Dear Professor M. Elena Valcher:

We wish to submit an original research manuscript entitled "Data-driven Input Reconstruction and Experimental Validation" by me, Yingzhao Lian, and Colin N. Jones for consideration in \textit{IEEE Control Systems Letters (L-CSS)}.

Input reconstruction estimates unknown inputs based on measured states/outputs, which finds broad application in system supervision, sensor fault detection, and robust control. This paper proposes a data-driven input reconstruction method from outputs (IRO) based on the Willems' Fundamental Lemma. The unknown inputs are estimated recursively by the IRO, which asymptotically converge to the actual inputs without knowing the initial conditions. Unlike the model-based IRO, which requires a system identification in advance, we achieve the data-driven IRO directly from historical I/O data. A recursive IRO and a moving-horizon IRO are developed based respectively on Lyapunov conditions and Luenberger-observer-type feedback. Their asymptotic convergence properties are studied and validated by numerical simulations. In addition, an experimental study is presented demonstrating the efficacy of the moving-horizon IRO for estimating the occupancy of a building on the EPFL campus via measured carbon dioxide levels.

We believe that the presented work is of academic interest and adapts various industrial applications, which is within the scope of the journal \textit{IEEE Control Systems Letters (L-CSS)}.

Thank you for considering this manuscript. We look forward to hearing from you regarding the review process for our paper.

Best regards,

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