Medical Image Processing - Semester Projects

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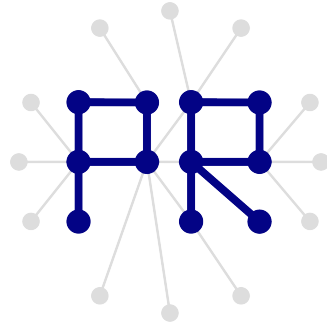

Siegen, winter term 16/17

Overview

1 General Information

2 Semester project

3 Projects

DIARETDB1 - Standard Diabetic Retinopathy Database

Skin Cancer

Cardiac MRI Dataset

4 Python and OpenCV

General information

- No weekly meetings
- Meeting dates: 10.11, 24.11, 15.12, ~~12.1~~, 19.1, ~~26.1~~, 2.2, 9.2
- Exercise consists mainly about talking about your projects
- Show me and your colleagues your progress/problems with your project
- My email: lukas.koeping@uni-siegen.de
- Feel free to make an appointment with me if you have some questions regarding the course material, your projects or other stuff

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Semester project

- Form groups of 2 - 3 people
- All three datasets are relevant
- Main goal: gather practical experience working with medical images
- Apply the techniques you learned in the course or read in the literature
- Questions about the project will be part of the final examination

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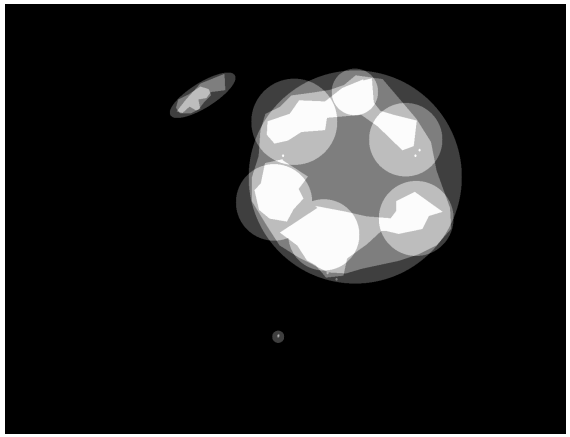
Standard Diabetic Retinopathy Database

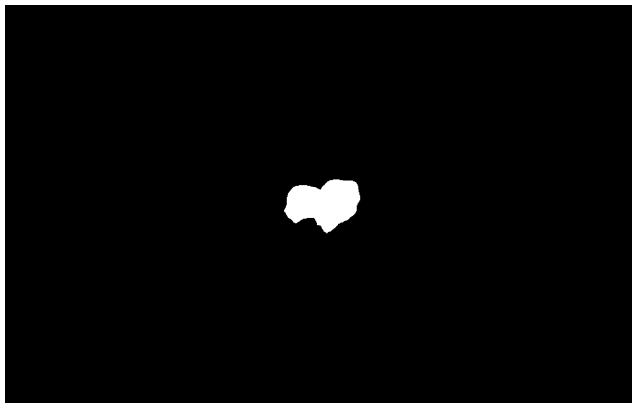
Diabetic retinopathy detection based on colour fundus images

- 89 colour fundus images (84 pathological, 5 normal)
- Mild non-proliferative signs (Microaneurysms) of the diabetic retinopathy
- Independent markings from 4 medical experts
- http://www2.it.lut.fi/project/imageret/diaretdb1/
- Goal: Manually extract anomalies



Skin cancer

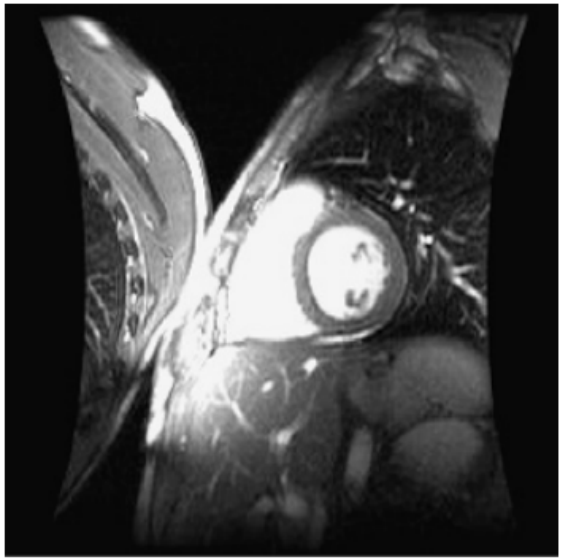
- RGB color images with a resolution
- 124 melanoma, 106 non melanom
- Manual segmentation of the lesions
- http://www.fc.up.pt/addi/project.html
- Goal: Perform **A**(symmetry) **B**(order) **C**(olor) **D**(iameter) analysis



Cardiac MRI Dataset

Short axis cardiac MR images

- Cardiac MR images acquired from 33 subjects
- 20 frames and 8 - 15 slices = 7980 images
- Manually segmented endocardium and epicardium of the left ventricle
- http://www.cse.yorku.ca/ mridataset/
- Goal: Segmentation by region growing



Semester project

For the start:

- Download your dataset
- Familiarize yourself with the data
- Load images using Matlab/C++/Python (whatever programming language you like)
- Check the medical background

Semester project

Until our next appointment start to write some functions:

- Pixel value normalisation
- Extract histogram with different number of bins
- Histogram equalisation
- Thresholding
- Implement a small look-up table to map some grey values to some colours
- ...

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Python

Installation:

- Download complete platform which provides Python and all common packages.
- **Anaconda**: https://www.continuum.io/downloads
- Install OpenCV for Python via Anaconda package manager (please check the internet for installation hints for your system, but the command should look similar to this: conda install -c https://conda.binstar.org/menpo opencv3).
- If you need an IDE (not required) you can use something like PyCharm, Spyder or IPythonNotebook.
- Online Python Tutorial

OpenCV for Python

First steps:

- Follow this tutorial:Gui Features in OpenCV
- Familiarise yourself with the internal data structure of an image (e.g. three-dimensional array).
- Try to change some values and observe what happens to the image.
- Caution: OpenCV uses BGR instead of RGB. So, the blue and the red colour channels are interchanged.

Next implementations: Filtering

- Gaussian filter
- Median filter
- Can you write a function to detect edges?

Next implementations: Thresholding

- Otsu's thresholding
- Adaptive thresholding (Niblack's method)