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Computer Vision - Laboratory class 4

Image Stitching

Objective

The goal of this laboratory class is to implement an image stitching algorithm for creating a panorama image of a scene. A panorama is an image stretched horizontally without distortion that offers a wide view of a scene. In implementing the stitching algorithm for obtaining the panorama of a scene we will follow the next steps:

a) detect feature points in input images and compute the corresponding descriptors using SIFT;

b) select good matches (using Lowe's ratio test) based on the distances between every pair of feature points from image;

c) get the homography matrix using the RANSAC algorithm;

d) generate the panorama by merging/stitching images transformed with the derived homography matrix.

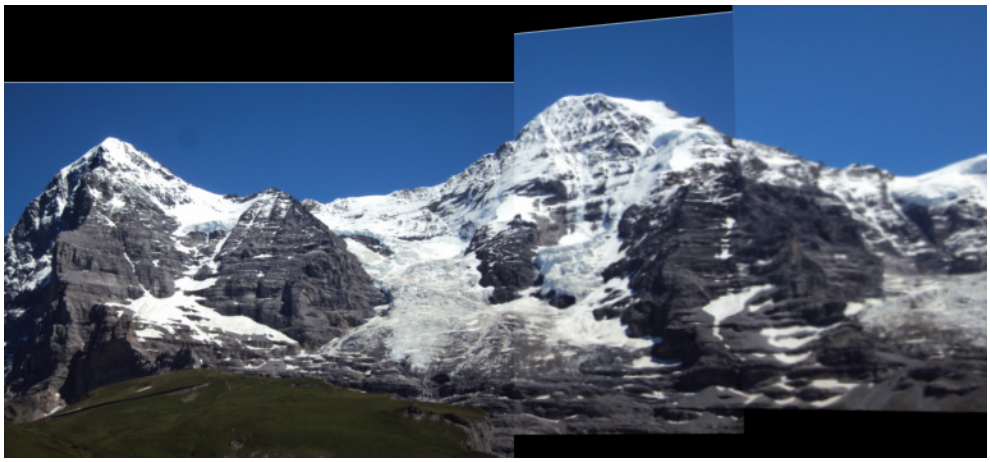
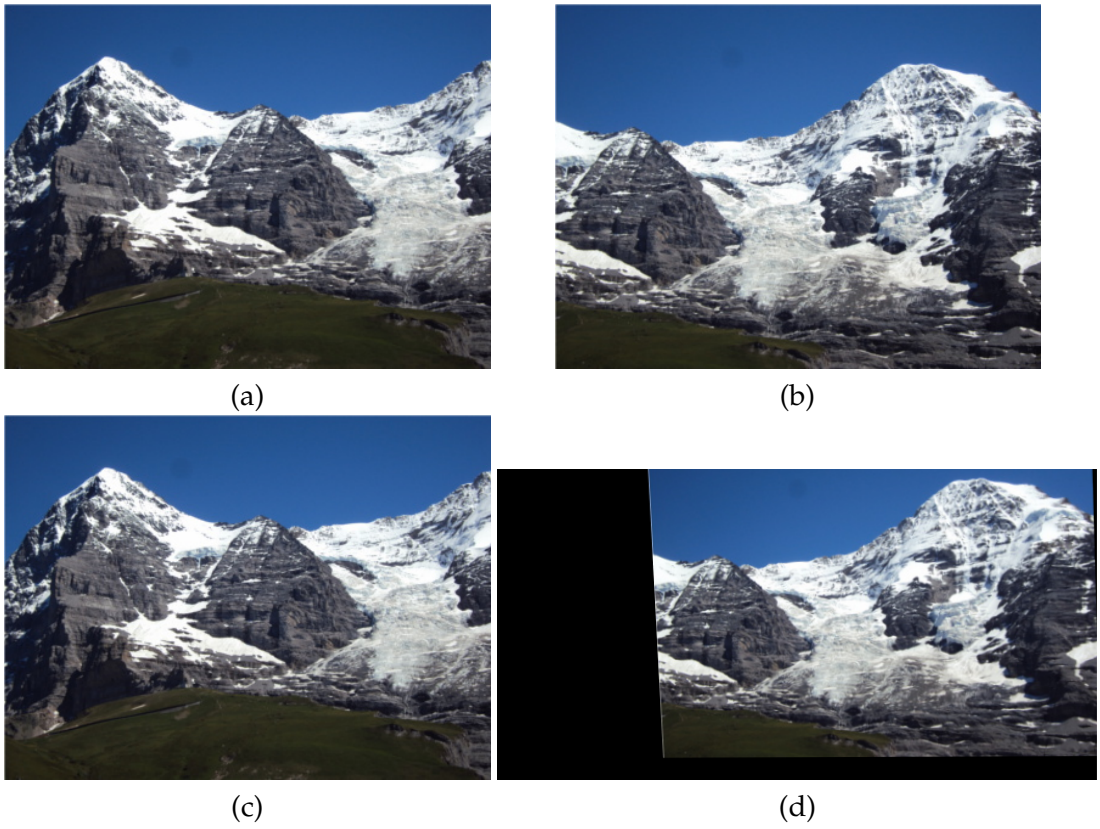


Figure 1: *We obtain the panorama image of the scene by stitching several images depicting different parts of a wider scene.*

Stitching algorithm

Our stitching algorithm iteratively processes the set of input images in pairs of two images (Figure 2): the destination image and the source image. At each iteration, we transform the source image with respect to the destination image, such that the two images will be well aligned. We accomplish this by applying a perspective transformation to the source image encoded by the homography matrix. We compute the homography matrix by relying on the RANSAC algorithm with matches between the two images obtained by finding correspondences between local features detected and described using SIFT features. In the end we merge the destination image and the transformed source image(Figure 3).



