Stellenbezeichnung: Master Thesis: Design of Analog Feature Extraction Channels for Event-based Neuromorphic Processors

Anforderungskennung **67007** - Veröffentlicht **06.07.2023** - **EMFT** - **Bachelor- & Masterarbeiten** - **Angewandte Wissenschaft** - **EMFT - Mikrosysteme und Festkörper-Technologien** - **Wissenschaft** - **Teilzeit**

Master Thesis: Design of Analog Feature Extraction Channels for Event-based Neuromorphic Processors

Fraunhofer EMFT conducts cutting-edge applied research on sensors and actuators for people and the environment. The about 150 employees in the three locations in Munich, Oberpfaffenhofen and Regensburg possess impressive long-term experience and wide-ranging know-how in the fields of microelectronics and microsystem technology. The technology offering of the research institute ranges from semiconductor processes, MEMS technologies and 3D integration to foil electronics. These nano- and microtechnologies are the basis for the other competence areas at Fraunhofer EMFT: sensor solutions, safe and secure electronics, and micropumps. The interdisciplinary interaction of these competencies enables the development of truly novel solutions to meet the current challenges facing our society.

The rapid development of artificial intelligence (AI) motivated moving AI closer to the edge or even in sensors to make daily human life more convenient. Conventional continuous-time signal processing, in which the physical signal is quantized by an analog front end (AFE) and later processed in a digital processing unit (DPU), is less practical due to significant power consumption for processing massive signal data. The event-based signal processing flow shows great potential to solve this problem because it only consumes power if a particular event occurs. It can be realized by combing an event-based AFE and analog spiking neural network (SNN) core. Instead of using analog-digital converters (ADC) to convert the analog signal into a digital format, the event-based AFE for voice detection or keyword-spotting has multiple channels to detect the acoustic signal changes from various frequency bands and further represents them as a time-discrete spike chain. The generated spike chain could be directly used as the input of the SNN core. This cochlea-inspired signal processing can be used in various fields, e.g., baby monitoring, siren detection for automobiles, and many others.

The team Circuit Design is offering a master's thesis for a duration of 6 months on the following topic: Design of an Analog Feature Extraction Channel for an Event-based Neuromorphic Processor. The theme sounds right up your alley? Then we look forward to receiving your application!

What you will do

The team Circuit Design aims to develop analog/mixed-signal integrated systems for applications such as sensors, high-performance data converters, neuromorphic computing systems, and RF components. As a part of this group, you will perform a literature study for the analog acoustic feature extraction using the event-based or dynamic acoustic AFE, design a feature extraction channel, and verify your design considering process variation and chip yield. Under certain conditions, publication of the results is possible and encouraged.

Your tasks at a glance:

- Literature study on the state-of-the-art of event-based or dynamic AFE for acoustic feature extraction
- Comparison and selection of system architecture
- Design and implementation of a feature extraction channel
- Documentation and presentation of the results

The combination of a mandatory research internship and a master thesis is possible.
The TUM-student will be co-supervised by Chair of Circuit Design (Prof. Ralf Brederlow).

What you bring to the table

- Course of Study in the field of Electrical Engineering or similar
- Good Knowledge of Integrated Analog Circuits
- First Experience with Cadence Virtuoso ADE is required
- Good English language skills, German is a plus

In addition, we expect a structured, analytical and independent way of working. You are familiar with scientific working techniques and have good communication skills in English, both written and spoken, to get along in an international team.

What you can expect
We offer you an open and collegial working environment as well as a challenging and varied master thesis with responsibility and flexible working hours that fits you. At EMFT we value commitment and creativity, which is why we allow freedom for your ideas and abilities.

Remuneration according to Research assistant pay (dependent on qualifications).

We value and promote the diversity of our employees' skills and therefore welcome all applications - regardless of age, gender, nationality, ethnic and social origin, religion, ideology, disability, sexual orientation and identity. Severely disabled persons are given preference in the event of equal suitability. Remuneration according to the general works agreement for employing assistant staff.
Interested? Apply online now. We look forward to getting to know you!

If you have any questions, please do not hesitate to contact us:
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