ABSTRACT

A pattern recognition algorithm has been used to search for edge parameters which are good candidates for triggering the H–mode transition in the DIII–D tokamak. The study uses a large database of edge electron temperatures T_e, electron densities n_e, electron pressures P_e and their gradients, which have been obtained from fits of hyperbolic tangent functions to Thomson scattering profiles. The database has been formed from the L–mode and H–mode phases of several discharges which had nearly identical magnetic equilibria but a range of 2.7 in their H–mode power thresholds due to changes in density, the use of impurity puffing and cryo-pumping. An inductive learning algorithm has been used to search for parameters in the database which provide good classification of the L–mode and H–mode states, where parameters with "good" classifications are those whose values can be reliably associated with either the L–mode or H–mode state. The basic results of this study are: 1) Several combinations of parameters provide good classification of L–mode and H–mode; 2) Gradients of quantities provide better classification than the quantities themselves; 3) The best classifications were obtained with the gradient of electron pressure and temperature; and 4) The poorest classifications were those based on edge temperature and density. These results suggest that edge pressure or temperature gradients may be more fundamental ingredients of the H–mode trigger than edge temperature alone.