A Review On Differential Time Lapse Video Techniques

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Abstract--- Time lapse technique is a video generation technique in which each and every frame is capture and stored after some time interval. This time interval or frame selection can be based on a time period the framing device or difference between successive frames. If event is periodic or certain than we can use periodic time lapsing in which record each and every frame after a certain fixed duration. Differential Time Lapse video is a non-periodic time lapse technique. It is generated by capturing each frame and comparing with the previous stored frame by pixel to pixel mapping method. If the number of difference pixel is greater than predefined threshold then the frame is stored otherwise frame is discarded. Then generating a video from these differential frames is a differential time lapse video. It is important for the records, particularly, which are not natural and with this the size of recording is very less as well as it is efficiently helpful to analyze the non-natural event like movement of any human bodies, animal movement etc. A differential time-lapse technique allows us to remove the unnecessary data from the normal video, in order to save the time to visualization and storage space. Time-lapse techniques if used for documentary, not only saves the time to understand how thing are changed but also reduces the size of documentary. Differential time lapse video does not give the information about at which time the event is occurred so in order to find the same in the video output loss less visual watermarking can be used. MATLAB based algorithm is used for generating the differential time lapse video along with the date and time stamping using the loss less visual watermarking.
Keywords: Time-lapse, Differential Time-lapse, Pixel to pixel mapping, Pixel difference threshold, watermarking.

I. INTRODUCTION TO TIME-LAPSE TECHNIQUES

There are three famous techniques to generate time-lapse video. The time lapse video can be generated in real time or using post presses on the video. The different techniques which are used for the generation of time lapse are discussed below.

A. Time-lapse video using noncontiguous acquisition:

In this method, frames are captured from the live video streams. We can set the frame capture interval property specifies how often frames are stored from video stream. For instant, 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. Disadvantages are in order to have 20 frames in time-lapse video, we need to capture 20*n (where n 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.

B. 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 it, 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 noncontiguous 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.

C. 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 time gap between to consecutive frames and those needs to be stored for generating time lapse video. It makes sure that there is no redundant information present in video.

II. WORKING PRINCIPLE OF TIME-LAPSE TECHNIQUES

Videos are regularly projected at 25 FPS, means that 25 images come out on the screen every second. Under normal circumstances a video camera will record images at 25 FPS. Images on screen are appear like moving normally because of the same speed of projection and recording.. Even for the recording at a slower speed it can be projected at 25 frames per second.
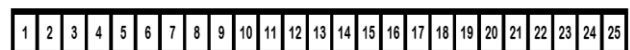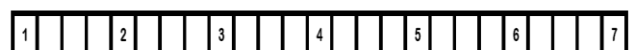

Fig. 1: Time-lapse Technique explanation while capturing frames

So the image on screen will materialize to move faster. Fig.1 shows that how time lapse frames are captured. Fig.2 shows how the images are replayed back in 0.28 sec or 0.36 sec in 7 FPS and 9 FPS system respectively. Now, when video of such a different frame are made, within 1 sec we can see 25 frames changing on the screen and hence we can see the moving object as per eye perception rules. These frames are captured at low FPS and hence, when replayed back at normal speed, it seems to be lapse in time and hence time lapse videos are generated.

Considering the case of 25 FPS, in 1 second we actually see the really what happened in 1 sec, but in the case of 1 FPS, in 1 second we sees what actually happened in last 25 seconds, similarly in the case of 0.2 FPS, we actually realized that what happened in 125 seconds in a second. This can be understood by the same example which is used earlier to explain working principal. The Fig-2 shows the when time-lapse photographs are replayed back at normal speed movie, within one second which number frame are played back within one second.

A. HDTR Images:

An HDTR image is an image in which multiple frames taken over an arbitrary time interval are blended together. The images in the time-lapse set are merged together by progressively sampling time-adjacent images horizontally or vertically.

