



Project Proposal for Digital Engineering Projects

Project Topic:	Shape Tracking with Event Cameras
Project abbreviation:	STEC
Institute/ Chair/ Research Group:	
Advisor(s):	Christopher Funk, Benjamin Noack
Preferred group size:	4-5
Desired project period:	SoSe 2022
Required/Desired knowledge:	Required: <ul style="list-style-type: none">• Programming in Python or C/C++. Desired: <ul style="list-style-type: none">• Experience with cameras.• Knowledge of:<ul style="list-style-type: none">○ Tracking algorithms,○ basic image processing.
Is any external affiliation involved (e.g., industrial partner, affiliated institute)?	
yes <input type="checkbox"/> no <input checked="" type="checkbox"/>	
Which one(s)?	
Project Description:	
General description: <p>Event cameras, also known as neuromorphic cameras, differ from conventional cameras in that they do not capture images at a fixed rate. Instead, they output pixel-level brightness changes enabling a very high dynamic range, avoiding motion blur, and offering a latency in the order of microseconds. Traditional vision-based tracking algorithms are not applicable, and new algorithms need to be designed to process the asynchronous sensor output with high temporal resolution.</p> <p>The project pursues the goal of developing and implementing extended-object tracking algorithms using an event camera. The algorithms shall use so-called random hypersurface models to track the shape and pose of an object. Such models describe the spatial extent by means of randomly scaled versions of the shape boundary. The measurements provided by event cameras typically appear at the boundaries of the moving object, hence rendering random hypersurface models a good choice for extended-object tracking with such cameras. However, challenges are the asynchronous sensor output and efficiency to enable real-time tracking.</p>	

Project goals:

- *Calibration and setup of the event camera*
- *Implementation of tracking algorithms based on random hypersurface models*
 - o *Derivation of mathematic models for event sensor*
 - o *Development of new tracking algorithm using event sensors*
- *Evaluation of implemented methods*

Subtasks:

- Hardware setup and software implementation
- Literature review for extended-object tracking with random hypersurface models
- Experimental design and definition of evaluation criteria
- Development, testing, and evaluation of tracking algorithms
- Documentation of project

Registration and Information:

<https://www.ams.ovgu.de/Teaching>