Thesis Work

Implementation of Numerical Optimization Algorithms in Embedded Processors

MUSIC Tribe is one of the world's largest holding companies for pro audio and music products offering broad range of premium audio solutions for the enterprise, entertainment, creation, lifestyle, and home market. MUSIC Tribe Brands Sweden AB – mostly known as Lab.gruppen - is located in Kungsbacka, just south of Gothenburg. We have a great staff committed to the development of boundary-breaking sound reinforcement products for the professional audio industry. With our unique and patented technologies, we work towards providing advanced power amplifiers and powered loudspeaker management systems that are utterly reliable and sonically superior. Through continued research and persistent hard work, we strive to stay among the leading brands within the professional audio community.

Suitable Background
The master thesis work is suitable for one or two students with a background in computer science, signals and systems, optimization or similar.

Keywords: Software development, embedded systems, optimization and verification, Python, C/C++

Description
The MUSIC Tribe develops high-end power amplifiers along with various audio digital signal processing algorithms. In these algorithms, there is a need for solving optimization problems where different criteria need to be satisfied. A simple example (of an optimization problem) is to find the impulse response values of a digital filter.

This thesis is part of an ongoing product development aiming to create tools for solving optimization problems in embedded processors. Referring to the previous example (on the digital filter), the aim is to modify the filter characteristics on-the-fly and get new impulse response values.

The goal of this thesis is to design a software framework which can solve different optimization problems over a user-defined set of objective functions. We aim to evaluate the possibility of solving optimization problems on embedded processors and also to benchmark different optimization routines against each other. In summary, the thesis can be described as:

- Study different optimization routines which can handle nonlinear problems
  - A selection of some relevant routines will be done after the study
- Provide a framework so that different optimization routines can be executed
  - Benchmark optimization routines with a high-level programming language (Python)
  - Benchmark optimization routines with a low-level programming language (C/C++)
  - Benchmark optimization routines on embedded processors

Thesis Level: Master

Number of students: one or two

Application: Send resume, cover letter, and transcripts to Amir Eghbali, PhD, Senior DSP Engineer
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