The difference between an HDTR image and a single-frame long exposure is that the contribution to any region of an HDTR image is primarily from a single image from the time-lapse set, rather than an average of all images. An HDTR is generated from a set of time-lapse images.
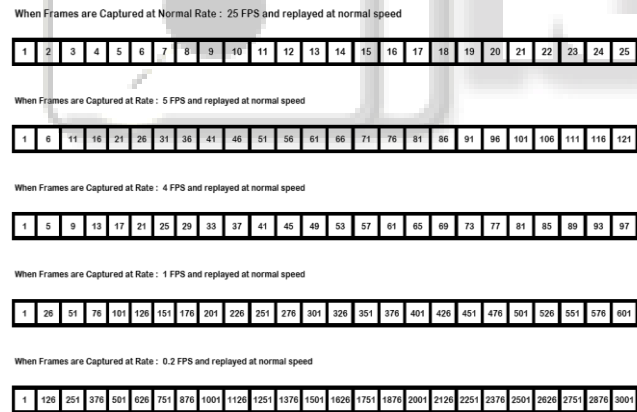

Fig. 2: Time-lapse technique interpretation while replayed back captured frame

Here, a simple HDTR is created from 5 images taken at different times. From each image, a strip representing 20% of the image is extracted and the strips are blended to reduce banding artifacts. It can be seen from the figure that how HDTR Images are generated from the time-lapse photographs. The first photograph is spliced from left side and placed on the left portion of the HDTR image. The second photograph's second slice is placed on near to first in HDTR Image and so on, as shown in the above figure. However, it can be easily seen that it is generated by the vertical slicing of the photographs as can be seen in figure below.

Time-lapse performance can be measured from the size and time duration of information available in the time-lapse

video to the original video. In order to improve the performance of the time-lapse the traditional periodic time-lapse can't be used. In order to improve, non-periodic time-lapse can be used. To generate non-periodic time-lapse, real time image processing application is required, which compares the previous image with recently captured image, if the there is some specific difference is there between this two image, then this image is required to save else need to capture the next image for further process. It may be something like pooling algorithm which requires dedicated processor to keep real time application running.
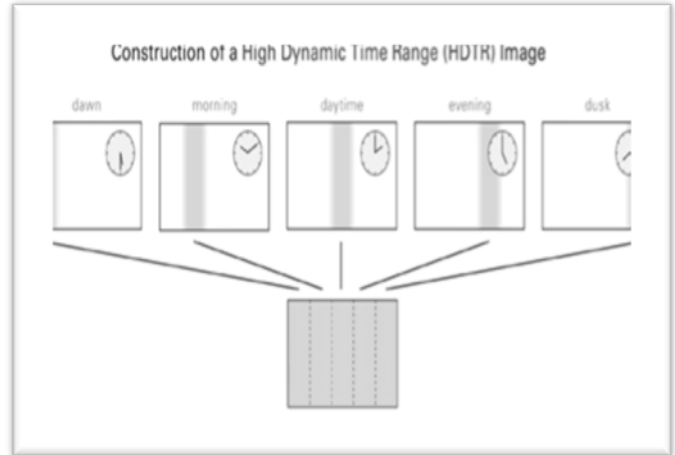

Fig. 3: HDTR Image generation process

III. IMPLEMENTATION OF TIME-LAPSE

B. General Time-lapse Algorithm:

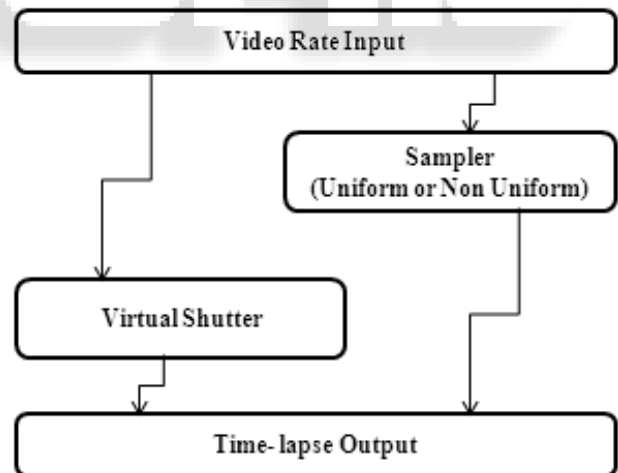General time-lapse generator should have the following components.

Fig. 4: General Time-lapse Generator

C. Differential Time-lapse Techniques:

Undetected time-lapse is shown in fig. 4. Real time video streaming is available from video camera. First one will be saved directly. Next frame will be compared with the previously saved frame by pixel to pixel in 3-dimension array (RGB Image) and 1-dimentsion array (Gray Scale Image). While computing the Image for finding out the Error vector, we take care of minor brightness changes, contrast changing and camera limitation of capturing brightness and contrast. The total average of error vector is computed in 3-dimentaion and 1-dimension array. This

value of error are compared, if this are above some minimum change required then this image is saved at the end of previously stored image, else new captured frame will be taken. We lost few frames of real streaming data coming from the live capturing camera while doing the calculation, but this will be 2-frames only if frame is not stored and 6-frames if frame is stored for particular case study we used here. This can vary depends on the configuration of the system.

