_j.

'c_i' is the number of data points in i^{th} cluster.

'c' is the number of cluster centers.

Algorithmic steps for k-means clustering

Let $X = \{x_1, x_2, x_3, \ldots\ldots, x_n\}$ be the set of data points and $V = \{v_1, v_2, \ldots\ldots, v_c\}$ be the set of centers.

1) Randomly select 'c' cluster centers.

2) Calculate the distance between each data point and cluster centers.

3) Assign the data point to the cluster center whose distance from the cluster center is minimum of all the cluster centers..

4) Recalculate the new cluster center using:

$$v_i = (1/c_i) \sum_{j=1}^{c_i} x_i$$

where, 'c_i' represents the number of data points in i^{th} cluster.

5) Recalculate the distance between each data point and new obtained cluster centers.

6) If no data point was reassigned then stop, otherwise repeat from step 3).

Short Message Service:

Whenever the moving object is detected, we are alerting the central control unit or the user through SMS using the GSM Modem. GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves.

Typically, an external GSM modem is connected to a computer through a serial cable or a USB cable. Like a GSM mobile phone, a GSM modem requires a SIM card from a wireless carrier in order to operate.

With the GSM modem, you can do things like:

- ✓ Reading, writing and deleting SMS messages.
- ✓ Sending SMS messages.
- ✓ Monitoring the signal strength.
- ✓ Monitoring the charging status and charge level of the battery.
- ✓ Reading, writing and searching phone book entries.

Images On Remote Computer System:

Whenever the owner get's SMS then, immediately he can see the images on any remote computer that has Internet access available. Once the IP Address is configured for access over the Internet, viewing images does not require any special software or hardware installed on the remote viewing computer. Connect to a remote computer through IP Address and view images using a web browser.

Instructions:

- Open Internet Explorer.
- Type the IP address and port number of the server system and folder name into the address bar at the top of the Internet Explorer web browser window using the format http://1.2.3.4:xx/folder_name replacing "1.2.3.4" with the IP address of the server and "xx" with the port number of the server and folder name is the folder where the images are stored.
- Press the "Enter" key. The images will now display in the Internet Explorer web browser window.

IV. CONCLUSION

In this Paper, a real-time background subtraction technique which can notice moving object on a background system was implemented using Java Version 1.6. Here the Discussion and comparison of Background Model using Frame difference, approximate medium, and Combination of Gaussian was obtained. It involves about subtracting a foreground and background frame, and then next algorithm takes the median value of a set number of previous frames to construct a back plate model, and finally modeling each pixel as a separate mixture model. From this it concludes the system can successfully resolve drop extraction in Mixture of Gaussian. Deal with the challenges of object extraction in dynamic environment, the results on several techniques show that this algorithm is efficient and robust for the dynamic environment with new objects in it.

Whenever the moving object is detected, We are alerting the owner by giving Short Message Service (SMS), then immediately the owner can see the images on any remote computer which is having Internet

V. FUTURE WORK

Future work is to resolve the cases when an object is totally occluded and an object is grouped with others.

VI. REFERENCES

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