Cyberattack Detection by Using a Discrete-Time Model-Based Unknown Input Observer

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Résumé

This work introduces a solution for cyberattack detection within the context of cooperative adaptive cruise control (CACC) system. Our approach involves a novel method that consists in shifting the original output to establish a new system that adheres to the observer matching condition (OMC). Additionally, we represent the system in descriptor form and design a delayed unknown input observer (UIO) to achieve an Input-to-State Stable~(ISS) bound on both the cyberattack and the state of the CACC system. Leveraging Lyapunov stability theory, we propose sufficient conditions expressed in terms of linear matrix inequality. To demonstrate the effectiveness of our algorithm, we proposed two simulation scenarios utilizing both Matlab software and the Carla simulator.

Mots-Clés: Unknown input observer, CACC, Connected vehicle

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