TECHNISCHE UNIVERSITÄT MÜNCHEN
NEUROWISSENSCHAFTLICHE SYSTEMTHEORIE
PROF. DR. JÖRG CONRADT

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PRACTICAL COURSE

Event-based stereo vision

Problem description:

During the recent years, a new type of optical sensor has entered the stage of Computer Vision, so called Dynamic Vision Sensors (DVS,[1]). The working principle of DVS is fundamentally different from frame-based cameras. They work similarly to biological retinas: every pixel operates independently from the others and generates an event every time the change in luminance crosses a certain threshold. The vision information is transmitted as stream of single pixel events, which describes the change in the scene, rather than as full picture frames. This results in a very low latency and redundancy of the vision information.
The advent of DVS requires the development of new and different methods to solve classical computer vision problems because traditional computer vision method cannot be simply transferred to the event-based domain. One of these problems is stereo vision, i.e. the estimation of the distance of objects using two cameras. In this project, you will be working with a specific stereo matching algorithm for event-based cameras developed by Xie et al.[2]. The task is to solve the stereo matching problem using the method and evaluate it accuracy and performance using suitable data. If you choose this topic you will learn about traditional computer vision as well as neuromorphic computer vision.
Programming skills are required (preferably C++)!

Tasks:

- Get familiar with event-based vision and the stereo problem
- Implement an event-based stereo algorithm available in literature
- Evaluate the algorithm's performance using suitable event data

Supervisor: Lukas Everding

(Jörg Conradt)
Professor

Bibliography:

[1] Lichtsteiner, P., Posch, C. and Delbruck, T. *A 128 x 128 120 dB 15 us Latency Asynchronous Temporal Contrast Vision Sensor* IEEE Journal of Solid-State Circuits Feb. 2008 p. 566-576
[2] Xie, Z., Chen, S. and Orchard, G. *Event-Based Stereo Depth Estimation Using Belief Propagation* Frontiers in Neuroscience 11 Oct. 2017 p. 535