Adaptive Neural Consensus Tracking Control for Multi-agent Systems with Unknown State and Input Hysteresis

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Research Article

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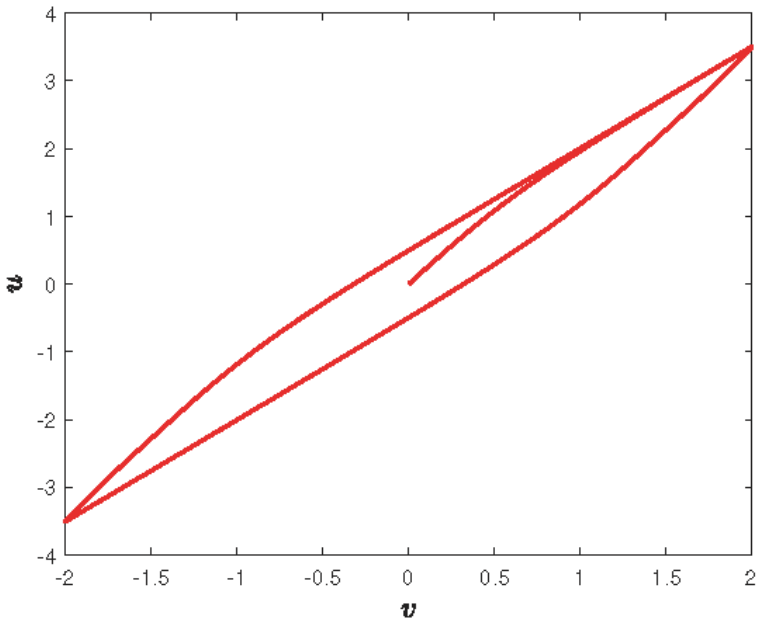
Abstract

An indirect adaptive consensus control method is presented for MASs with Unknown Bouc-Wen hysteresis states and input. All states of MASs are measured by sensors subjected to hysteresis. In order to reduce the effect of hysteresis with multi-value and rate-dependent characteristics, an adaptive compensated scheme is proposed. NNs are introduced to approximate the time-varying control gain which is coupled by input hysteresis and states hysteresis. The parameters of inverse compensation model are approximated by adaptive laws. The proposed control scheme can guarantee that the consensus errors of followers converge to a predefined interval of zero asymptotically. In addition, the transient performance of MASs can be further ensured. A simulation example is included to verify the effectiveness of the presented control approach.

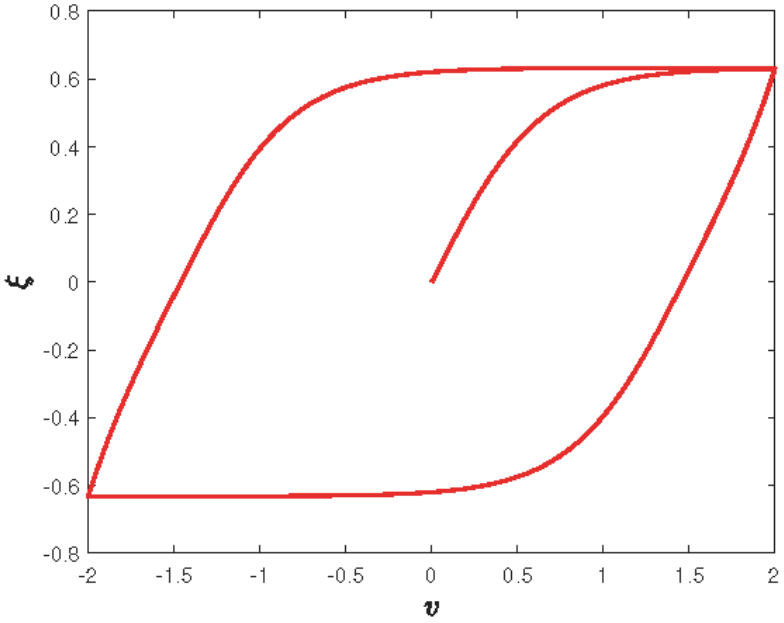
Full Text

Due to technical limitations, full-text HTML conversion of this manuscript could not be completed. However, the manuscript can be downloaded and accessed as a PDF.

