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Real-Time Classification Algorithm for Recognition of Machine Operating Modes by Use of Self-Organizing Maps

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Abstract: In this paper a new algorithm for classification and real-time recognition of different a-priorily assumed operating modes for construction machines is proposed. This algorithm utilizes the effectiveness of the Self-Organizing Maps (SOM) for creating the so called Separation Models, that are able to distinguish each operating mode separately. After training, these models are used in a real-time procedure, which calculates at each sampling time the minimal Euclidean distances from the current data point to a certain node of each SOM. Then the separation model (represented by a respective SOM) that has the least minimal distance to this data point defines the class of the current operating mode. Simulation results and extensive analysis, based on experimental data from a hydraulic excavator have shown that the proposed algorithm outperforms the standard one-model approach. It is faster in the terms of computation time for training and leads to a higher percentage of true recognitions.

Key Words: Classification, Self-Organizing Maps, Real-Time Recognition, Operating Modes, Separation Models