

Homework #7 - Class Photo-Stich

Part 1: Photos due Wednesday July 15th, before 11:55pm

Part 2: Final due Wednesday July 22nd, before 11:55pm

Description:

The goal of this assignment is to create a digital photo artifact that will serve as a reminder of your time in Barcelona. It will be a very wide aspect ratio picture that includes many “landmarks” of the city and people from the class. However, you will need to stitch and blend the final photo together from photos take at different locations, with (hopefully) undetectable seams.

You will be partnered into a team with 5-6 other students in the class. Each team member should photograph themselves (or an anthropomorphic stand in*) in front of an “interesting” aspect of the city. You will need to coordinate with your other team members such that the sides of your photograph will closely match the sides of their photographs, to make stitching them together visually possible.

For example, if the right side of your photo has some trees, it would be very helpful if the left side of the next photo had trees or foliage of some type, as opposed to a brick wall.

Part 1: Site selection, Viewpoint selection, and Image Acquisition

Think of all of the areas in and around Barcelona that you have visited. What landmarks would you like to memorialize? What does the background look like? Urban? Forest? Mountains? The Sea?

Brainstorm with your team about a “team” or “visual appearance” that the entire time would be happy to have for the entire finished photostitch. (If 3 people are taking pictures inside the city, and one person wants a beach photo, the fifth person would need to take a photo in a location that bridges urban landscape with a beach.)

At your team meeting in class, form a plan. Sketch a storyboard or rough drawing of what your final group photostitch will look like. Label each person's “area” and pay special attention to the seams between photos. Discuss what the left and right side of each person's photo should look like to make it more likely that they can be joined seamlessly. Use reference photos you have previously shot or found on the Internet to try and visualize what are visible to the left and right side of the “landmark” that each person will stand before.

Choose a common height for your “horizon” to go through so that some photos don't get taken too high or too low. Although a themed “day in Barcelona” that goes from dawn to dusk would look very cool,

you may find it easier to stitch the photos together if they are all shot under the same general lighting conditions and have the same general color tones.

Note that your final photo-stich must be at least 2000 pixels high, and having 3600 or 5000 pixels high would be even better. (a 24" tall poster at 150 dpi is 3600 pixels, and 300dpi is 7200!)

You will need a 6 mega-pixel camera at a minimum. The team may want to select their best camera and then shoot all of the photos using that. Another trick that may work for narrow regions is to shoot in portrait orientation instead of landscape, to get more pixels vertically. All team members do not need to be at each photo shoot, but we require a minimum of two (one to take the picture, and one to pose in the picture), so plan time to capture your images with other team members.

As you capture the images, lay them side-by-side digitally to get a feel for how well they will stitch together. Capture a lot more "border" on all sides of the person than you think you will need. The more room you have to work with, the more likely it will be that you can crop or seam carve the left and right borders in or out to find a good location. Depending upon the care you take when capturing the images, it may be necessary to slide some images up or down to match up the horizons with other images, so make sure you have enough room above and below the subject to do that as well!

* - This image will be featured on the class website. If you do not want to give us permission to show your image, you can instead substitute a stuffed animal, toy or other anthropomorphic object when shooting the photo.

Deliverables for part 1:

-In class activity: You will be turning in photo(s) of your storyboard and a textual description of the "photo guidelines" that your group will be following.

- To make sure that your team has enough time to complete the stitching together of the photos, you will be turning in the images you have captured one week before the final deadline. Along with the photo, turn in a text file that describes where the photo was taken (street address, GPS coordinates, or link to a google map location would work).

Part 2: Image Stitching

You may use any software you like to stitch the images together. Photoshop, OpenCV, whatever. You will receive more credit for solutions that are more automated (computational) in nature. You may find the Gaussian pyramids image blending code from a previous homework does a good job when

applied using a custom mask. You can create the mask by hand, or use a technique such as seam carving to algorithmically pick a good mask.

You may want to write a piece of software that will take in two images, and “slide” them over each other, calculating the total error between the two images (normalized by the number of overlapping pixels, to get an “error per pixel” metric) to find the best relative position of two images with respect to each other before carving a seam and merging them. *Students in the class may share code freely with other groups! You may use code from other students or that you find on the Internet as long as you give credit for the source in the code and your writeup.*

Ideally the procedure you develop would work for any two images with a minimum of human input, but you are allowed to just “photoshop” the images together if you decide that would be easier. *Teams with primarily automated image stitching will be held to a lower standard of “good seams” than teams who use humans to do the work manually.*

Your final deliverable will be a single picture that is a minimum of 2000 pixels high and quite a bit wider that includes each team member featuring something interesting from Barcelona in the background. Ideally the image should look natural enough, and the seams should be so unnoticeable that somebody who was unfamiliar with the landscape and layout of Barcelona would think it was just a shot of a group of students standing in a row.

If you find that it is difficult to stitch together two images, you are free to re-shoot any images to make your life easier. (So we recommend that you try and complete the stitching process early, to give yourself time to swap out any problematic images if needed.)

Deliverables for part 2:

- The final seamless image, a minimum of 2000 pixels high (more is better!)
- A PDF project writeup that describes:
 - The locations you chose, and why you picked them.
 - Lessons learned, or advice to any teams doing this assignment in the future!
 - A detailed description of the process you used to stitch the images together.
 - This may include the steps you used in a graphics editing program.
 - Or it may describe the different programs you ran:
- Any code that you ran as part of the stitching process.
 - Include any mask images or parameters the code used.

Grading Rubric:

Part 1: 55%

-Storyboard & Photo Capture Plan: (20%)

- Is it detailed enough?
- Are the “borders” between images well specified?
- Are the locations specified likely going to allow a good match?
- Will the final image look somewhat consistent, or have a “theme” or obvious flow?

-Individual images (35%)

- Are they of sufficient size to allow a high quality output?
(2000 pixel output height minimum!)
- Do the edges of the images look like they will make stitching work well?
- Will the lighting and coloring of the images match or flow into each other?
- Image location description text file (must be able to find the location again)

Part 2: 45%

- How well are the individual images stitched together into a seamless whole? (35%)

-Solutions that are stitched together using primarily computational means will be given the benefit of the doubt on seam quality. If it was manually edited by a human, we expect you to have very well hidden seams.

- Project Writeup: (10%)