Figures



(a) Hysteresis



(b) Hysteresis variable ξ

Figure 1

Bouc-Wen model

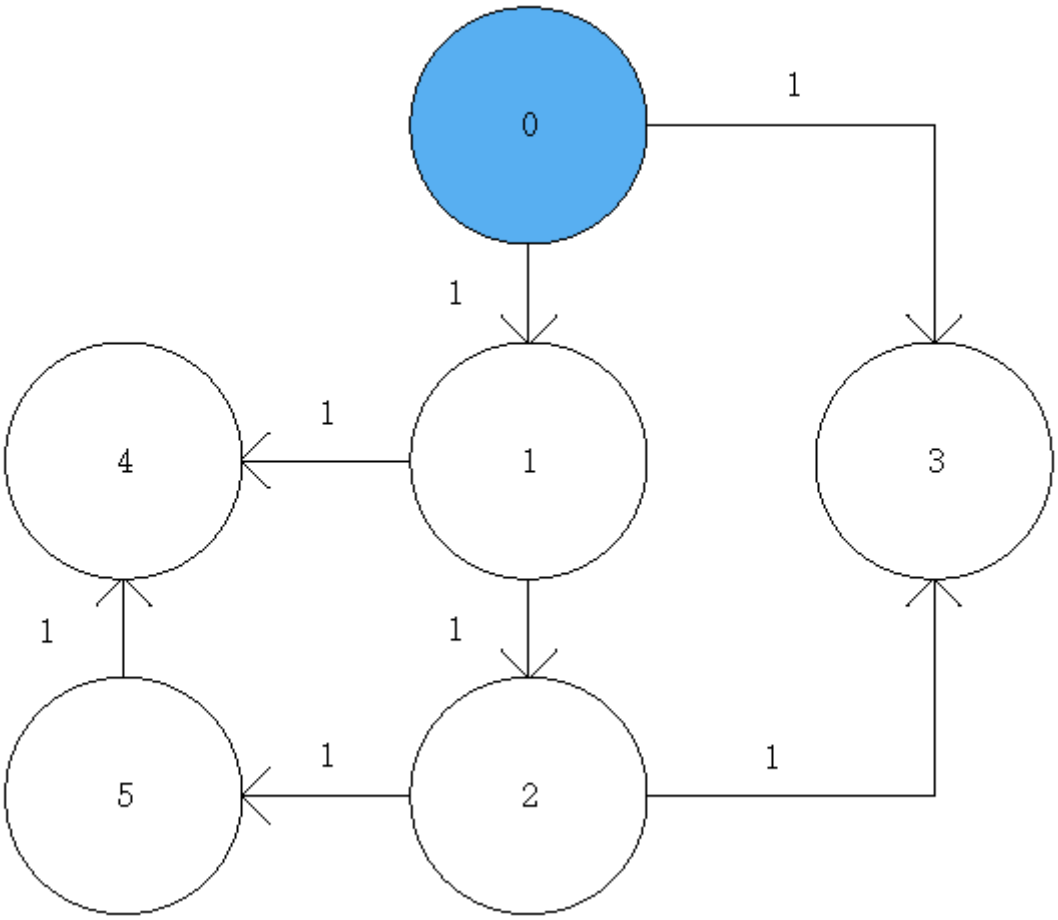


Figure 2

Directed graph of the MASs.

