**Short programming project - Computing Science**

**Course code: WBCS15002**

**Credits (EC): 5 points (140 hours, 14 hours/week)**

**1. General information**

**Project title: Implementing the algorithm from Vaz et al.**

**Student name and signature: Nick Borchers**

**Student number: s2865947**

**Date: 16-11-2018  
  
First supervisor (name + signature): M.H.F. Wilkinson   
  
Second supervisor (name + signature):**

**2. Project description:**

M. Vaz et al. Proposed a new, more efficient algorithm for decomposing 2D and 3D Structuring Elements (SE). All previous algorithms are computationally very expensive. This algorithm has applications in object recognition, image segmentation, and industrial inspection. In medical imaging, Mathematical Morphology, which this algorithm uses is utilised for such applications as brain segmentation from MR images and airway/vessel segmentation from CT images.

In addition, the algorithm lends itself to parallel optimization. Therefore an OpenMP implementation is also going to be written.

The project targets the problem that there is no C/openMP implementation of the algorithm yet.

The Image Processing department of the University of Groningen would like to create a C(++) library implementing various image processing algorithms.

**References**:

[1] M. S. Vaz, A. P. Kiraly, R. M. Mersereau, Multi-level decomposition of Euclidean spheres

**3. Methodology and timeline:**

Due to the nature of the task at hand I decided on making a priority list of tasks instead of predicting when it is done per week.

1. Reading and understanding the paper from M. Vaz on Multi-Level decomposition of Euclidean spheres. Reading about (parallel) van Herk/Gil-Werman.

2. Implementing 2D SE decomposition in C.

3. Implementing 3D SE decomposition in C.

4. Implementing parallel (openMP) 2D SE decomposition in C.

5. Implementing parallel (openMP) 3D SE decomposition in C.