PERSISTENT EXCITATION IN A SHUNT DC MOTOR UNDER ADAPTIVE CONTROL

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ABSTRACT

The adaptive input-output linearizing control has been successful in achieving the asymptotic output tracking stability of a shunt DC motor, however, persistent excitation (PE) of the regressor has not been investigated. PE is known to be the necessary and sufficient condition for the exponential stability of a general adaptive system. Its fulfillment can be checked \textit{a priori} when all the states entering the regressor track a prescribed trajectory asymptotically. However, it is rather difficult for this application because the regressor depends partly on the estimated parameters and the unobservable state which do not converge to any known signal at all. Nevertheless, it is found that such a task can actually be accomplished under some mild assumptions on the system and the reference trajectories. Simulation results confirming the assertion are given in the final section.

\textit{KeyWords:} Shunt DC motor, adaptive control, feedback linearization, persistent excitation.