

Slip Suppression Sliding Mode Control with Various Chattering Functions

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Abstract : This study presents performance analysis results of SMC (Sliding mode control) with changing the chattering functions applied to slip suppression problem of electric vehicles (EVs). In SMC, chattering phenomenon always occurs through high frequency switching of the control inputs. It is undesirable phenomenon and degrade the control performance, since it causes the oscillations of the control inputs. Several studies have been conducted on this problem by introducing some general saturation function. However, study about whether saturation function was really best and the performance analysis when using the other functions, weren't being done so much. Therefore, in this paper, several candidate functions for SMC are selected and control performance of candidate functions is analyzed. In the analysis, evaluation function based on the trade-off between slip suppression performance and chattering reduction performance is proposed. The analyses are conducted in several numerical simulations of slip suppression problem of EVs. Then, we can see that there is no difference of employed candidate functions in chattering reduction performance. On the other hand, in slip suppression performance, the saturation function is excellent overall. So, we conclude the saturation function is most suitable for slip suppression sliding mode control.

Keywords : sliding mode control, chattering function, electric vehicle, slip suppression, performance analysis

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