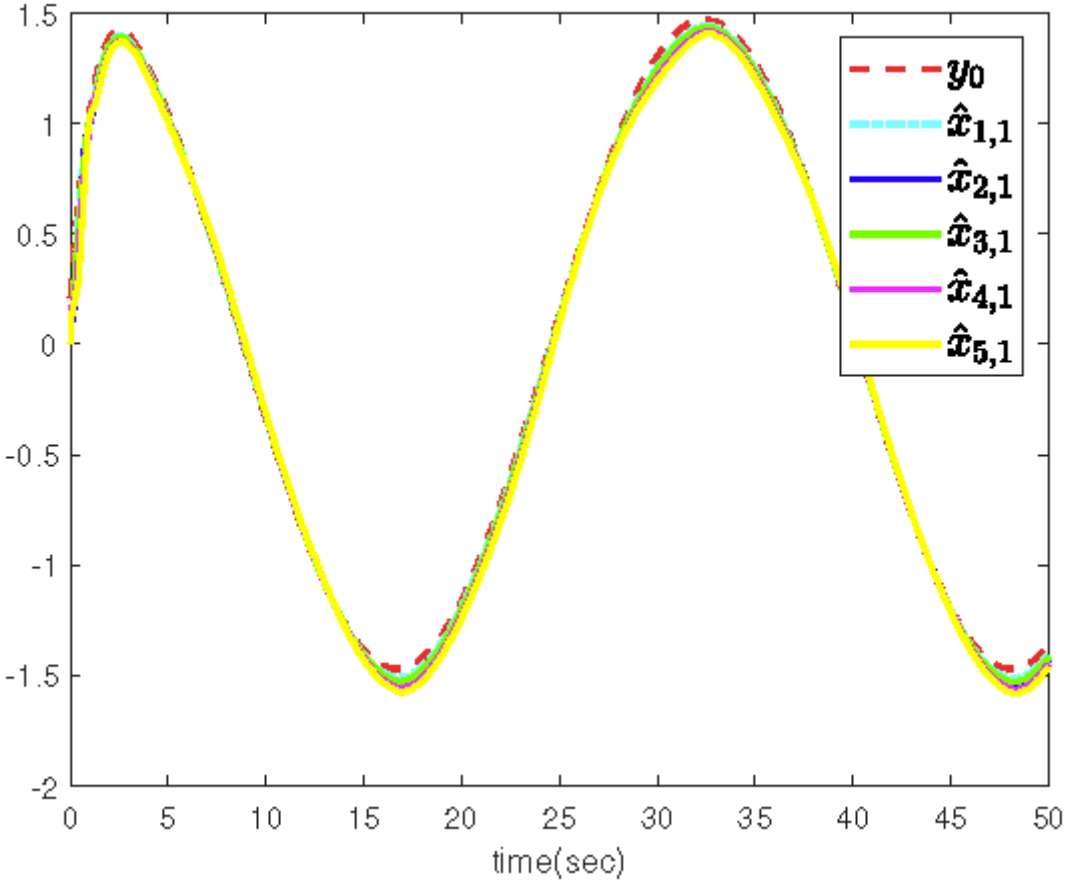


Figure 3

The outputs measured by sensors and the leader's output

