Homework #1: Creating 3D Models, Panoramas, and HDR

Assigned: Wednesday, September 7
Due: Monday, September 19

For this assignment you will need a digital camera and, for Problem 3, the camera should have manual control of shutter speed and aperture, and a tripod will be very helpful. If you do not have these, you can check them out for a day from Prof. Dyer.

0. Take a color self-portrait photograph that can be posted on the class web site. Crop it so that the aspect ratio (i.e., ratio of number of rows to number of columns) is approximately 1.3 or 1.4. You should be recognizable from the photo. Save it as a jpg file. The image should be roughly from the shoulders up. Name your file with your last name and put it in a folder called "P0"

1. In this problem you will build a 3D model for part of a building or object on campus. You will do this by using Microsoft's Photosynth (http://photosynth.net). To do this: (1) run Photosynth, which is installed on the instructional Windows machines, (2) login in with email address "cs534-fall11@live.com" and password "helloworld", (3) name your synth with the name of the building or object you photographed *and your login name*, (4) enter a description if you want, (5) click "Add Photos" and add ALL your photos, and (6) click "Synth." After processing is completed, click "View" to see the result on the Photosynth website. All the synths that are created by the class are shown under "My Photosynths." You should take and use at least 40 photographs for this problem. If you select a large object such as a building, just take photos of one or two sides of it so that you get a lot of overlapping images. Put your source images (as jpg's) and a Readme.txt file in a folder called "P1"

2. Take 5-10 photographs that have overlapping fields of view (but do not rotate the camera around its optical center) and put them all in a folder called "P2". Create a panoramic image from them using AutoStitch, which is installed on the Windows machines. Alternatively, you can install AutoStitch on your own Windows machine. To use AutoStitch, just select File → Open and find the P2 folder with your images. Select all of them and click Open. The result image will be put in the same folder. For more information and examples, see http://people.cs.ubc.ca/~mbrown/autostitch/autostitch.html

3. Take 3 or 5 photographs of a scene that contains a very large dynamic range of intensities. Suggestions for how to take these photos are given at http://www.hdrsoft.com/resources/tut_mac/part1.html
Then use HDRsoft's Photomatix, which is installed on the eight instructional Windows machines in the *Cyclops Lab* in room 1358 CS, to create an HDR image. Put all your source images and HDR output image(s) (as jpg's) in a folder called "P3".

Hand-in Instructions:

Copy your folders "P0", "P1", "P2" and "P3" into the hand-in directory for HW1 as follows:
 cp −r foldername /p/course/cs534-dyer/handin/your-cs-login/HW1/
For example, if you want to copy folder "P1" into the hand-in directory, do:
 cp −r P1 /p/course/cs534-dyer/handin/your-cs-login-name/HW1/

Problem 3 Information: How to use HDRsoft's Photomatix

1. Take 3 or 5 photos of an interesting scene that contains parts that are very bright and other areas that are very dark. Manually set up the camera so that the aperture size is fixed (around f/5.6), ISO is fixed (say to 100), flash is off, and the resolution is as large as possible, so that the photos you take differ only by the shutter speed. If you take 3 photos, separate each pair by 2 EV. If you take 5 photos, separate each pair by 1 EV. Learn how to take a set of appropriate photos at http://www.hdrsoft.com/resources/tut_win   A user manual for Photomatix is at http://www.multimediaphoto.com/pm/PhotomatixProManual.pdf You can download some test images at many websites including http://www.debevec.org/Research/HDR/SourceImages/Memorial_SourceImages.zip

2. Open Photomatix from the "Start → All Programs → Photomatix Pro 4.0" menu on an instructional Windows machine. (Note: The machines in the Cyclops Lab have the "paid version" whereas the other instructional Windows machines have the "demo version" which puts a watermark on the output image.)

3. Click "Load Bracketed Photos" button on the *Workflow Shortcuts* panel.

4. Click "Browse" in the pop-up window and add all your images. You can add multiple photos at the same time.

5. After you add all the source photos, click "OK".

6. There will be a pop-up window called "Preprocessing Options". Note that if you did not use a tripod when taking your source photos, you should select the "Align source images" check box and select the "By matching features" radio button. For all the other check boxes, you can either use the default values or choose what you like.

7. Click "OK".

8. After you click "OK" in step 7, there will be a new pop-up window. This window will show you a preview of the final HDR image that will be created using your source photos. Note that this might not be the final HDR image but just an approximation of the final HDR image.

9. Click "Tone Mapping/Fusion" button on the *Workflow Shortcuts* panel. (We will talk more about Tone Mapping later this semester.)

10. Now you can see an output image on your screen. Adjust different parameters on the for Tone Mapping/Exposure Fusion, such as the color saturation, luminosity, and so on as you like using the *Adjustments* panel (on the left side of the screen).

11. Once you are satisfied click "Process" button at the bottom of the *Adjustments* panel.

12. Go to "File → Save as" to save your HDR image.

Note: We will talk more about HDR imaging later in the course. If you want to know more about HDR now, you can find more information at many websites including Wikipedia at http://en.wikipedia.org/wiki/High_dynamic_range_imaging