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Artificial Steady-State-Based Nonlinear MPC for Wheeled Mobile Robot

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Abstract : To ensure the stability of closed-loop nonlinear model predictive control (NMPC) within a finite horizon, there is a need for appropriate design terminal ingredients, which can be a time-consuming and challenging effort. Otherwise, in order to ensure the stability of the control system, it is necessary to consider an infinite predictive horizon. Increasing the prediction horizon increases computational demand and slows down the implementation of the method. In this study, a new technique has been proposed to ensure system stability without terminal ingredients. This technique has been employed in the design of the NMPC algorithm, leading to a reduction in the computational complexity of designing terminal ingredients and computational burden. The studied system is a wheeled mobile robot (WMR) subjected to non-holonomic constraints. Simulation has been investigated for two problems: trajectory tracking and adjustment mode.

Keywords : wheeled mobile robot, nonlinear model predictive control, stability, without terminal ingredients
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