Numerical Methods for Visual Computing
M. Möller, University of Siegen
Winter Semester 18/19

Weekly Exercises 8

To be discussed on Friday, 07.12.2018, 10:15-11:45, in room H-C 6336
Submission deadline: Tuesday, 04.12.2018, in the lecture

Programming

Exercise 1 (4 points)**.** Implement a power method that is able to find eigenvectors corresponding to the two eigenvalues of largest magnitude by assuring the second vector remains orthogonal to the first. Test your program on some small random but symmetric matrix and compare your result to matlabs *eigs*.

Exercise 2 (4 points)**.** Download the file *spectralClustering.zip* from the course's website. Unzip it and study the file *spectralClustering.m*.

- Working in Matlab you can replace Matlab's method for computing the eigenvectors to the two largest eigenvalues by your code from exercise 1.
- Working in python you can load the given *.mat* file (e.g via `scipy.io`) which contains the matrix W for the image `pilz.jpg`. Then use your own method from exercise 1 to compute the two largest eigenvalues and follow the code of *spectralClustering.m* to visualize your segmentation.

Does it still work? (You might have to rescale the image and make it smaller in order to have a reasonable runtime for your own method).

You can use more interesting color images, e.g. from `www.pixabay.com`. Are you able to segment an image based on colors by modifying the code?