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Revisiting derivative-free nonlinear Kalman filtering: implementation aspects of algorithms CDKF, DDKF, CKF, AND UKF

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This work aims at revisiting derivative-free nonlinear Kalman filters. The main algorithms focused are the CDKF (Central Difference Kalman Filter), DDKF (Divided Difference Kalman Filter), CKF (Cubature Kalman Filter), and UKF (Unscented Kalman Filter), which depart from different basic principles to evolve to their final algorithms (Noorgard et al., 2000; Arasaratnam e Haykin, 2009; Julier and Uhlmann, 1997). These algorithms are among the most popular used in state estimation of nonlinear systems, notably in aerospace systems. Although they are different in their basic concepts, it is overwhelming the similarity of their respective final algorithms, especially in aspects of computational implementation. Such similarities and differences in the implementation of the algorithms are emphasized in order to allow easy assessment in terms of computational complexity.

References

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