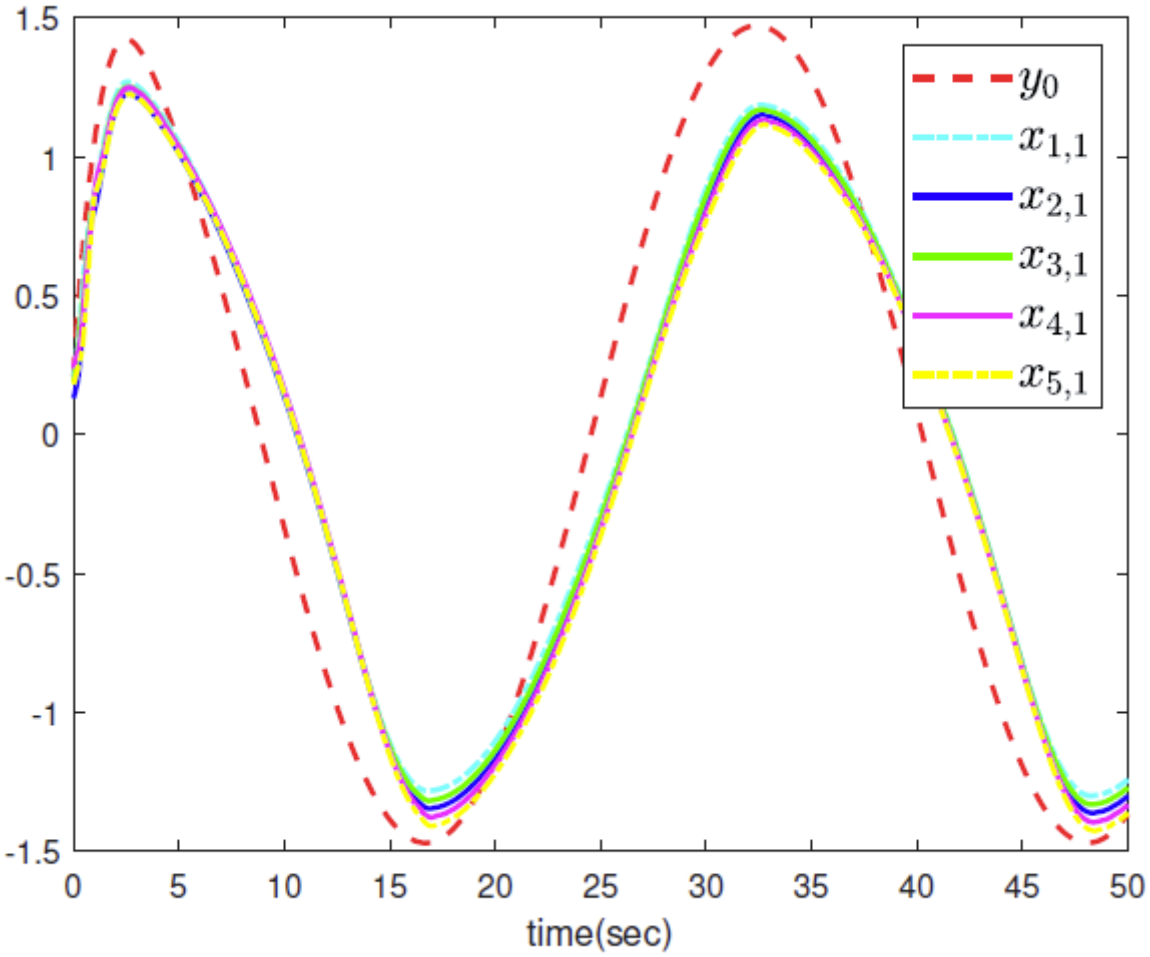


Figure 4

The genuine outputs of agents

