5. Methodology

The Differential Time Lapse Video can be generated using pre or post processing or in real time application. The time-lapse video can be generated by different ways. The major ways to generate the time-lapse video are discussed here as under. The one way is to generate time-lapse is post procedure, in which a complete video is first taken and stored in the digital media and then from that time-lapse can be generated. Another way to generate time-lapse is to make digital camera connect to the system and make some algorithm runs for your system which makes sure that digital camera captures and store the photographs at periodic time, and then generate the movie file from that sequence of the photograph. This all techniques are discussed with their advantages and disadvantages as under.

Differential Time Lapse Video Using Non-Continuous Acquisition

In this method, frames are captured from the live video streams. We can set the frame capture interval property specify how often frames are stored from video stream. For instance, if we set frame capture interval to 10, then only 1 in 10 frames are kept, the other 9 frames will be discarded. These selected frames are stored back to back to generate time-lapse video.

Disadvantage: In order to have 20 frames in time-lapse video, we need to capture 20*t (where t is frame capture interval) frames. The system will be counting for each frame and waiting for the required number frame, means busy like polling algorithm based system. In this system, is just able to store that desired frame but also reduces the size of the video but, system remains busy to store the desired frames or discarding and counting the frames. It means that system must be dedicated to generate that time-lapse video using non-continuous acquisition.

Differential Time Lapse Video Using Time Events

In this method, we make out timer running back side in the system and when timer runs out of time, we capture a frame and reload the timer to run again, and wait for time till timer runs out of time. Here, we capture frames at equally separated time period as in previous case. Compare to time-lapse video using non-continuous acquisition, time gap is available between two successive
frame capture while we just have to wait for timer running out. Advantage: Time gap can be utilized for image processing and storing or sending the information through net, allows us to generate real time application.

**Differential Time Lapse Video Using Post Processed Data**

This method is ideal for situation where we are not sure which frames are relevant during capture or where our processing would take too long time to occur during the acquisition. The possible application would be to delete frames that have no motion relative to the previous frames. Here, we may have the different time gaps between successive frames that need to be stored to generate time-lapse video, which makes sure that all important information will be there in video and no redundant information present in video. Disadvantage: The primary disadvantage is that it is a post processed application like time-lapse video using non-continuous acquisition and this method of time decimation requires a large amount of memory to store all frames. Advantage: However once process is over, the time-lapse video which get generated will have all the information without any overlapping information, which may not be the case with constant time interval as in previous two cases.

**Differential Time Lapse Video in Real Time**

This is most effective technique to generate the Differential Time Lapse Video. While dealing with the real time implementation method, the care should be taken that algorithm should be as simple as possible to make sure that system can work in real time. The problem with the Image processing algorithms is that they are time consuming. The proposed algorithm is very simple and efficient to work in real time application.

**Implementation of Periodic Time Lapse Video**

Step 1  Capture the First Frame  
Step 2  Date and Time Stamping over the frame  
Step 3  Add frame to the Video file  
Step 4  Wait for the Some Time  
Step 5  Go back to Step 1
Implementation of Differential Time Lapse Video

Step 1  Capture the First Frame
Step 2  Add frame to the Video file
Step 3  Capture the another frame
Step 4  Compare the captured frame with the last stored frame
Step 5  Both frames are having sufficient difference?
  If NO: Go back to Step 3
Step 6  Date and Time Stamp over the frame
Step 7  Modify the frame to do Steganography?
Step 8  Store the frame in the Video File
Step 9  Go back to Step 3

The algorithm shown in the above tabulations are used for collecting the data. The care should be taken while realizing this algorithm. The care should be taken in terms of time consumption of the algorithm.

Utility of the Research

The one of the application of the same is for security system at remote location. The time lapse video can be the better replacement for the CCTV System also. The few of the application are discussed over here.

Differential Time Lapse Video for Security System

Differential time lapse video system can be utilized for security system. The simple time lapse video can be generated at remote location using computer system or by making embedded system or using dedicated board, can be sent over the internet very easily and over the long distance within few seconds also. The observer can see the video of last one hour in just few seconds and knows that what are the activity are happening there over the observing area. The observer can then easily monitor and kept watch for many reasons including security purpose too. The observer can take decision accordingly.
This kind of security system cannot prevent the any incident to be happened or even does not provide the alarm on incident happened. However, it stores the complete information about the incident, which can be used for legal action later on if required.

The system can be connected to the internet, and the one hours time lapse video are sent to the predefined mail id or predefined IP address or uploaded over the some website for reference to the observer.

The more can be added is that, the observer can see the time-lapse as it happens instead of that every hour file is uploaded. This is not that much simpler, many modification is required for the same, where the system just have the last stored frame with itself and send the frame to be stored next to the server or to observer. The time lapse video is than generated at the server and it reduces the cost of the equipment which needs to be placed at the remote location.

The furthermore, the observer should able to send some command at according to that capturing device should move towards the left-right or up-down. This will give the really new dimension to the security system. This kind of systems are all ready exists but the security camera is continuously sending the frames and observer is watching the frame continuously, while if the system is made intelligent like these, the frame which are having some motion that only is sent to the server and server converts the received frames to the time lapse video.

Due to the limitation of the bandwidth available and frames to be sent, normally a highly compressed, normally lossy compressed, frames are sent to the system which are not that much clear to see. If the time lapse is added in such a system, only few frames are need to be sent to the server. The system can send the loss less compressed frames or even uncompressed frame to the system without compromising over the available bandwidth. That reduces the cost of communication too, and also reduces the load over the internet.

As discussed earlier, the time lapse video can be stored in different videos of selected hours. If the system is made connected to the internet, the generated time lapse video can be uploaded over the internet directly.

The dedicated embedded system can be used for the above application. The cost effective embedded system can be made, where the system stores only frames which is need to stored in
differential time lapse video. The system compared the new frame from the capturing device with the available frame and find out whether to store or discard the frame. If frame is selected to store, system puts time and date stamping using water marking or steganography and uploaded to the server along with that it store the frame as the reference frame for next frames to be selected.

One of the new eras in security system can be generated if the capturing device is connected with mechanism which allows the capturing device to move left-right and up-down.