Title: Minimum-energy (Deterministic Optimal) filtering on the kinematics of the attitude and the pose of a rigid body.

Abstract: Obtaining robust estimates of the attitude and the pose of a rigid body moving in the three dimensional space using noisy measurement is a challenging task. The extended Kalman filter (EKF) is known to encounter convergence issues for these problems due to nonlinearities in the geometric space of the underlying systems. In this presentation an alternative optimal filtering derivation (that is known as minimum-energy filtering) is considered that is due to Mortensen. We extend this vector space method to three geometric systems, i.e. a first order system define on the unit circle and kinematic models for the attitude and the pose of a rigid body in 3D space. We avoid linearizations of the underlying state spaces and extend Mortensen's approach to kinematics defined directly on the unit circle $S^1$, the special orthogonal group SO(3) and the special Euclidean group SE(3). In simulations we consider the performance of the proposed attitude filter compared to the performance of the multiplicative extended Kalman filter (MEKF) that is the state of the art filtering method in many current applications.

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