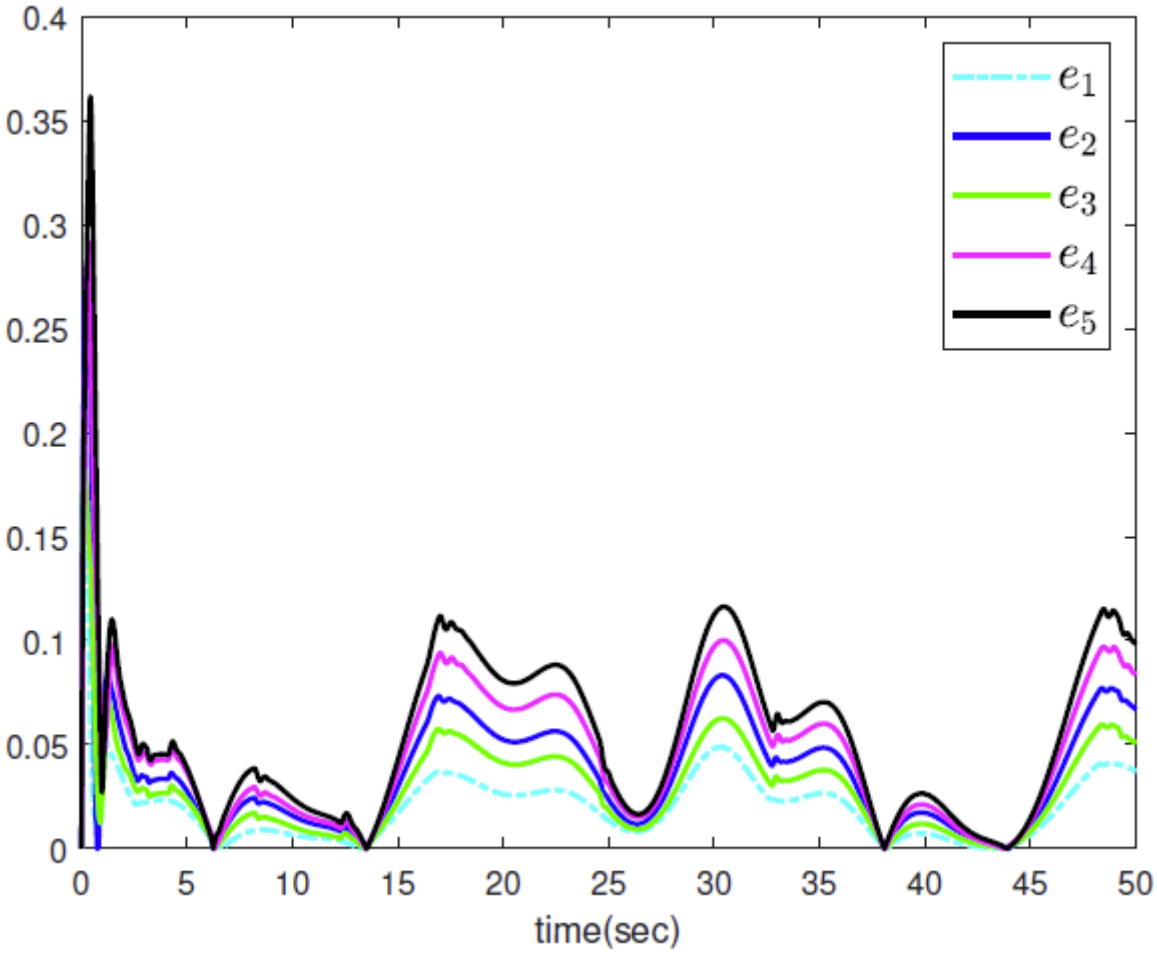
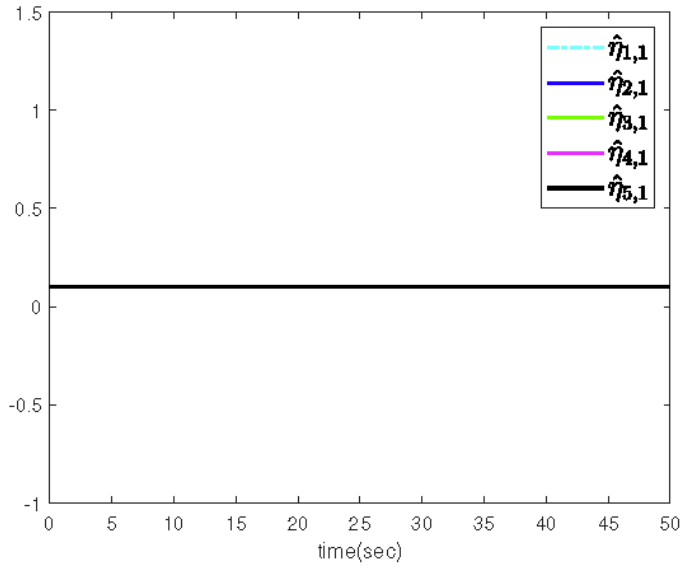
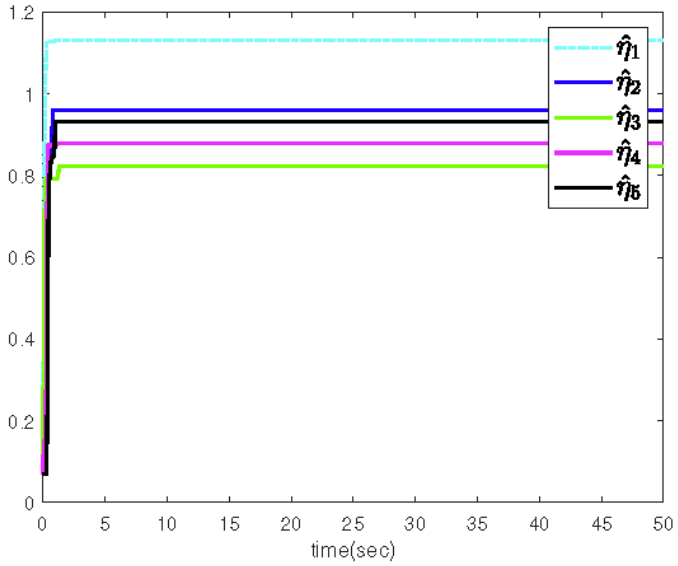


