Parameter Estimation using Extended KF

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***Abstract*—In this work, we explore the parameter estimation procedure using the extended Kalman-Filter on a system discussed in the literature. We found that the proposed estimation does not converge to the real values.**

***Index Terms*—State and parameter estimation, extended Kalman-Filter, linearization.**

I. Introduction

The model used in the present work is discussed in [1], given by the discrete dynamic system presented in eq. (1).

$$\begin{cases} x_{t+1} = Ax_t + \xi_t \\ y_t = Cx_t + \zeta_t \end{cases} \tag{1}$$

Where ξ_t and ζ_t are uncorrelated white noises with covariance matrices Q_t and R_t respectively.

The specific state matrices are given in eq. (2), with parameters a^1, a^2, $a^3 \in [-1, 1]$.

$$A = \begin{bmatrix} a^1 & 1 & 0 \\ a^2 & 0 & 1 \\ a^3 & 0 & 0 \end{bmatrix} C = \begin{bmatrix} 1 & 0 & 0 \end{bmatrix} \tag{2}$$

In order to estimate parameters a^i, the state must be extended with the dynamics of these parameters. Let $z_t := (x_t^T, a_t^T)^T$, where $x_t := (x_t^1, x_t^2, x_t^3)^T$ and $a_t := (a_t^1, a_t^2, a_t^3)$. Clearly, the resulting dynamic system nonlinear, hence we use the extended Kalman-Filter using the standard linearization. The new state matrix is

II. Results

III. Discussion and Future Work

References

[1] P. Wei, B. Xia, and X. Luo, "Parameter estimation and convergence analysis for a class of canonical dynamic systems by extended kalman filter," in *2017 3rd IEEE International Conference on Control Science and Systems Engineering (ICCSSE)*. IEEE, 2017, pp. 336–340.