



# Design of Navigation and Guidance Control System of Mobile Robot with Position Estimation Using Ensemble Kalman Filter (EnKF) and Square Root Ensemble Kalman Filter (SR-EnKF)

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**Abstract:** A mobile robot is one of the unmanned land vehicles which can be controlled and whose position can be detected when it is equipped with a Global Positioning System (GPS). A mobile robot aims to automate some tasks that were usually done manually by a human. To gain an accurate detection of the mobile robot position, the mobile robot must follow the existing trajectory with the right position. Therefore, we need a method to estimate the mobile robot trajectory in order to easily detect its position. In this paper, we propose two trajectory estimation methods, i.e., the Ensemble Kalman Filter (EnKF) and the Square Root Ensemble Kalman Filter (SR-EnKF). Furthermore, we also compare the performance of the two methods on the mobile robot equation. The simulation results showed that the EnKF method has a higher accuracy compared with the SR-EnKF method. The mobile position error of the two methods was less than 2% in the case of 100 and 200 ensembles. The smallest error was obtained when generating 100 ensembles, where the position error w.r.t. the X-axis was 0.02 m, the position error w.r.t. the Y-axis was 0.02 m, and the angle position error was 0.003 rad.

**Keywords:** mobile robot; EnKF; SR-EnKF; trajectory estimation.

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