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A SURVEY: VIDEO SYNOPSIS TECHNIQUES

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ABSTRACT

In today's modern world, most surveillance cameras operate 24/7, but often there is not enough time and manpower to review all the video recordings. As a result, important events and activities can be missed during fast forwarding or passive camera monitoring (when cameras are not watched by security personnel.) With the increasing volume of video data, how to analyze and browse video in fast and effective way has become an urgent problem in application. Video Synopsis is an approach that helps reduce the time it takes to review long video records. It summarizes hours of video footage into minutes by simultaneously presenting all the events and activities that occurred within a specific period of time. In other words, different events that happened within a day are presented and viewed together. This allows an operator to review an hour of video in less than a minute. In this paper, we present a survey on different techniques of video synopsis.

Keywords: Video Summarization, Video Skimming, video surveillance.

INTRODUCTION

Today, video surveillance is used in thousands of locations worldwide for enhancing public safety, investigating and preventing security breaches, criminal activity and loss prevention. It also serves as an effective tool to improve employee and operational performance. Yet, with all the technological advances that have been made in video surveillance, viewing and analysis of recorded video surveillance footage is still a costly and time intensive task that often requires a large team. So Video Synopsis provides a very short video representation of a long time period, while preserving all essential activities of the original video. For example, if a camera was set to record activities on the parking lot, at the end of the day security personnel will watch through a 1.5 minute video "packed" with all the people and cars that were entering or leaving the parking lot. The important factor is that videos are not being speed up, but all the events and activities are reviewed at the same time.

Video synopsis is compact video in which most of the activity is condensed by simultaneously showing actions, even when they originally occurred at different times [2].In figure 1, video started with a person walking on the ground and after some time, bird is flying in the sky. so compact video show walking man and flying bird simultaneously.In this paper we present the different methods for producing the synopsis video.

Figure 1:
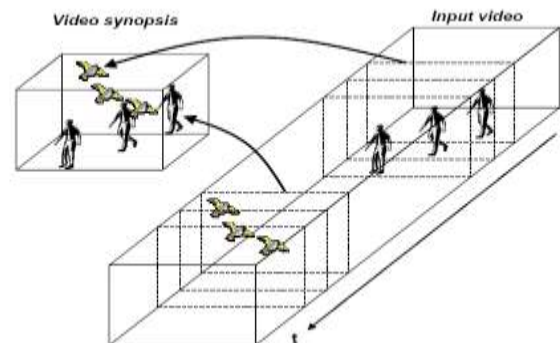
The input video shows a walking person and, after a period of inactivity, displays a flying bird. A compact video synopsis can be produced by playing the bird and the person simultaneously.

RELATED WORK

An improving the effectiveness and efficiency of video acquisition, archiving, cataloguing, indexing and increasing the usability of stored videos, video abstraction is there.Video abstraction is a mechanism that allows the user to gain certain perspectives of a video document without watching /addressing the entire video [1].Abstraction techniques are mainly designed to facilitate browsing of a video database.Video abstraction has mainly two types: video summarization and video skimming.

Video *summarization,* these are also called representative frames, R-frames, still-image abstracts

or static storyboard, and a set consists of a collection of salient images extracted from the underlying video source.

Video skimming. This is also called a moving-image abstract, moving story board, or summary sequence. This type of abstract consists of a collection of video segments (and corresponding audio) extracted from the original video.

Video Synopsis is video abstraction technique that optimally reduces the spatio-temporal redundancy in video.

Some benefits of video synopsis are:

- Get Better Evidence Faster Intelligently identify incident and link to the original video with one click.
- Review All of Your Surveillance Video Quickly review weeks of video without missing single incidents.
- Export Incidents Synopsis Videos and original footage are easily exported for use in investigations.

METHODS OF VIDEO SYNOPSIS
Video synopsis techniques can be classified as

- Frame based abstraction
- Object based video synopsis
- Part movement video synopsis

Frame based abstraction
There are two types of video abstraction: keyframes and video skim, both are based on frame based method. In that frames are the basic building block and can't be decomposed.

