

Statically Fused Unbiased Converted Measurements Kalman Filter

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Abstract : The statically fused converted position and doppler measurements Kalman filter (SF-CMKF) with additive debiased measurement conversion has been previously presented to combine the resulting states of converted position measurements Kalman filter (CPMKF) and converted doppler measurement Kalman filter (CDMKF) to yield the final state estimates under minimum mean squared error (MMSE) criterion. However, the exact compensation for the bias in the polar-to-cartesian and spherical-to-cartesian conversion are multiplicative and depend on the statistics of the cosine of the angle measurement errors. As a result, the consistency and performance of the SF-CMKF may be suboptimal in large-angle error situations. In this paper, the multiplicative unbiased position and Doppler measurement conversion for 2D (polar-to-cartesian) tracking are derived, and the SF-CMKF is improved to use those conversions. Monte Carlo simulations are presented to demonstrate the statistical consistency of the multiplicative unbiased conversion and the superior performance of the modified SF-CMKF (SF-UCMKF).

Keywords : measurement conversion, Doppler, Kalman filter, estimation, tracking

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