*International Journal of Engineering & Technology*, 7 (2.21) (2018) 427-430

International Journal of Engineering & Technology

*Website: www.sciencepubco.com/index.php/IJET*

***Research paper***

# An effective approach for video condensation by ribbon carving

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**Abstract**

The proposed system aims in developing a method to stream video based on time intervals. Regular or irregular sub-sampling is not sufficient for scaling of video in time. Seam carving has been used where an Image can be resized either by inserting or removing pixels. Ribbon carving is an extension of seam carving which resizes the video in temporal direction. The non-parametric kernel model used for background subtraction has been replaced with temporal median filter. It enhances the processing speed and memory allocation has been more efficient, thus reducing the time of video without loss of data.

***Index Terms:*** *Video digest, ribbon carving, seam carving, video summarization.*

## 1. Introduction

A video condensation algorithm has been developed for streaming video which limits the size depending on the time intervals. Original video frames is read into a buffer, gets condensed and written into streaming video with the help of sliding window.
The same process gets repeated for the remaining set of fames. Temporal Median filter is implemented for background subtraction which helps in reducing the complexity of motion detection.
Image resizing can be done via down-sampling, cropping etc.., but video resizing requires more attention and should be checked for information retrieval.
Video sequences have been most important aspect in various applications like visual surveillance, forensics, parking areas etc.., Fast review of videos is needed in all aspects which helps to get the information faster.
This can be done with the help of frame skipping where the video can be viewed in minimum time [1].

## 2. Existing system

### Video digest

An abbreviated video is produced preserving the most relevant activity and static segments gets removed.
So surveillance videos can be viewed rapidly focusing on the important details needed.
It can be computed with the help of various approaches, the most important being:

- Fast Forwarding, where fames gets skipped in fixed intervals[7];
- Video Summarization, which extracts key frames and presented as a storyline [5];
- Video Montage, which combines both spatial and temporal information extracting visual information contents.

### Fast forwarding

Fast forwarding involves removal of complete frames under generative model, which results in video condensation ratio getting relatively low [7].

### Video summarization

Frames of interest based on video features were extracted and used for summarizing the information content in the videos. A set of key frames will be selected from the video eliminating redundancy preserving the essential information from the video [14].
Video skimming can be used which extracts the sub sequences and combine them into a summary video [8,9].

### Video synopsis

Delivers much information in a short time. The activities get condensed showing simultaneous actions which took place at different times.
Dynamic objects are extracted and realigned in time resulting in spatio-temporal redundancy [11, 12].

### Seam carving

A novel technique called seam carving was introduced for content-aware image resizing. Seam is constructed by connected path of pixels either from left to right (or) top to bottom.
Image can be resized by recursively reducing or increasing the dimension values with the respective pixel values.
Seams are associated with costs which reflect scene content, representing larger costs associated with more important content [13].
Seams will be inserted or deleted with least cost till desired aspect ratio is achieved.

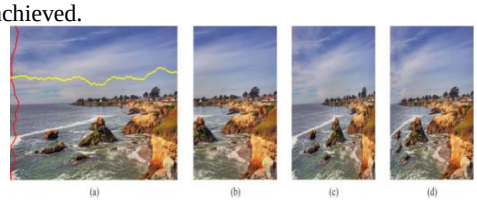


**Fig.1:** (a) original image with horizontal and vertical seams

(b). Cropped image
(c). Scaled image
(d). Carved image

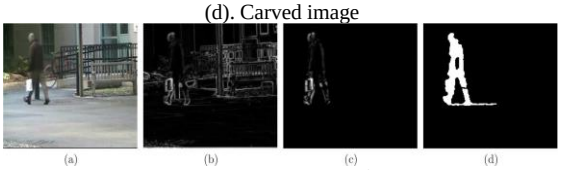


**Fig. 2:** (a) Original video frame.
(b) 3-D luminance gradient.
(c) Temporal luminance derivative.
(d) Activity (motion) labels from background subtraction

### Limitations

- Complexity involving multiple processing stages.
- More Content degradation.
- Effective for videos with multiple, similarly moving objects.
- Consumes more memory and Visual Time.

## 3. Proposed system

### Ribbon carving

2D seam carving can be extended to 3D case by ribbon carving. A video can be condensed either in spatial dimension (vertically or horizontally) or in time dimension by orientation direction. In this project, the total length of the original video is reduced without changing the spatial size of video frames. Video is partitioned into past and future regions connecting the surface in 3D. While deleting the pixels make sure that the pixels should not have same spatial coordinates, thereby deleting the temporal values by one.

