Comments

Corrections to "Unscented Filtering and Nonlinear Estimation"

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In the above paper [1], we surveyed the state of the art in unscented techniques for nonlinear estimation, and we provided a number of examples that illustrate its advantages over traditional linearized approaches such as the extended Kalman filter (EFK). Unfortunately, the description of the reentry example in Section VI-B of the paper was not completely and correctly explained and was not entirely consistent with the implementation used to generate Fig. 9(a)–(c). The force terms $D(k)$ and $G(k)$ acting upon the projectile are

$$D(k) = \beta(k) \exp\left\{\frac{[R_0 - R(k)]}{H_0}\right\} V(k)$$
$$G(k) = -\frac{Gm_0}{R^3(k)}$$

and not the equations quoted in the paper. The process noise covariance matrix used on each filter is *not* be the same as the process noise used to drive the motion of the true projectile in the simulation. The process noise used to drive the simulation was specified in the paper; the process noise used to drive each filter is

$$\boldsymbol{Q}(k) = \begin{bmatrix} 2.4064 \times 10^{-5} & 0 & 0 \\ 0 & 2.4064 \times 10^{-5} & 0 \\ 0 & 0 & 10^{-6} \end{bmatrix}.$$

All the Jacobian matrices for the EKF were calculated numerically using a central difference scheme and a step size of 10^{-3}.

The corrected graphs for Fig. 9(a)–(c) appear here. The conclusions that can be drawn from the results—that the EKF yields and inconsistent estimate, whereas the unscented Kalman filter yields a consistent estimate—remain the same as those presented in the original paper.

Manuscript received July 26, 2004.

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Digital Object Identifier 10.1109/JPROC.2004.837637

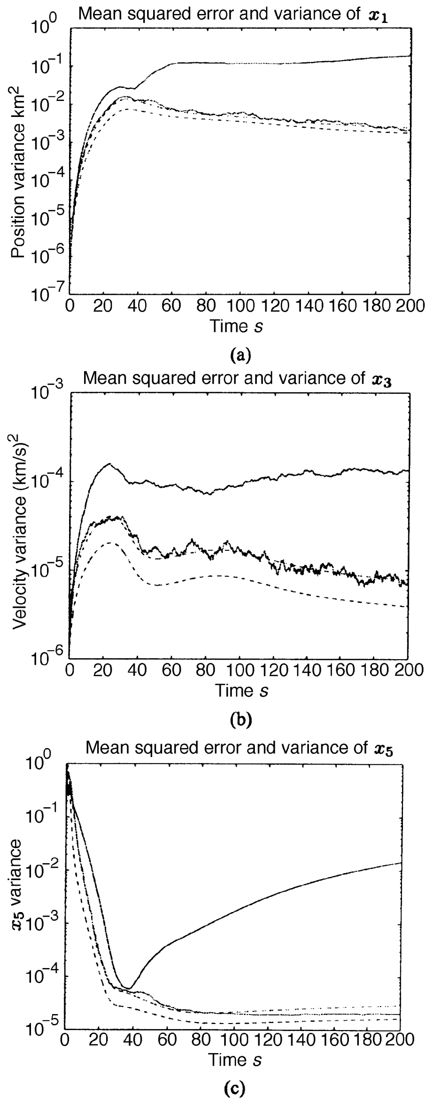

Fig. 9. Mean squared errors and estimated covariances calculated by an EKF and an unscented filter. In all the graphs, the solid line is the mean squared error calculated by the EKF, and the dotted line is its estimated covariance. The dashed line is the unscented mean squared error and the dot–dashed line its estimated covariance. (a) Results for x_1. (b) Results for x_3. (c) Results for x_5.

ACKNOWLEDGMENT

The authors would like to thank Yuanxin Wu at the National University of Defense Technology, Hunan, China, for bringing these issues to their attention.

REFERENCES

[1] S. J. Julier and J. K. Uhlmann, "Unscented filtering and nonlinear estimation," *Proc. IEEE*, vol. 92, pp. 401–422, Mar. 2004.