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Examining the eigenvalues effect to the computational cost in mobile robot simultaneous localization and mapping

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ABSTRACT

One of the biggest factors that contributes to the computational cost of extended Kalman filter-based simultaneous localization and mapping is the computation of the covariance update. This results from the multiplications of the covariance matrix with other parameters along with the increment of its dimension, which is twice the number of landmarks. This study attempts to look for an optimal solution to decrease the computational complexity of the covariance matrix without compromising the accuracy of the state estimation through eigenvalue approach. This paper presents a study on the matrix-diagonalization technique, which is applied to the covariance matrix in extended Kalman filter-based simultaneous localization and mapping to simplify the multiplication process. The behavior of estimation and covariance were observed based on four case studies to analyze the performance of the proposed technique.