Progress Report 2 - 14/5/18 **Gael Humblot-Renaux**
Bsc Assignment - DMB s1570609

Looking back

Goals for this week:

- Look into how multiple images can be combined
- Get hands-on experience with the finger vein scanner
- Start defining research questions & make planning

Progress

Practical work

- I got familiar with the setup, and took a lot of finger vein images to investigate the effect of different camera settings and illumination settings.
- The current illumination algorithm is unnecessarily slow. I started rewriting it completely.
- Challenge: increasing the illumination of LEDs does not not necessarily correlate with an increase in brightness in the image, since the camera adjusts the exposure automatically based on illumination. The exposure cannot be fixed manually.

Combining multiple images:

I implementing the following:

1. Acquire different images with different levels of illumination or with illumination on different parts of the finger (see figure 2)
2. Extract vein detail from each image using the background illumination subtraction method (see fig 1)
3. Segment the image vertically. For each segment, evaluate the level of detail to get a score
4. Fill a score matrix which selects, for each segment/part of the finger, the image with the highest detail score
5. Use the score matrix to reconstruct an image with the best segments. Result can be seen in fig 3.

The next step is to fuse/blend the segments together to create a homogeneous image.

Research questions

How can High Dynamic Range imaging be implemented to improve the quality of finger vein images?

- What is the optimal illumination algorithm to acquire finger vein images at different exposures?
- How can multiple Low Dynamic Range images of different exposures be combined to create a High Dynamic Range image?
- What criteria can be used to evaluate the quality of finger vein images?
- How does image quality translate to recognition performance?

Looking ahead

- Outline & implement a method to evaluate the performance of the current setup (for future comparison with my results)
- Continue working on merging different images.
- Documentation / research paper

Appendix

Background illumination subtraction

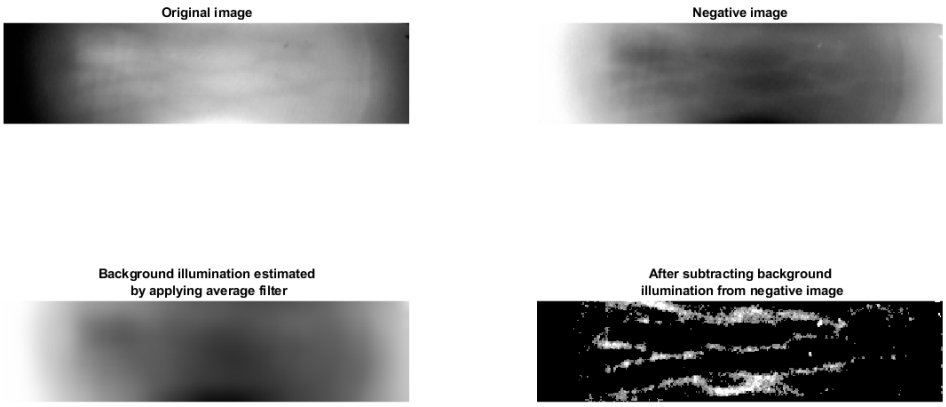

Figure 1: Example of background illumination subtraction for vein detail extraction

Combining images with different illuminations by selecting segments with the highest level of detail

Figure 2: Input images (1 to 5)

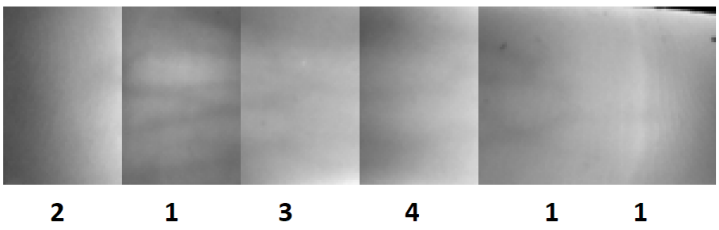

Figure 3: Resulting image (Matlab output)