CS766 Project Proposal

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Table 1: Group Members

1 Problem Statement

Our project selection is **Seam Carving**, which is effectively used in image resizing, image content enhancement and object removal. The traditional image resizing method generally only considers geometric constraints of the image and can't meet new demands. We want to keep the image's notable part still significant after image resizing, so we need to take the image content into consideration. The Seam Carving paper by Avidan and Shamir [2007] presented a simple image operator called seam carving that supports content-aware image resizing for both reduction and expansion. In our project, we are going to re-implement this paper and explore different applications of seam carving. Besides, we would like to extend this to video (Michael, Avidan and Shamir [2012]) or other kinds of data, such as webpages.

2 Why this Problem?

One reason we choose **Seam Carving** as our project is it can be widely used in our real life. For example, many mobile apps choose to display thumbnail images before users click and see the full-size images. A thumbnail image owns all image information but usually make it hard for users to perceive the key part of the image because of the reduced size. With seam carving, the significance of key part of an image can be maintained. Besides, the results of this project are intuitive and comparable, which will help us examine the performance of our implementation. Finally, this project is extensible. We may extend our implementation to other kinds of data if we have enough time.

3 Related Work

Seams for Image Editing Avidan and Shamir [2007] presented an operator for content-aware resizing of images using seam carving. Seams are computed as the optimal paths on a single image and are either removed or inserted from an image, which can minimize the seam cost or energy lost. The optimal seam can be found using dynamic programming and they have shown seam carving is more effective than other strategies of resizing, such as cropping, scaling etc. This operator can be used for a variety of image manipulations including: aspect ratio change, image retargeting, content amplification and object removal, and can be easily integrated with various saliency measures, as well as user input, to guide the resizing process.

Seams for Video Retargeting Michael, Avidan and Shamir [2012] extend the work of Avidan and Shamir [2007] and proposed a graph based approach to seam carving, which can handle video retargeting. This extension

defines 2D surfaces to be removed from the 3D video cube. The intersection of the surface with each frame defines one seam in this frame. Hence, removing this manifold removes, in effect, one seam from each video frame. On the one hand, because the surface is flexible, the seams can change adaptively over time in each frame. On the other hand, because the surface is connected, the seams preserve temporal coherency. They employed graph cut to obtain the optimal manifold to remove and demonstrated the effectiveness of this method on several images and video sequences.

4 Plan and Time Table

Milestone	From	To
Fully understand seam carving for image resizing	2/14	2/21
Implement code to resize along one direction	2/22	3/1
Implement code to resize along two directions	3/1	3/8
Implement content amplification	3/9	3/16
Implement object removal	3/17	3/23
Compare seam carving with other algorithms and complete mid-term report	3/24	3/31
Implement seam carving for video retargeting	4/1	4/15
Design project web page	4/16	4/23

Table 2: Plan and Time Table