III. TIME STAMPING

In differential time-lapse techniques only movement are stored. The event is recorded, but no one can say that at which time event is recorded. If frame is need to be saved according to differential time-lapse algorithm criteria, the first it is time-stamped and then stored. For time stamping the system clock time is taken as the reference, and water mark techniques is used to show the time and date over the frame.

A. Over View of the Digital Water Marking System for Video:
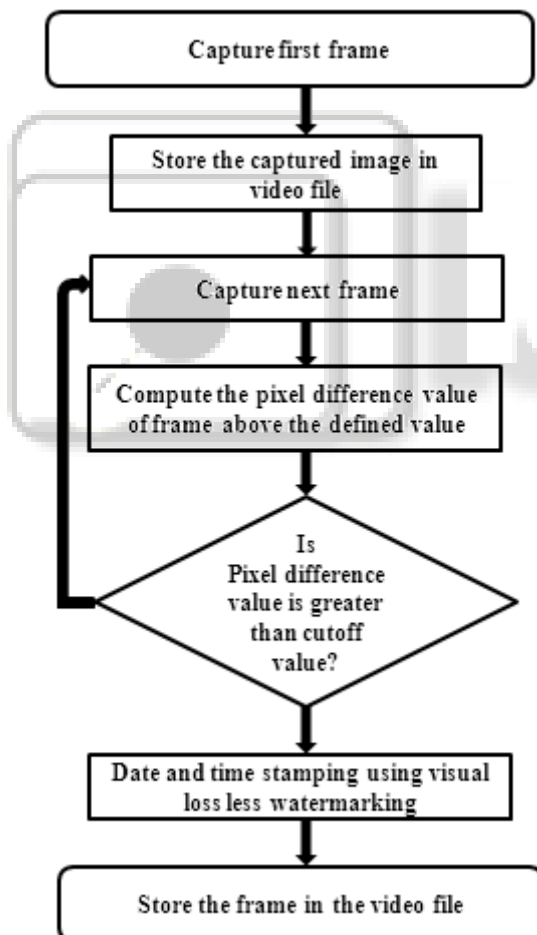

Fig. 5: Differential time-lapse algorithm generator

Video watermarking involves embedding cryptographic information derived from frames of digital video into the video itself. Ideally, a user screening the video not able to recognize a difference between the new, unmarked video and the marked video, but application of watermarking extraction can read the watermark and obtains the implanted information. Because the watermark is part of the video,

rather than part of the file format or DRM system, this technology works independently of the video file format or codec.

This watermarking algorithm should take care of following parameters:

1) Robustness: the ability to resist an attacker to demolish it by changing the rotation, size, quality or other visual aspects of the video.
2) Security: the ability to resist attempts by a attacker to take out it or demolish it via cryptanalysis, without modifying the video itself.

IV. RECENT DEVELOPMENT IN TIME-LAPSE

The most recent development in time-lapse cinematography is the addition of High Dynamic Range Imaging (photographic technique) to time-lapse. One of the first experiments was an 11 second series completed in un-automated form by Nicholas Phillips on July 8, 2006. Modern time-lapse enthusiasts have started to follow suit as of May 2007. Ollie Larkin (work) and Jay Burlage (work) have both successfully shot and processed HDR time-lapse footage in High definition, with motion control, using DSLR cameras. The first example of this technique in a full length film can be seen in Silicon Valley Time-lapse (2008). Time-lapse photography can create an overwhelming amount of data. For example, a single camera that takes an image every 5 seconds will produce 17,280 images per day, or closed to 63,07,200 images per year. Image or video compression reduces the storage requirements, but the resulting data has compression artifacts and is not very useful for further analysis.

In addition, it is currently difficult to edit the images in a time-lapse sequence, and advanced image-based rendering operations such as relighting are impossible. A key challenge in dealing with time-lapse data is to provide a representation that efficiently reduces storage requirements while allowing useful scene analysis and advanced image editing.

V. CONCLUSION

Unknown movement time-lapse method is presented for creating non-periodic time-lapse video which provide superior compression of time without lost any of the important information. Based on user-specific characteristics, we can generate time-lapse videos with periodic or non-periodic lapse in time. Our suggested non-periodic lapse chooses the frames of the time-lapse video using an image processing in MATLAB application which is user specified and hence performance of the system is better on special cases where user defines their parameters.

VI. REFERENCES

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