Figure 5

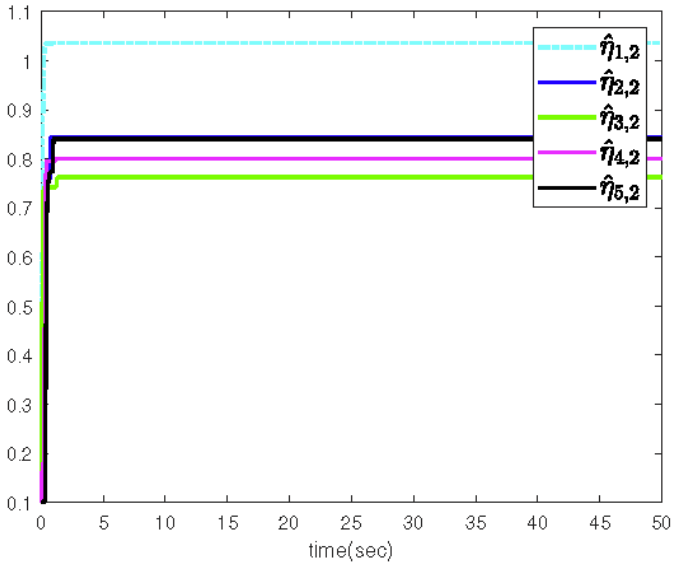
Consensus tracking errors



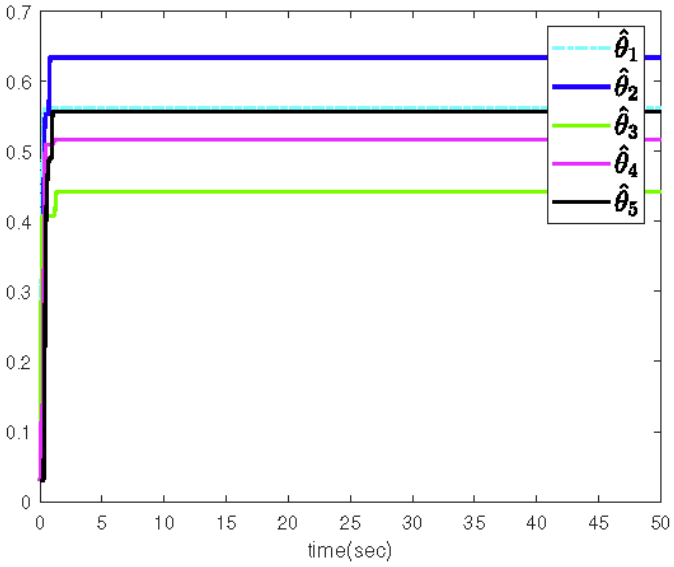
(a) Adaptive parameters $\hat{\eta}_{i,1}$