In keyframe abstraction, set of salient images are extracted and collected. The simplest method for keyframe generation is uniform sampling. Review of keyframe extraction techniques will focus only on techniques that take into account the underlying dynamics, to different degrees and from varying viewpoints, of the video sequence.[1]

In video skim, it is collection of video segments extracted from source video. To generate it requires high-level content analysis and the simplest method for generating video skims is uniform sub-sampling, which extracts fixed-duration excerpts of the original video at fixed intervals. For generating video skims automatically: excerpt segmentation, excerpt selection, excerpt shortening, multimodal integration, and excerpt assembly. Note that the term *excerpt* here refers to a segment of video, be it shot, scene, or event spanning across a number of shots, etc. [1]

The fast forward method is types of keyframe based method, which select keyframe uniformly and adaptively. But the disadvantage is that they do not preserve time coherence and result in unrealistic views. [5]

Object based video synopsis
Hong-Wen Kang, Yasuyuki Matsushi, Xiaoou Tang, Xue-Quan Chen(2006) [3] proposed space-time video montage which analyze simultaneously the spatial and temporal information distribution in a video Sequence, and extract the visually informative space-time portions of the input videos. Proposed algorithm contain main three steps

1. Finding informative video portions
2. Layer segmentation of the saliency volumes
3. Packing saliency layers.

Advantage is that it is able to generate much more compact and highly informative output videos. But it is computationally expensive.

Alex Rav-Acha, Yael Pritch, Shmuel Peleg(2006) [4] proposed an object-based Approach and algorithm steps are:

The video synopsis S will be constructed from the input video *I* using the following steps:

1. Objects *b*1....*br* are extracted from the input video *I*.
2. A set of non-overlapping segments *B* is selected from the original objects.
3. A temporal shift *M* is applied to each selected segment, creating a shorter video synopsis while avoiding occlusions between objects and enabling seamless stitching.

By using above algorithm the generated video synopsis that is similar to that of Hong-Wen Kang, Yasuyuki Matsushi, Xiaoou Tang, Xue-Quan Chen(2006) [3]. Both of these methods change the chronological order of objects, and show several actions at the same time. The difference is that the latter [4] only moves objects along the time axis.
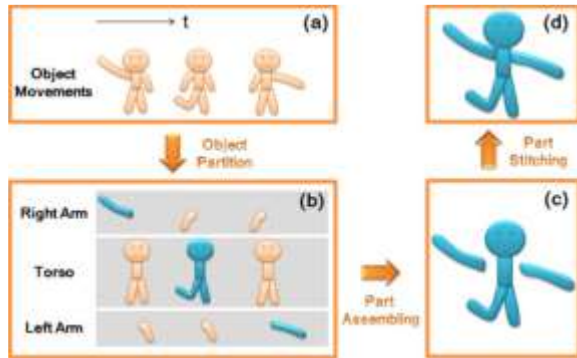
Part movement video synopsis
Part movement based approach proposed by Nie, Sun, Ping Li, Chunxia Xiao, and Kwan-Liu Ma(2014) [6].In this method main focus on the movements of a single video object, and try to eliminate the redundancies existing in the object movements, which produce more compact video synopsis. Basic idea is to work at the level of object part, and to remove the non-moving parts which are considered as redundancies.

In this method main three steps are:

- Object movement partition
- Part movement assembling optimization
- Part movement stitching optimization

We give an overview of the proposed object movement's synopsis method in figure 2.

Figure 2:

Overview of the object movement's synopsis system.

In the first stage we extract an object movement sequence from an input video (Fig. 2a), and partition each object into several semantic parts, which produces several part movement sequences (Fig. 2b). The partition boundaries between adjacent parts are kept for using in the next two stages. In Fig. 2b, the blue ones are selected from the "Right Arm", "Torso" and "Left Arm" movement sequences and are assembled together to form a synopsized object movement (Fig. 2c).

The Table 1 shows the comparison between different methods for video synopsis.

Table:

Table 1. Comparison table of video synopsis methods

Methods	Advantages	Disadvantages
Frame-based	• Simple and Efficient.	• This method abandon a frame as a whole, they usually suffer from losing fast activities.
Object-based	• Eliminate Spatiotemporal redundancy. • Utilize empty space of frame.	• It cannot effectively handle videos with redundancies exiting during the movement of a single object.
Part movement based	• Eliminate the redundancies existing in the object movements. • It can produce more compact and natural synopsis result, as we remove the inter-part and inner-part redundancies.	• It can damaging the structure of object and introducing new object movements that is do not exist in the input video. • The overlaps between parts increase the difficulty of producing perfect synopsis results.

CONCLUSION

In this paper a variety of Video Synopsis techniques such as Frame based abstraction, Object based Synopsis, Part movement video synopsis. For each technique a detailed explanation is there for synopsis of video. And there is comparison of this techniques are also given.

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