

## Static Output Feedback Control of a Two-Wheeled Inverted Pendulum Using Sliding Mode Technique

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**Abstract :** This paper presents a static output feedback sliding mode control method to regulate a two-wheeled inverted pendulum system with considerations of matched and unmatched uncertainties. A sliding surface is designed and the associated sliding motion stability is analysed based on the reduced-order dynamics. A static output sliding mode control law is synthesised to drive the system to the sliding surface and maintain a sliding motion afterwards. The nonlinear bounds on the uncertainties are employed in the stability analysis and control design to improve the robustness. The simulation results demonstrate the effectiveness of the proposed control.

**Keywords :** two-wheeled inverted pendulum, output feedback sliding mode control, nonlinear systems, robotics

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