(c) Adaptive parameters $\hat{\eta}_i$



(b) Adaptive parameters $\hat{\eta}_{i,2}$



(d) Adaptive parameters $\hat{\theta}_i$

Figure 6

Adaptive parameters

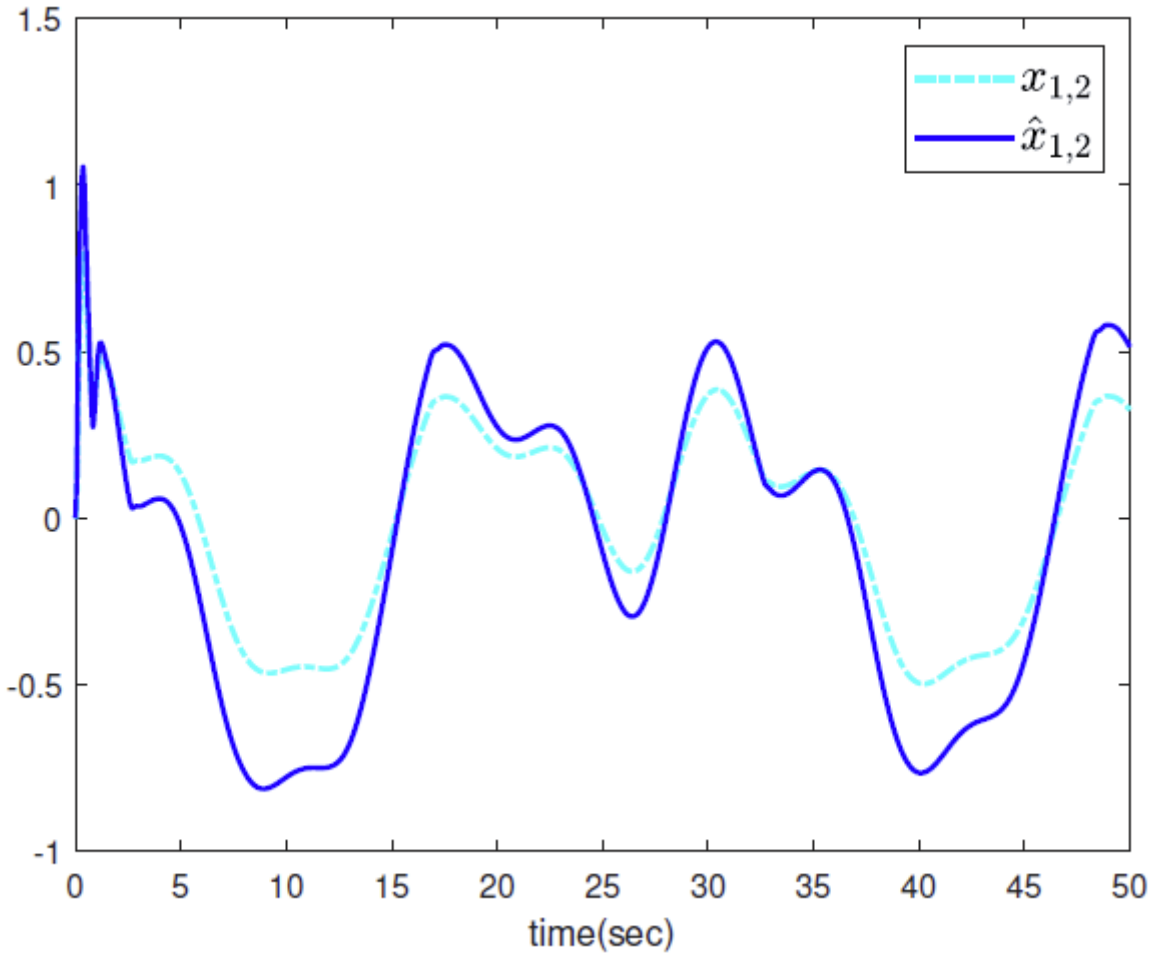


Figure 7

States of MASs x1;2 and $\bar{x}$1;2

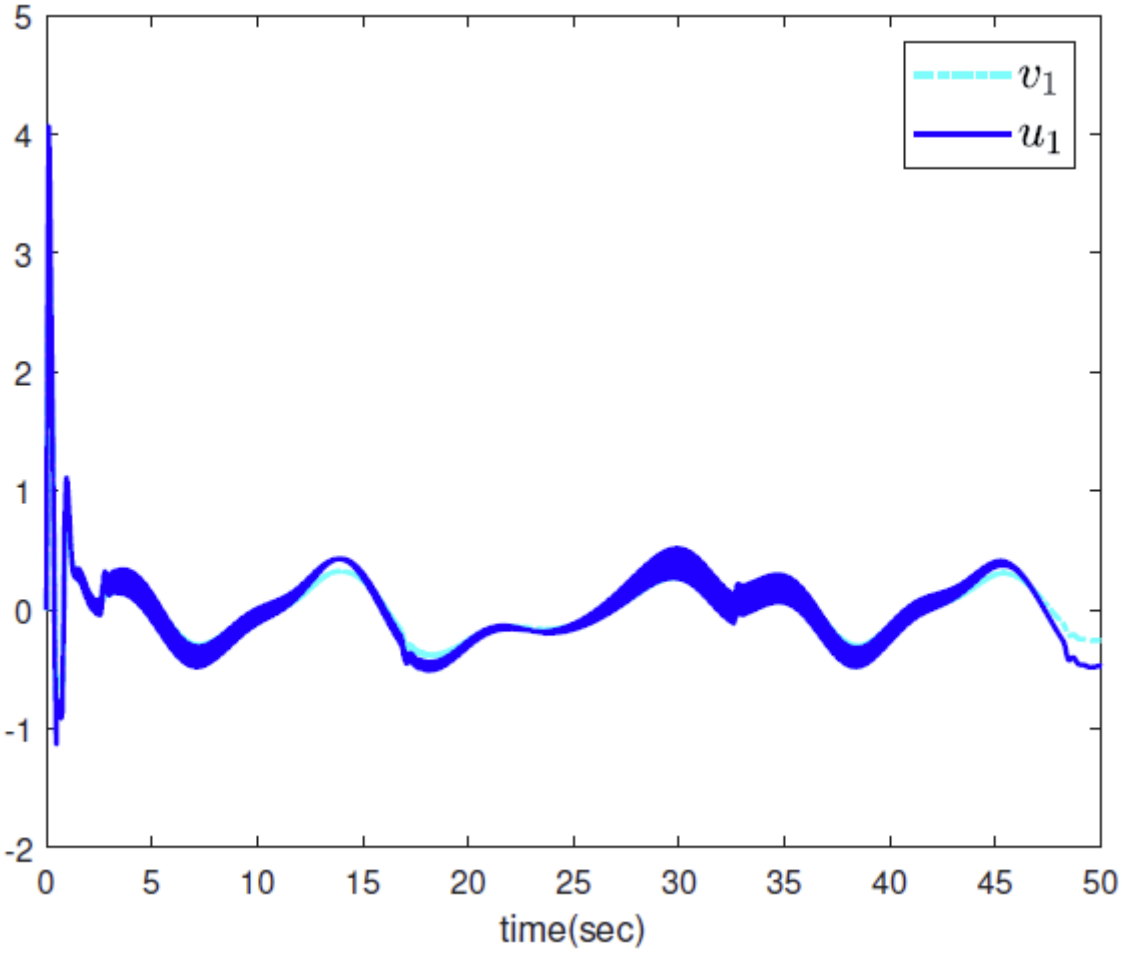


Figure 8

Designed control signal and actual control signal