Chair for Integrated Systems
TUM Department of Electrical and Computer Engineering
Technical University of Munich

Master's Thesis

FPGA-Based Cell Detection for Digital Holographic Microscopy

Machine learning and artificial intelligence are promising new tools, when it comes to helping physicians with the analysis of blood samples. Where the detection and classification of blood cells could be perofrmed automatically. However, the sheer amaunt of data that is produced by digital holographic microscopes makes this a challenging task. So in order to ease the development of application specific ML/AI algorithms data reduction should happen as early as possible. Therefore in this work a coarse grained detection of cells based on thresholding shall be implemented in an FPGA, so that the subsequent classification tasks don't need to be perfromed on full frames, but only on the segments of the frame, that actually contain cells.

This project is part of a joint effort by the Chair of Integrated Systems (https://lis.ei.tum.de), the Heinz Nixdorf Chair of Biomedical Electronics (https://lbe.ei.tum.de), the Chair for Data Processing (https://ldv.ei.tum.de) and the Chair of Electronic Design Automation (https://eda.ei.tum.de) .

Goal

The main goal is to create a prototypical FPGA design, either directly with VHDL/Verilog or using C/C++ code and High-Level Synthesis.

The basic steps you will need to carry out are:

- problem assesment
- design space exploration
- implementation
- evaluation of your design

Prerequisites

To successfully complete this project, you should already have the following skills and experiences:

- knowledge of basic image processing
- understanding of hardware design
- experience with VHDL/Verilog or solid C/C++ programming skills
- self-motivated and structured work style

Contact

Thomas Goldbrunner

(Room N2137, Building N1, Theresienstraße 90)

Tel: 089 289 23871

thomas.goldbrunner@tum.de

Advisors