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**One-Dimensional Burn Control in Fusion Reactors**[1] MARK D. BOYER, EUGENIO SCHUSTER, Lehigh University — Control of plasma density and temperature magnitudes, as well as their profiles, are among the most fundamental problems in fusion reactors. Economic and technological constraints may require fusion reactors to operate at operating points for which an active control system may be necessary to stabilize the thermonuclear reaction. In [1], a zero-dimensional (0-D) nonlinear model involving approximate conservation equations for the energy and the density of ion species was used to synthesize a nonlinear feedback controller for stabilizing the burn condition of a fusion reactor. This result is exploited in this work to propose a controller that is able to stabilize the one-dimensional (1-D) burn dynamics. A simulation study is carried out to assess the performance of the controller and its effect on the plasma density and temperature profiles. The long-term goal is to develop model-based controllers for simultaneous kinetic profile regulation and burn condition control.

[1] E. Schuster, M. Krstic and G. Tynan, "Burn control in fusion reactors via nonlinear stabilization techniques," Fusion Science and Technology, vol. 43, no. 1, pp. 18-37, January 2003.

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