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CROSS-COVARIANCE ESTIMATION FOR EKF-BASED INERTIAL AIDED MONOCULAR SLAM

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Abstract. Repeated observation of several characteristically textured surface elements allows the reconstruction of the camera trajectory and a sparse point cloud which is often referred to as "map". The extended Kalman filter (EKF) is a popular method to address this problem, especially if real-time constraints have to be met. Inertial measurements as well as a parameterization of the state vector that conforms better to the linearity assumptions made by the EKF may be employed to reduce the impact of linearization errors. Therefore, we adopt an inertial-aided monocular SLAM approach where landmarks are parameterized in inverse depth w.r.t. the coordinate system in which they were observed for the first time. In this work we present a method to estimate the cross-covariances between landmarks which are introduced in the EKF state vector for the first time and the old filter state that can be applied in the special case at hand where each landmark is parameterized w.r.t. an individual coordinate system.

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