Abstract

Unmodeled systematic and nonsystematic errors in robot kinematics and measurement processes often cause adverse effects in several autonomous navigation tasks. In particular, accumulated sensor biases can render simultaneous localization and mapping (SLAM) algorithms of autonomous vehicles to perform very poorly especially in large unexplored terrains including cycles, as a result of the estimator divergence and inconsistency. One way to deal with this problem is the accurate modeling and precise calibration of sensors. However this may add up to longer setup and calibration times. Even after accurate calibration and modeling, sensor calibration may often subject to drifts, rendering the efforts ineffective. Therefore, the correct and effective way to deal with this problem is explicit estimation of these parameters with other states. In this work we address the estimation theoretic sensor bias correction problem in SLAM using a simple unified framework and establish theoretically, the behavior and properties of the solution with special consideration to diminishing uncertainty, rates of convergence and observability.