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P3.038 Assessment of linear disruption predictors using JT-60U data

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Recent research on disruption prediction shows that predictors based on analysing the amplitude evolution of magnetic signals outperforms the results obtained by using simple thresholds. To accomplish this, the disruptive and non-disruptive information of discharges can be compressed into two centroids in a particular parameter space (PS). During a running discharge, points in the PS are assumed to show a disruptive behaviour if they are closer to the disruptive centroid. By using a single signal, the plasma behaviour is evaluated with a simple linear equation in two variables (the ones that form the PS), which allows a straightforward real-time implementation. This new class of predictor can be used for next devices such as JT-60SA or ITER. To test the method, data obtained in the JT-60U high-beta operation have been used (in particular the magnetic perturbation time derivative signal). The PS is a 2-dimensional space formed by consecutive amplitudes of the above signal. 76 disruptive discharges and 78 non-disruptive ones have been used in two different approaches. Firstly, the centroids have been determined with 40% of the available shots (disruptive and non-disruptive). The preliminary results with the remaining discharges show 98.2% of success rate, 5.2% of false alarms and 17 ms of average warning time. A second approach has been the development of an adaptive predictor from scratch in which the discharges are taken in chronological order and the predictor learns in an adaptive way. The first predictor utilizes 1 disruptive discharge and 2 non-disruptive discharges. New computation of centroids is carried out after each missed alarm. With this adaptive predictor the success rate is 97.3% (only two re-trainings were necessary), the false alarm rate is 19.7% and, on average, the warning time is 59 ms. Details, interpretations and potential application to JT-60SA will be discussed.

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