

## Master's Thesis (taken)

### A Hardware/Software Co-Designed ORB-SLAM2 Algorithm for FPGA

ORB-SLAM2 [1] is a state-of-the-art feature-based simultaneous localization and mapping (SLAM) algorithm for monocular, stereo and RGB-D images and can be used for visual-based navigation in, for example, autonomous robots or self-driving cars. ORB-SLAM2 is computationally intensive which asks for hardware acceleration to achieve the required frame rates on embedded computing platforms.

The goal of this project is to create a hardware/software co-designed version of the ORB-SLAM 2 algorithm using the Xilinx Zynq system-on-chip platform. For the evaluation of the implementation, either different datasets (e.g. KITTI) or / and experiments with a (3D) camera can be used.

#### Type of project

- Analyze the algorithm and partition existing code into hardware and software tasks
- Develop a C/C++ and VHDL / HLS co-design for Xilinx Zynq-7000 SoCs
- Evaluate the resulting design with respect to performance, resource requirements and accuracy

#### Prerequisites

- Basic C / C++ / VHDL and / or HLS knowledge

[1] Mur-Artal, Raul, and Juan D. Tardós. "Orb-slam2: An open-source slam system for monocular, stereo, and rgb-d cameras." *IEEE Transactions on Robotics* 33.5 (2017): 1255-1262.



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