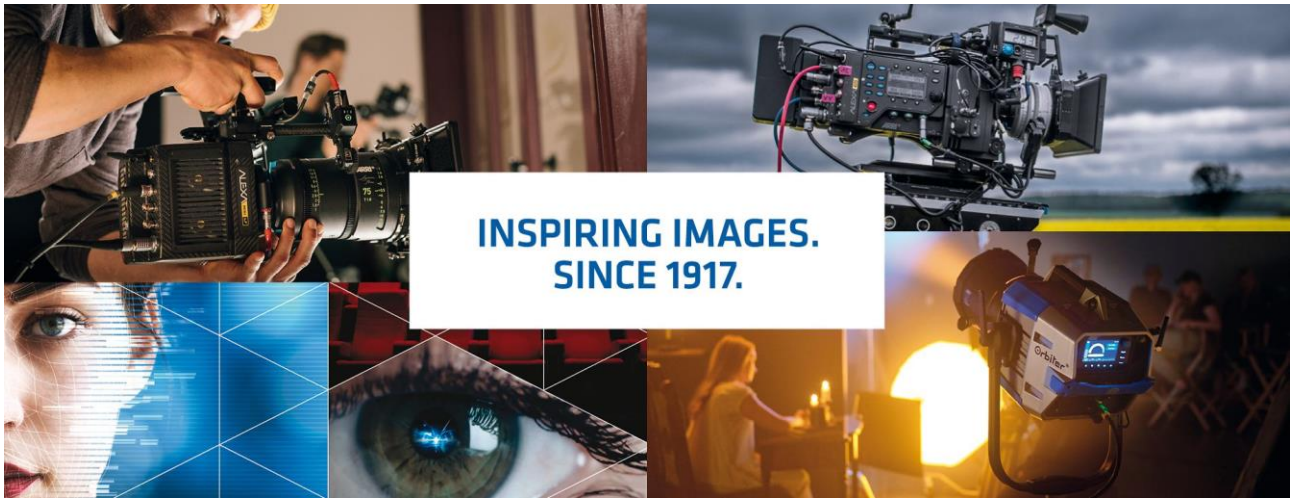

ARRI is a global company within the motion picture media industry, employing around 1,400 staff worldwide. Named after its founders August Arnold and Robert Richter, ARRI was established in Munich, Germany, where the headquarters is still located today. Other subsidiaries are in Europe, North and South America, Asia, and Australia. The ARRI Group consists of the business units Camera Systems, Lighting, Media, and Rental, all dedicated to connecting art and future technologies for moving images.

Topic for Thesis / Internship / Working Student Position

Approximate Computing for Image Processing on FPGAs: Implementation and Evaluation of Case Studies

Description

In motion picture cameras, the trend towards high resolutions and frame rates paired with the demand for best possible image quality is outpacing the capabilities of camera hardware. Approximate computing is a novel design paradigm which reduces resource usage by allowing certain calculations to be inexact while minimizing the impact on output quality. This allows for the modified components to be simplified, resulting in less power consumption.

Many techniques for the approximation of specific operations and hardware components have been proposed in recent years, but their benefits are often demonstrated in isolation, leaving the applicability in real-world applications unclear. To evaluate the usefulness of such methods and potential effects of their interaction, they have to be studied in the context of relevant applications.

In this work, case studies of image processing applications shall be implemented, building upon readily available implementations of basic components. Furthermore, the applicability of different approximations within these components shall be analyzed from a system level perspective and the resulting global resource-quality space shall be explored using state-of-the-art multi-objective optimization methods.

Tasks

- Familiarization with the framework used in our research project and related literature
- Conceptualization of image processing case studies that could benefit from approximations (e.g. filtering, color processing, camera (sub)-pipelines)
- Implementation using a high level language (e.g. Python/Matlab) for behavioral simulation
- Implementation in VHDL for FPGA implementation (targeting Intel ARRIA series FPGAs)
- Evaluation of the impact and interaction of combined approximations within the application on system level

Requirements

- Interest and motivation in the fields of digital image processing and hardware/FPGA design
- Familiarity with FPGA design flows, experience in VHDL preferred
- Experience in coding with a high level language such as Python or Matlab

The actual scope of the project will be discussed depending on the type of work. If you are interested in this topic, please send your application via email, including your CV and a current grade report.
Please don't hesitate to contact me if you have further questions.

Arnold & Richter Cine Technik GmbH & Co. Betriebs KG | Contact: Simon Conrady, sconrady@arri.de