ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

TIK
Institut für Technische Informatik
und Kommunikationsnetze
Computer Engineering and
Networks Laboratory

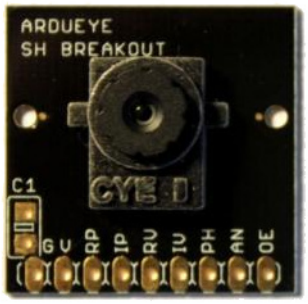
Prof. L. Thiele

Master Thesis:

Wearable Device for Ultra-Low-Power Vision Sensing

Motivation: Traditional sensor nodes are usually powered from energy storage devices such as batteries or supercapacitors in order to guarantee continuous operation during periods of energy unavailability. More recently, there is a new research field which focuses on batteryless, energy-driven sensor nodes. One of the challenges is to account for the variability present in typical energy harvesting such as solar cell in indoor scenarios. Our initial prototype shows the viability of low-power image acquisition under extremely low power budgets. We now want to extend this prototype to include on-board image processing.

Task Description: During this project you will work both on hardware prototyping and firmware development. We have an initial prototype which harvests solar energy to acquire low-resolution images using an MSP430 microcontroller. The main goal of this thesis is to demonstrate the feasibility of on-board image processing in low power-budgets. The recent MSP432 platform is a good candidate for basic computer vision algorithms such as optical flow, which approximates the speed of a moving camera. A final wearable device should be built to demonstrate the viability in real-world scenarios.



This involves the following tasks

- Characterization of energy source and available power budget.
- Firmware development of the MSP432 platform for image acquisition and non-volatile storage.
- PCB design of prototype including image sensor and photovoltaic cell.
- Prototype evaluation in real-world scenarios.

Requirements: Mixture of HW/SW design skills. Familiarity with microcontrollers and embedded C programming is an advantage, but not required.

Interested? Please have a look at http://www.tec.ethz.ch/research.html **and contact us for more details!**

Contacts

- Andres Gomez: gomeza@tik.ee.ethz.ch, ETZ J68.2
- Lukas Sigrist: lukas.sigrist@tik.ee.ethz.ch, ETZ G78.1
- Lothar Thiele: thiele@ethz.ch, ETZ G87