TNM087 Bildbehandling - 2014

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Lab 4 Project: Prokudin-Gorskii Collection

For a full description of the background of this project see the information on the website of the Library of Congress: http://www.loc.gov/pictures/collection/prok

The images consist of sets of three images, taken with a red, green and blue filter (in the order B,G,R: the top image is the blue channel, the lowest is the red channel).

The images in the zip file are jpg versions but larger tiff-versions are also available at the website. Some examples are

Buildings:

http://www.loc.gov/pictures/collection/prok/item/prk2000001392/

http://www.loc.gov/pictures/collection/prok/item/prk2000000145/

Persons:

http://www.loc.gov/pictures/collection/prok/item/prk2000000200/

http://www.loc.gov/pictures/collection/prok/item/prk2000002549/

Landscapes:

http://www.loc.gov/pictures/collection/prok/item/prk2000000297/

http://www.loc.gov/pictures/collection/prok/item/prk2000001373/

The jpg versions of the original red+green+blue images are in the file: Lab4-JPGImages.zip

You can start with them but you should also download the higher quality tiff files from the website since one challenge is to match the really big images. For an idea on what quality you can produce (by doing it manually you can visit http://www.gridenko.com/pg; these images definitely don't look 100+ years old.

You are relatively free to use different techniques.

This is a popular project in Computer-Vision/Computational-Photography/… courses. This means that it is not very hard to find results/code/etc… This means I have to trust you that you do it yourself. It also means that you have to be prepared to answer questions I may have after reading your code and report.

And now have fun!

Some hints to get you started

The problem is similar to Lab2 with the registration task. Two important differences are now (a) you have to align 3 images and (b) the images are much larger. Some observations that might be useful

- Generally the green channel is the most important one so I would suggest that you align red and blue to green.
- The differences between the channels should be relatively small, a global mapping is sufficient and probably a translation (combined with a small rotation) should be enough to align them
- Only the center parts of the images are important. So perhaps you can start by cropping (manually or automatically) the border regions. Align the center parts and use the transform parameters for the whole image.
- Use the images in different resolutions (check image pyramids in Wikipedia and the Computer Vision book). Perhaps you can find good matches in small images, use the results in the next finer level and restrict the search region.
- You can think of correlation techniques as a generalization of the red-eye strategy of finding a patch from the green channel in the red/blue channels.
- Can you use FFT – techniques?
- For large images like the tiff-versions it might be better to use techniques similar to the ones you used from aligning the pin images. You could start by marking interesting points in the channels and then use the same techniques as in Lab2. Check how good that works.
- Next you can try to find corner points with the Harris detector (check Matlab toolboxes) if you find similar interest points in the three channels that are not too distant then you can try these point configurations to estimate the transformation
- If you really want to explore something that was not described in the lectures you can find out what SIFT features are and how they are used to stitch images. Don't implement SIFT but use one of the many SIFT packages available.
- After you have found good matching/registrations solutions it is time to actually produce good colors. An important problem here is how to weight the different channels so that the final image looks good. One way to achieve this is to select a (few) point(s) in the image that should be white and scale the channels so that the new RGB values at these points are all equal.

Summary:

What you should not do: rerun Lab2, this is NOT enough.

What you should do:

a) You can co-operate but everybody must upload a report and code to Lisam
b) Your code should run in realistic times on large TIFF images
c) You should document your results with at least one easy image (like a building with a lot of easy to find details) and a more complicated image (like person(s))
d) You are free to choose the technique you want to use. Using known techniques similar to those of Lab2 (extended for example to image pyramids) should produce good results. If you try something completely new like SIFT then your visual results are not that critical
e) For the basic processing you will get 10 credit points
f) If you either use advanced techniques or add features like automatic cropping and good color processing after the registration you get 5 extra points.
g) If you produce code that is good enough to run on the whole database of big tiff images and produces good results then we have to discuss how much this is worth…

Finally if in doubt send me an email and we can discuss questions/problems/etc…