用于弹道目标跟踪的有限差分扩展卡尔曼滤波算法(PDF)

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Title: Finite Difference Extended Kalman Filtering Algorithm for Ballistic Target Tracking

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摘要: 针对目前常用的滤波算法不能同时做到精确和高效跟踪目标的缺点，提出一种有限差分扩展卡尔曼滤波(FDEKF)算法用于再入阶段的弹道目标跟踪.该算法应用有限差分运算得到滤波的验前、验后误差协方差矩阵，避免了非线性函数求导运算，以及Jacobian阵和Hessian阵的计算，降低了计算难度，扩大了应用范围，增强了滤波过程的收敛性. Monte Carlo 数值仿真表明，FDEKF算法与扩展卡尔曼滤波（EKF）算法和无味卡尔曼滤波（UKF）算法相比较，在跟踪精度上比EKF算法提高了约20%，与UKF算法相当，在计算复杂度上比EKF算法稍有增加，但比UKF算法低约39%.这说明FDEKF算法在计算量增加不多的情况下，滤波精度有显著提高.

Abstract: In order to overcome the disadvantage of the common used filtering algorithms that can not achieve the tracking accuracy and effectiveness at the same time, a finite difference extending Kalman filter? algorithm was proposed for ballistic target tracking problem in the re entry phase. This algorithm uses finite differences to approximate the priori error covariance matrix and the posterior error covariance matrix, and avoids evaluations of derivatives,? the Jacobian and Hessian matrices, which enlarge the application areas and improve the filtering convergence. The Monte Carlo simulations show that, compared with the extended Kalman filter (EKF) and the unsented Kalman filter (UKF), the tracking accuracy of the new algorithm is close to that of UKF, but 20% higher than that of EKF; the computational complexity of the new algorithm is close to that of EKF, but 39% lower than that of UKF. All these results show that the filtering accuracy of the proposed algorithm is improved evidently with a little increasing in computational cost.

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参考文献/REFERENCES

［1］LI Xiaorong, JILKOV V P. A survey of maneuvering target tracking: Part II: ballistic target models ［C］‖Proc

2001 SPIE Conf on Signal and Data Processing of Small Targets. San Diego， USA：The International Society for Optical Engineering,? 2001： 559 581.
［2］COSTA P. Adaptive model architecture and extended Kalman Bucy filters ［J］. IEEE Trans Aerospace and Electronic Systems， 1994， 30(2)：525 533.
［3］FARINA A， BENVENUTI D， RISTIC B. Tracking a ballistic target： comparison of several nonlinear filters ［J］. IEEE Trans Aerospace and Electronic Systems， 2002， 38(3)： 854 867.
［4］JULIER S J, UHLMANN J, DURRANT WHYTE H F. A new method for nonlinear transformation of means and covariances in filters and estimatiors ［J］. IEEE Trans Automatic Control, 2000, 45(3): 477 482.
［5］JULIER S， UHLMANN J. Unscented filtering and nonlinear estimation ［J］. Proceedings of the IEEE， 2004，92 (3)： 401 422.
［6］BRUNO M G S， PAVLOV A. A density assisted particle filter algorithm for target tracking with unknown ballistic coefficient ［C］‖Proc ICASSP 05. Piscataway，USA：IEEE, 2005： 5 8.
［7］SCHEI T S. A finite difference method for linearization in nonlinear estimation algorithm ［J］. Automatica， 1997，33(11)： 2053 2058.
［8］ITO K,XIONG K.Gaussian filters for nonlinear filtering problems? ［J］.Automatica, 2000,45(5):910 927.
［9］FARINA A， STUDER F A. Radar data processing ［M］‖Introduction and Tracking： Ⅰ. New York： Researches Studies Press， 1985.

备注/Memo: -

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