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A modified variable rate particle filter for maneuvering target tracking

Key words: Maneuvering target tracking, Prolonged smooth regions, Variable rate model, Maneuver detection

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Motivation/Main ideas

- **Motivation**

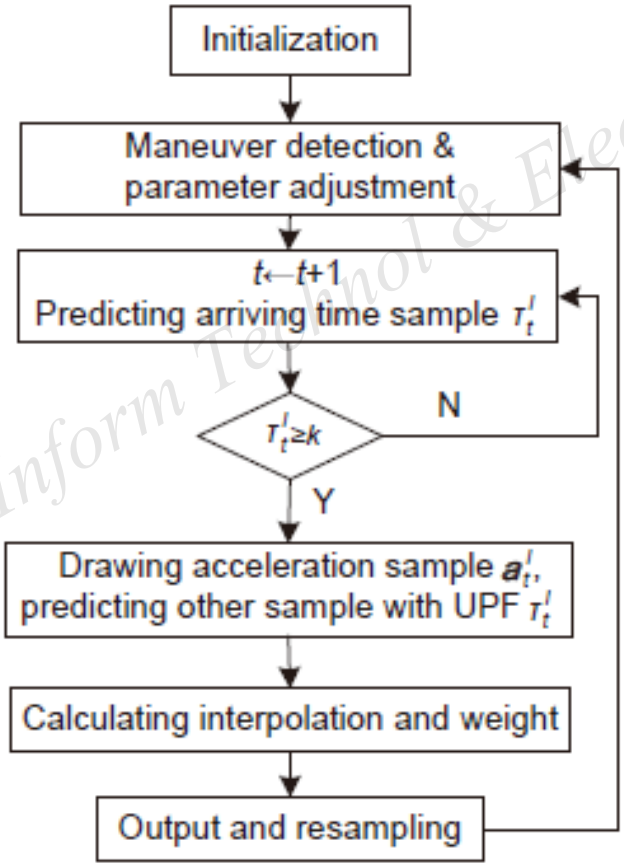
  Propose an algorithm for maneuvering target tracking, where the target trajectory has prolonged smooth regions and abrupt maneuvering regions.

- **Main ideas**

  - Present a Cartesian-coordinate based variable rate model which does not need any prior knowledge of target mass or external forces.
  - Adjust the algorithm's parameters adaptively with a maneuvering detection strategy.
  - Adopt the unscented particle filter in the algorithm to improve the tracking performance.

Method

1. Main block diagram of the modified variable rate particle filter (MVRPF)



Major results (I)

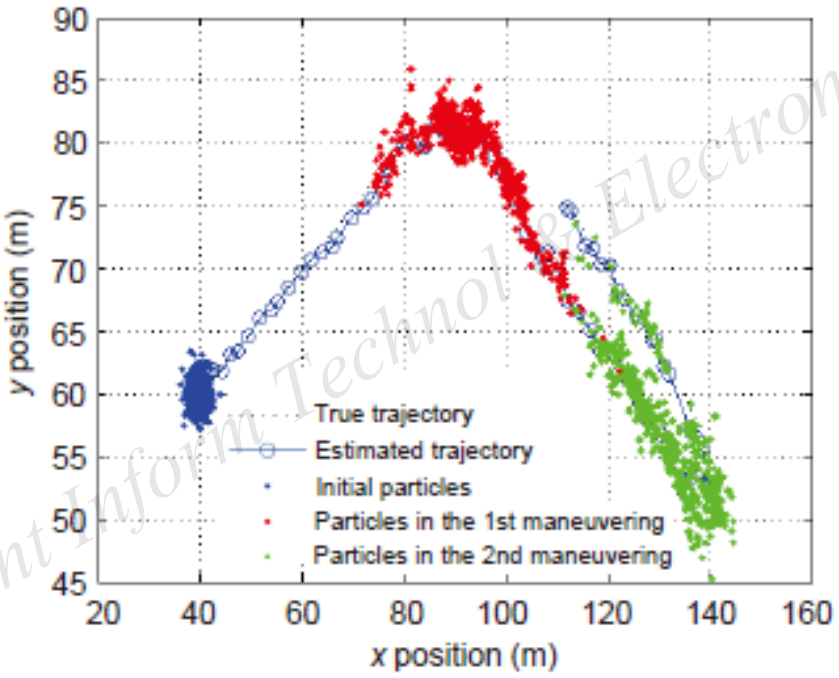


Fig. 3 Estimated target trajectory and particles

Major results (II)

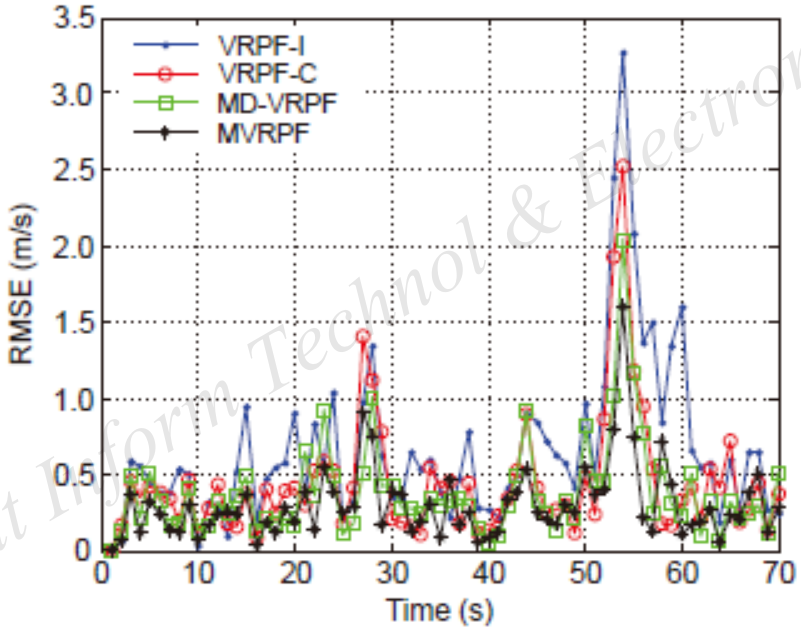


Fig. 10 Velocity RMSE curves of different methods under the second group of parameters

Conclusions

- A modified variable rate particle filter algorithm is proposed.
  - A Cartesian-coordinate based variable rate model is presented, which is more convenient than the intrinsic-coordinate based model.
  - Based on maneuver-detection, a parameter adjustment method is proposed to reduce the storage requirement and improve the estimation accuracy.
  - A UPF is embedded in the proposed algorithm to improve the tracking performance, in the presence of sharp likelihood.