### Video seams

If we have a set of frames which is W pixels wide and H pixels tall, after condensation, a new set of N' consecutive frames having same width and height but with N'≤ N will be formed. Video condensation preserves the essential events and timings without degrading the video quality [3]. Seam deletion is performed reducing the frames in video, preventing video distortion.

### Stopping criterion

Least cost ribbon in a frame will be selected and removed either horizontally or vertically from the original video. Until the prescribed stopping criteria is met, least cost ribbons will be carved out iteratively and processed further. If we have a set of video frames, apply ribbon carving for each block until we reach the condensation ratio.

### Advantages

- Easy to implement.
- Faster processing.
- More efficient memory allocation.
- The ribbon model is flexible.

### Methodology

- Ribbon carving is an extension of 2D seam carving.
- Video can be condensed.
  - Spatial dimension.
  - Time dimension assuming.
- Size of video frame is H*W.
- The buffer length is K.
- Vertical ribbon will be processed using the Y co-ordinates.
- Horizontal ribbons will be processed in X direction.

## 4. Results and discussion

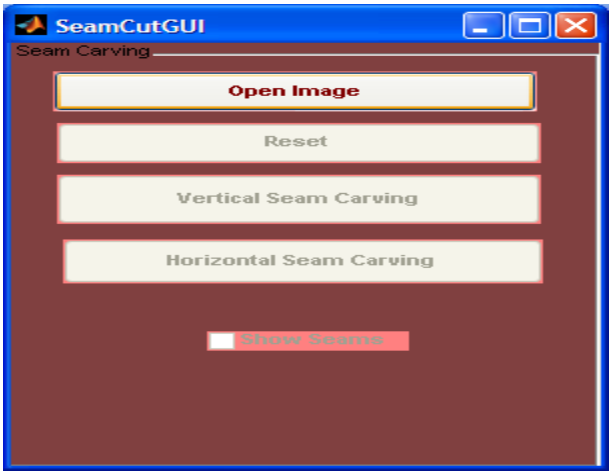



**Fig. 3:** GUI for seam carving

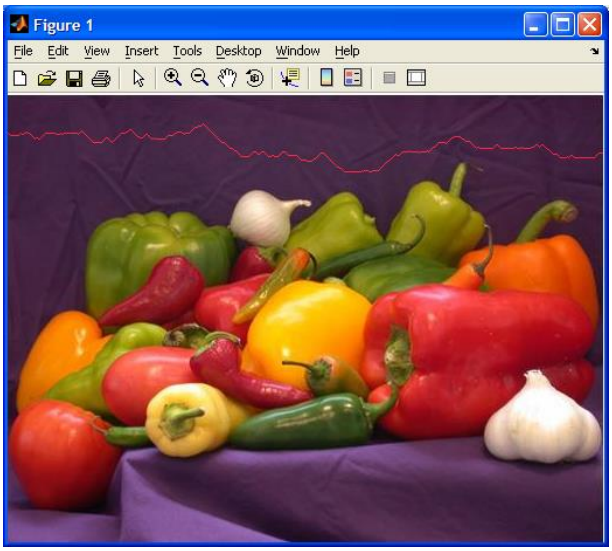



**Fig. 4:** Horizontal seam carving

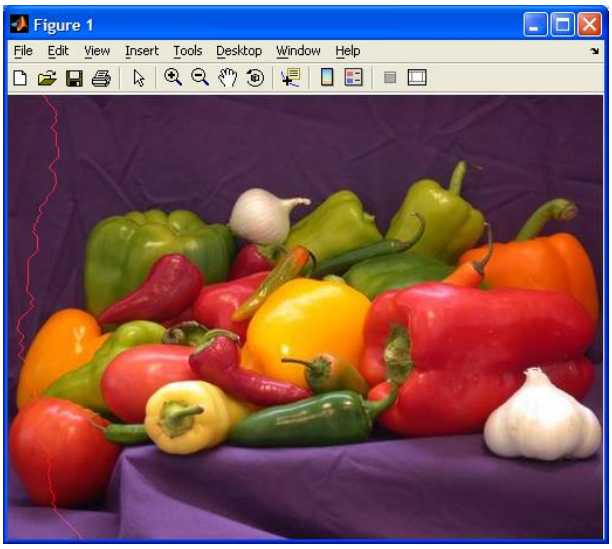
