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Self-Calibration of Fish-Eye Camera for Advanced Driver Assistance Systems

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Abstract : Tomorrow's car will be more automated and increasingly connected. Innovative and intuitive interfaces are essential to accompany this functional enrichment. For that, today the automotive companies are competing to offer an advanced driver assistance system (ADAS) which will be able to provide enhanced navigation, collision avoidance, intersection support and lane keeping. These vision-based functions require an accurately calibrated camera. To achieve such differentiation in ADAS requires sophisticated sensors and efficient algorithms. This paper explores the different calibration methods applicable to vehicle-mounted fish-eye cameras with arbitrary fields of view and defines the first steps towards a self-calibration method that adequately addresses ADAS requirements. In particular, we present a self-calibration method after comparing different camera calibration algorithms in the context of ADAS requirements. Our method gathers data from unknown scenes while the car is moving, estimates the camera intrinsic and extrinsic parameters and corrects the wide-angle distortion. Our solution enables continuous and real-time detection of objects, pedestrians, road markings and other cars. In contrast, other camera calibration algorithms for ADAS need pre-calibration, while the presented method calibrates the camera without prior knowledge of the scene and in real-time.

Keywords : advanced driver assistance system (ADAS), fish-eye, real-time, self-calibration
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