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# An Intelligent transducer security system adopting background subtraction

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***Abstract:* Improving an Intelligent self-secured decision making system can be made possible by the performance of different techniques in background subtraction and decibel calculations. Detection of moving objects in video streams is the relevant step of info extraction in several computer vision applications. Main features that can be extracted from each moving object are centric, area, average luminance. Computer vision difficulties such as recognition, classification, activity investigation &tracking play a vital role in security systems. So here we propose background subtraction is one of the vital image handling steps for video surveillance. The proposed approach uses k-means comparison for frame change, approximate average and combination of Gaussian method proves that the chosen method has good performance under dynamic circumstances for real time tracking. Once if the object is detected then transducers can be used in detecting the sounds within the environment to conform the case, various security functions such as HD video tracking, alarm beepers, automatic door locking system can be auto activated by the system using input power source generated by the transducer.**

*Index Terms* -**Alarm beepers, clustering, High Definition video tracking, k-means algorithm, noisy frequency.**

## I. INTRODUCTION

Advancing the security monitoring systems to a level of decision making will be a major trend in coming days, it is an important branch of research in the content of enhancing security and recently monitoring system has become 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...

## II. REVIEW AND RELATED WORK

Present security systems at banks, gold shops, shopping malls, super markets, railway stations, airports, we adopt security cameras which are connected to a central monitoring server [9]. Data base administrators have to work round the clock to monitor is the videos being recorded from all the cameras [3][7]. These videos may be stored into the servers which may require zeta-bytes of memory space are a great problem in holding memory space. It becomes a risky task for the security system both to provide 24hours surveillance besides storing the captured videos also needs a very huge amount of memory space to the servers, it consumes storing and retrieval time too [12].Unfortunately present systems has problems in extracting the moving objects quickly and exactly from a real time stream image or monitoring video is quiet difficult, maintaining 24 hours admin support and continuous monitoring is highly difficult in a long run.

## III. ANALYSIS AND IMPACT OF SECURITY SYSTEM

In this technique we are not increasing the hardware or implementation cost over the entire architecture. Price of a transducer that is integrated to the system that predicts the sound and imitates the information to the system is very cheap as it is a direct Universal Serial Bus connective, it can be directly integrated to machine without using any connectors [7]. It indirectly improves quality of output by reducing the noise and distortions. Back ground subtraction using k-means is a simple unsupervised technique, so it can run on any simple machine and store the resultant in it. An integrated camera with changes in transducer architecture attached to it will even more reduce the price and error ratio inversely increases the quality of outcome and performance of entire system.

## IV. PROPOSED TECHNIQUE AND OBJECTIVE

### *A. Calculating dB using transducer*

A simple transducer is a sound receiver and a convertor, efficiency is an important consideration in any transducer. [16] Transducer efficiency is defined as the ratio of the power output in the desired form to the total power input. Mathematically, if P represents the total power input and Q represents the power output in the desired form, then the efficiency E, as a ratio between 0 and 1, is given by:

$$E = Q/P$$

If E% represents the efficiency as a percentage,

$$\text{Then: } E\% = 100Q/P$$

Usually this loss is manifested in the form of heat. Some antennas approach 100-percent efficiency [16]. A well-designed antenna supplied with 100 watts of radio frequency (RF) power radiates 80 or 90 watts in the form of an electromagnetic field. A few watts are dissipated as heat in the antenna conductors, the feed line conductors and dielectric, and in objects near the antenna. In general conditions a quiet room will be having a 20dB of sound, average house will be in 50dB and conditions where hammering, power saw and massive movements on the

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rooms will increase the sound up to 100 dBs' too. So we can easily calculate the change in sound with in the safe room using the transducer [16].

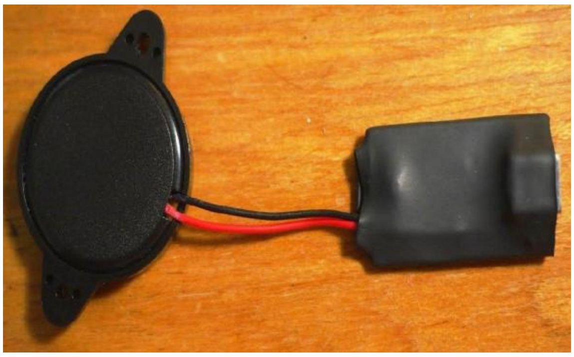

**Fig (1): Simple low decibel transducer-Strokes from 0.10"**

### *B. Background Subtraction*

Background subtraction is a commonly used technique for segmenting out objects. It involves comparing an observed image with an estimate of the image if it contained no objects of interest [4]. 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 [10], but this approach is very sensitive to object motion, camera motion, and brightness changes and noise [4]. This works on the background subtraction algorithm which was introduced above, discusses the problem of the algorithm, and proposes the resolve of the problem [11] [3]. 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. Extracting out the 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 [7]. Let fore object i the foreground object, which is the result of the algorithm. Then, the algorithm of background subtraction can be presented by the following formulate Fore object $_{(i)}$ . Frame $_{(i)}$ background $_{(j)}$

### *An example: Showing a real time tracking*

Figure (2.A) shows a background frame, we can remove the background from a frame image of a video as shown in Figure (2.D). Figure (2.A) is the original frame Figure (2.B) is the moving object frame, which is obtained by the above expression.

