Robust adaptive gain for suppression of chattering in sliding mode controller

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Abstract:

This paper proposing a new design to improve sliding mode controller by employing an Adaptive Exponential Gain (AEG) for reducing the unwanted chattering phenomenon. The chattering reduction is achieved by using a new gain function of states feedback system combined with Conventional Sliding Mode Controller (CSMC). The value of the gain is calculated based on the value of the system states; so that a new value of sliding mode controller (SMC) gain always depending on the system stats as the corrective control term instead of discontinuous sign function. In SMC the amplitude of chattering is proportional to the magnitude of discontinuous control, this worrying issue can be handled if the magnitude of the control signal is reduced to a minimal value defined by exist of the conditions for the SMC. The application of this methodology AEG enables for reducing the control signal magnitude to the minimum possible value maintenance the property of SMC. The AEG algorithm shows an efficient reduction in system chattering as comparison between it and existing methods Super Twisting Algorithm (STW), used to treatment of chattering phenomenon. Moreover, the new algorithm is more robust, accurate and high responses to external noise and any change in system parameters.