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Predictive Rotation Profile Control for the DIII-D Tokamak[1] W.P. WEHNER, E. SCHUSTER, Lehigh U, M.D. BOYER, PPPL, M.L. WALKER, D.A. HUMPHREYS, GA — Control-oriented modeling and model-based control of the rotation profile are employed to build a suitable control capability for aiding rotation-related physics studies at DIII-D. To obtain a control-oriented model, a simplified version of the momentum balance equation is combined with empirical representations of the momentum sources. The control approach is rooted in a Model Predictive Control (MPC) framework to regulate the rotation profile while satisfying constraints associated with the desired plasma stored energy and/or β_N limit. Simple modifications allow for alternative control objectives, such as maximizing the plasma rotation while maintaining a specified input torque. Because the MPC approach can explicitly incorporate various types of constraints, this approach is well suited to a variety of control objectives, and therefore serves as a valuable tool for experimental physics studies. Closed-loop TRANSP simulations are presented to demonstrate the effectiveness of the control approach.

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