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Burn control of an ITER-like fusion reactor using fuzzy logic[1] A. SAIR GARCIA-AMADOR, Facultad de Ciencias, UNAM, JULIO J. MARTINELL, ICN-UNAM — The fuel burn in a fusion reactor has to be kept at a nearly constant rate in order to have a steady power exhaust. Here, we develop a control system based on a fuzzy logic controller in order that adjusts external parameters to keep the plasma temperature and density at the design values of a reactor of the characteristics of ITER. The control parameters chosen are the D-T refueling rate, the auxiliary heating power and a neutral helium beam. We use a fuzzy controller of the Mamdani type that uses a number of membership functions appropriate to produce a response to parameter deviations that minimizes the response time. The inference rules are determined in a way to provide stabilization to all perturbations of the temperature, density and alpha particle fraction. The dynamical response of the reactor is simulated with a 0D model that uses confinement times provided by the ITER scaling. We show that the system is feedback stabilized for a large range of parameters around the nominal values. The recovery time after a departure from the steady values is of the order of one second. We compare the results with another control system based on neural networks that was developed previously.

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