### *A. Steps for object detection and abnormality detection in real time tracking*

- Transducer calculates the sound in the safe room (20dB: quite room, 65+dB: Abnormal condition).
- If sound condition is more than 35 dB, it is conformed that someone has entered the safe room.
- Transducer generates the electrical energy that empowers the GSM modem to forward SOS messages.
- Figure (2.A) shows the background frame of the original image of a video taken in normal condition.
- Figure (2.B) shows the object in moving condition which is detected in the real time condition.
- Figure (2.C) shows the tracking the detected object where frame $_{(i)}$ is moving nearer to the camera.
- Figure (2.D) shows the tracking of moving object by subtracting figure (x) from figure (y).

**Fig (2.A): Reference image {x} Figure (2.B): Moving object {y}**

**Fig (2.C): Object detection**

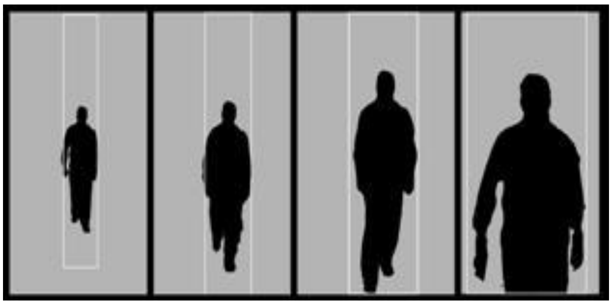

**Fig (2.D): Tracking the moving object**

A reference background is initialized at the start of the system is with the first few captured frames of video and it is updated to adapt the changes during the operational period. At each new frame, foreground pixels are

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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 colored 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, center of mass and color histogram which will be used in later steps. Figure (5.A) gives the sequence of steps followed in this project. The first Step is the input video taken for preprocessing. The pre-processing consists of color 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.

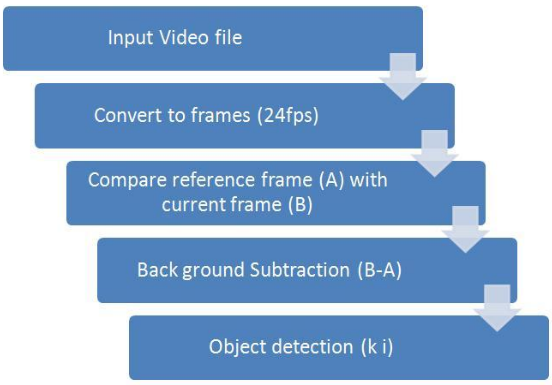


**Fig (2.E): Flow chart followed in detecting frames**

### *B. Adopting K-means technique*

K-means is the simplest unsupervised learning technique to solve the well-known clustering problems. The procedure follows a simplest way to classify a given data set through a certain number of clusters (assume k clusters) in a fixed apriori. Here the main idea is to define n centers, one for each cluster. These centers should be placed in a cunning way because of different location causes different result. So, the best 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 it needs to re-calculate k new centroids as bary center 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 that can be defined:

$$J(V) = \sum_{i=1}^{k} \sum_{j=1}^{k_i} \left( \| x_i - v_i \| \right)^2$$

Where,

- 'J' is the squared error function
- $||x_i - v_j||$ is the Euclidean distance between $x_i$ & $v_j$,
- '$c_i$' is the number of data points in $i^{th}$ cluster
- '$k$' is the number of cluster centers.

### *C. 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 '$k$' cluster centers.

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

3) Assign data point to the cluster center whose distances are near tothe entire cluster

4) Recalculate the new cluster center using

$$v = (1/k_i) \sum_{j=1}^{k_1} x_i$$

Where, '$k_i$' 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.

Step 1: Alerting the owner: Whenever the moving object is detected, system sends an automated message to the owner 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, 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.

Step 2: Live through remote surveillance system: As soon as the ownergetsan SMS then, immediately he can see the images and high definition video 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 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://[remote10.10.10.10]:xx/folder___name replacing "remote10.10.10.10" with the IP address of the server and "xx" with the port number and folder name is the folder where the images are stored.

Step 3: Automatic door locking system: As soon the anomalies are found, Act 1: System will automatically operating the Automatic locking door system, ring on the alarm beepers outside the room alerting the people around also can intimate a nearby police and security to take the area under control. Act 2: System can turn on the electricity of the fences and activate the mesh doors that are fixed around the secured area to catch the culprit red handed. Thus Video surveillance system helps to enhance the security of a system.

## V. CONCLUSION

Comparison of background model using Frame difference, approximate medium, and combination of Gaussian is obtained. A real-time background subtraction technique which can notice moving object on a background system is implemented using Java Media framework 2.1.1. From this it concludes the system can successfully resolve drop extraction in mixture of Gaussian dealing 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, system is alerting the owner by giving 3 acts. Step 1: Short Message Service (SMS), Step 2: Remote video surveillance, then immediately the owner can see the images on any remote computer which is having Internet Step 3: Automatic door locking System, either by adopting Act 1 or Act 2as per availability which helps in improving the security.

## VI. FUTURE SCOPE

Integrating this system in parallel computing along with global positioning systems will control the chances of burglaries. As cameras are improving day by day and usage of high end technology is becoming cheaper, small and medium level business people also can use this kind of security system when it is manufactured and sold on a large scale. This security system can be adopted in areas where high security is required such as banks, museums, gold shops, shopping malls, colleges where cameras can be improved by adopting this background subtraction technique where a highest security can be adopted from a remote zone where human can't employed round the clock. We can resolve the cases when an object is totally occluded and an object is grouped with them.

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