(a) (b)

(c) (d)

Figure 2: *Destination (a) and source (b) images at the current iteration. We transform the source image (d) to have the same perspective as the destination image (c).*

Overlaying images Now and Then

In this scenario, we can modify the stitching algorithm to overlay the content of a source image (a Then image - an image taken much years ago of the same scene) where it belongs in the destination image (a Now image - an image taken recently of the same scene).

We follow the initial algorithm using the Now (destination) and Then images (source) from Figure 4, and transform the Then image to have the same perspective as the Now image (as shown in Figure 4d). In the end (Figure 5), we overlay the Then image on the

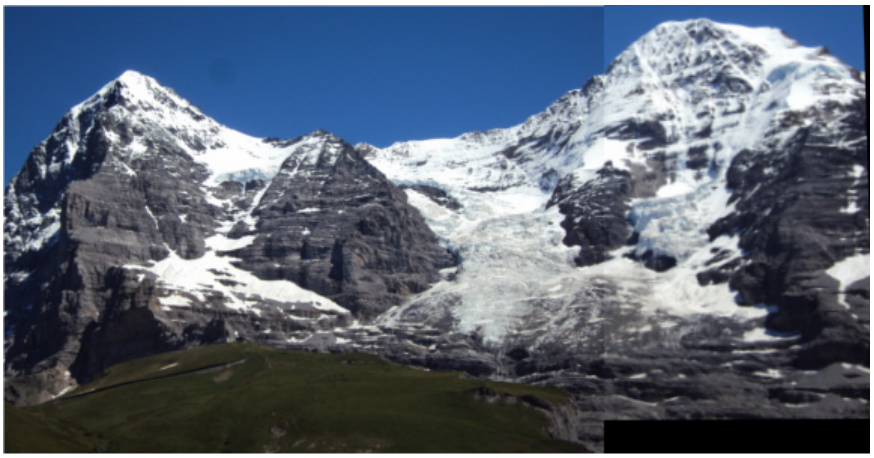
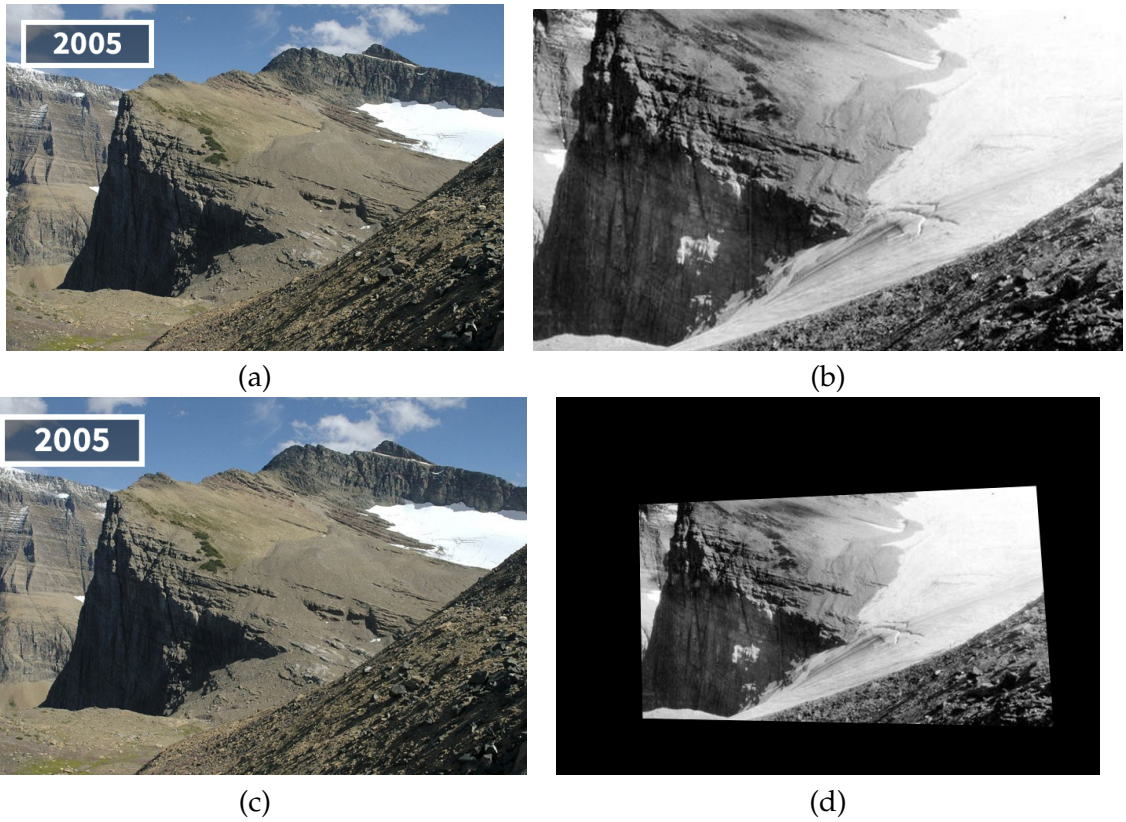


Figure 3: *The stitched image obtained by merging destination and transformed source images.*

Now image by copying the Now image pixels in the resulted Then image black pixels region.



(a) (b)

(c) (d)

Figure 4: *Now (a) and Then (b) images. We transform the Then image (d) to have the same perspective as the Now image (c).*

Figure 5: *Overlay of the Then and Now images.*