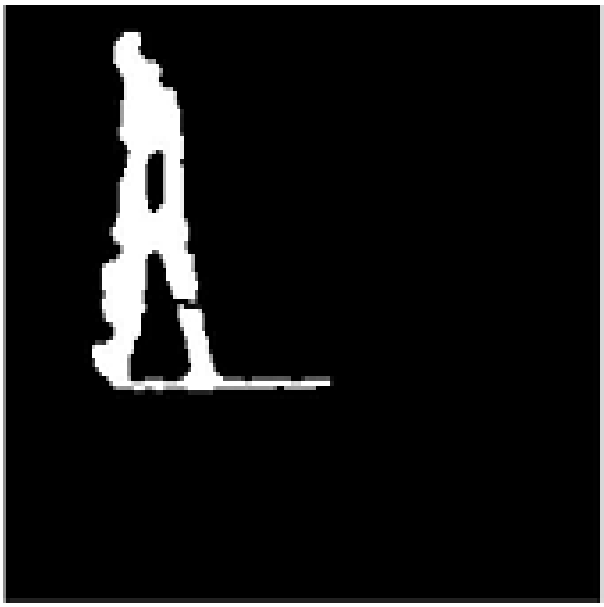


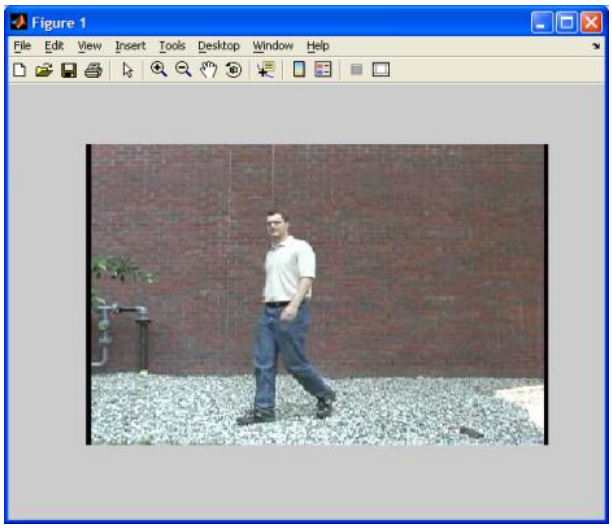

**Fig. 5:** Vertical seam carving

a) Original image

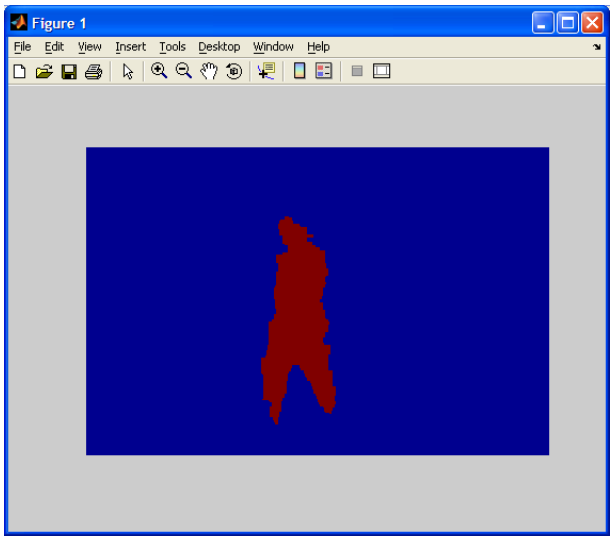


b) Extracted image

**Fig.6:** Background extraction




a) Original image




b) Extracted image

**Fig 6a:** Background extraction

Original frame #12,852

Original frame #12,933

Original frame #12,947

Condensed frame #1,808

**Fig.7:** Condensed frame

## 5. Conclusion

Video condensation is a method for reducing time duration of a video, producing output video in a short duration than the original video without the loss of spatial data. Condensing video is required for identifying, localizing dynamic scene contents in the areas of video forensics where time seems to be an crucial factor. Ribbon carving approach has been developed which performs seam deletion temporally preserving the spatial data. The dynamic events in a different time sequence will be brought together eliminating the idle frame sequences, thereby reducing the total time of a video.

## 6. Future enhancement

Image compression will be performed in addition to temporal length reduction and improves the condensation process with high quality and clarity. To improve the algorithm of ribbon carving for

streaming video, the future work should focus on an effective way to deal with multiple objects moving at varying speeds.

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