

Adaptive Optimal Control of RWM in Tokamak

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As plasma parameters evolve in time during a tokamak discharge, the resistive wall mode growth rate will change and necessitate changes in the feedback circuit parameters. This is especially important for long pulse burning plasma experiments. Motivated by this we have developed an adaptive control system described below. First, we have an online system identification scheme, which continually updates the RWM parameters via either a least square batch method or least square recursive method. The estimated RWM parameters thus determined are fed into a Kalman filter followed by an optimal state feedback design module. The resulting control action will then optimally stabilize the continually updated RWM mode. The fluctuation and control energy are found to be a few times the noise energy. The convergence time for the adaptive control for DIII-D like parameters is found to be 20-30 ms, which may be acceptable.