

## Reaching Phase Elimination in Variable Structure Control of the Third Order System with State Constraints

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*Abstract:* In this paper the design of a time varying switching plane for the sliding mode control of the third order system subject to the velocity and acceleration constraints is considered. Initially the plane passes through the system representative point in the error state space and then it moves with a constant velocity to the origin of the space. Having reached the origin the plane stops and remains motionless. The plane parameters (determining angles of inclination and the velocity of its motion) are selected to ensure the minimum integral absolute error without violating velocity and acceleration constraints. The optimal parameters of the plane for the system subject to the acceleration constraint are derived analytically, and it is strictly proved that when both the system velocity and acceleration are limited, the optimal parameters can be easily found using any standard numerical procedure for solving nonlinear equations. The equation to be solved is derived and the starting points for the numerical procedure are given.

*Keywords:* variable structure systems; sliding mode control; switching plane design;

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