

Camera array autocalibration in an ADAS context

Postdoc offer

Advanced Driving Assistance Systems (ADAS) necessitate a precise knowledge of the environment of the vehicle in order to extract the necessary information to their operations. This knowledge can be acquired through sensors such as cameras, RADARs, LIDARs, etc.

This project focuses on the case of an array of cameras surrounding the vehicle, detecting obstacles, other vehicles, etc. The relative positions and orientations of the cameras with respect to the vehicle must be known precisely. However, the geometry of the array can change during the life of the vehicle, following short or long term deformations of its mechanical structure. We aim at developing autocalibration methods for the extrinsic parameters of the camera, i.e. their relative positions and orientations with respect to the vehicle, ensuring an adequate calibration of the camera array along the life of the vehicle.

The state of the art mainly focuses on the case of one camera, based on known reference such as chessboard targets [1], vehicle parts visible in the field of view [2], or structured environments (lane markings [3], or "Manhattan world" [4]).

The project aims at autocalibration in arbitrary, unstructured environment, such as off-road conditions. Another goal is the quantification of the uncertainties of the estimation of the parameters.

The developed methods will be based on exploiting the movement of the vehicle, possible overlaps between the cameras' field of view, computer vision, Bayesian estimation [5] and Kalman filtering on Lie groups [6], allowing uncertainty quantification, etc.

Multimodal calibration, e.g. RADAR + camera calibration, will also be considered, with the goal of performing calibration without known targets [7, 8].

This project takes place in the framework of an industrial collaboration between L2S and Forvia.

Duration: 18 months

Location: L2S, 3 rue Joliot-Curie, 91192 Gif-sur-Yvette (Paris-Saclay)

Applications are to be sent to gilles.chardon@centralesupelec.fr.

Starting date: as soon as possible

References

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