Using (2) in (5)

$$\bar{y}_k = HX_k + \nu_k - \alpha H\phi^{-1}X_k + \alpha H\phi^{-1}G\omega_{k-1} - \alpha\nu_{k-1}$$
$$= H[I - \alpha\phi^{-1}]X_k + \alpha H\phi^{-1}G\omega_{k-1} + \nu_k - \alpha\nu_{k-1} \quad (6)$$
$$\bar{y}_k = \overline{H}X_k + \bar{\eta}_k, \quad (7)$$

where $\overline{H}$ and $\bar{y}_k$ are as defined in [1] and $\bar{\eta}_k$ is given by

$$\bar{\eta}_k = \alpha H\phi^{-1}G\omega_{k-1} + \nu_k - \alpha\nu_{k-1}.$$

There appears another mistake in the derivation of (11) in [1]. Starting from

$$\bar{u}_k = (\nu_k - 2\nu_{k-1} + \nu_{k-2}) + (\nu_{k-1} - \nu_{k-2})T + \tfrac{1}{2}a_{k-1}T^2 - \tfrac{1}{2}a_{k-2}T^2 \quad (8)$$

$(\nu_{k-1} - \nu_{k-2})$ is equal to $a_{k-1}T$ and using this, (8) becomes

$$\bar{u}_k = (\nu_k - 2\nu_{k-1} + \nu_{k-2}) + a_{k-1}T^2 + \tfrac{1}{2}a_{k-1}T^2 - \tfrac{1}{2}a_{k-2}T^2$$
$$= (\nu_k - 2\nu_{k-1} + \nu_{k-2}) + \tfrac{3}{2}a_{k-1}T^2 - \tfrac{1}{2}a_{k-2}T^2 \quad (9)$$

whereas this is (11) in [1] and is shown as

$$\bar{u}_k = (\nu_k - 2\nu_{k-1} + \nu_{k-2}) + \tfrac{1}{2}a_{k-1}T^2 + \tfrac{1}{2}a_{k-2}T^2.$$

In [1], the author might have used that $(\nu_{k-1} - \nu_{k-2})$ is equal to

$$(\nu_{k-1} - \nu_{k-2}) = a_{k-2}T. \quad (10)$$

Equation (10) is not logical. This can be explained as

Present position − previous position

= (present velocity) ∗ time

Present velocity − previous velocity

= (present acceleration) ∗ time

and so on. So (11) in [1] should have been

$$\bar{u}_k = (\nu_k - 2\nu_{k-1} + \nu_{k-2}) + (\tfrac{3}{2}a_{k-1} - \tfrac{1}{2}a_{k-2})T^2. \quad (11)$$

Taking the Z-transform of (11), we have

$$\bar{u}(z) = (1 - z^{-1})^2\nu(z) + m(z) \quad (12)$$

where

$$m(z) = (\tfrac{3}{2}z^{-1} - \tfrac{1}{2}z^{-2})a(z)T^2. \quad (13)$$

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[1] Wu, W. R., and Chang, D. C. (1996)
Maneuvering target tracking with colored noise.
IEEE Transactions on Aerospace and Electronic Systems, **32**, 4 (Oct. 1996), 1311–1320.

Authors' Reply

The missing of H in (5) is a derivation error, however, it does not affect the simulation results since $H = 1$ in our setting. The derivation in (11) is correct. This is because there can be two representations describing the relation of v_k and a_k:

$$v_{k+1} = v_k + a_kT \quad (1)$$
$$v_{k+1} = v_k + a_{k+1}T. \quad (2)$$

We can use either one as long as this relation is consistent elsewhere. As a matter of fact, (1) and (2) are identical if we let a_k in (1) be a delayed version of (2).

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Comments on "A New Model and Efficient Tracker for a Target with Curvilinear Motion"

In IMMIE formulation, always an input (cross-track acceleration) estimate is used at every sample instant, regardless of whether the target is accelerating or not and hence it will degrade performance during constant-speed sections of track [1]. Just for reducing computational burden and cost, the authors compromised on the accuracies in the estimates of target state vector. The probabilities a_n are to be found out through innovation and so are their covariances in the corresponding Kalman filters. These are chosen arbitrarily as 0.9. The along-track-acceleration inputs which are supposed to be found out adaptively using input estimation techniques are also chosen arbitrarily.

The authors of [1] reduced NM number of kalman filters to N number of Kalman filters by incorporating only the estimated along-track acceleration (a_t),

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