Estimation behavior of intermittent measurement in EKF-based SLAM

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ABSTRACT
Simultaneous localization and mapping (SLAM) of mobile robot by means of extended Kalman filter requires the availability of continuous data measurement along the process to ensure successful estimation of the state vector. Extended Kalman filter is a recursive algorithm that uses previous data in completing the iteration. Therefore the availability of measurement data is crucial in the estimation process. However, due to some failures of the sensors or network, measurement data may not be available at a certain period of time throughout the estimation process. Such situation is known as intermittent. In this paper, a theoretical study on the EKF-based SLAM with intermittent measurement is conducted to examine the estimation behavior of this nonlinear process. From the analysis, it is observed that the estimation of robot position is still possible even when the measurement data are unavailable. However the estimation possesses high uncertainties and produce abnormal covariance behavior. It has been proven that EKF is able to correct the estimation upon the availability of measurement data. Simulation results prove the consistency of the proposed analysis.