A WSN-Based Prediction Model of Microclimate in a Greenhouse Using an Extreme Learning Approach

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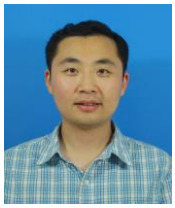
***Abstract*—Monitoring and controlling microclimate in a greenhouse becomes one of the research hotspots in the field of agrometeorology, where the application of Wireless Sensor Networks (WSN) recently attracts more attentions due to its features of self-adaption, resilience and cost-effectiveness. Present microclimate monitoring and control systems achieve their prediction by manipulating captured environmental factors and traditional neural network algorithms; however, these systems suffer the challenges of quick prediction (e.g. hourly and even minutely) when a WSN network is deployed. In this paper, a novel prediction method based on an Extreme Learning Machine (ELM) algorithm is proposed to predict the temperature and humidity in a practical greenhouse environment in Nanjing, China. Indoor temperature and humidity are measured as data samples via WSN nodes. According to the results, our approach (0.0222s) has shown significant improvement on the training speed than Back Propagation (BP) (0.7469s), Elman (11.3307s) and Support Vector Machine (SVM) (19.2232s) models, plus the accuracy rate of our model is higher than those models. In the future, research on faster learning speed of the ELM based neural network model will be conducted.**

***Keyword*—Wireless Sensor Networks, Extreme Learning Machine; Greenhouse Microclimate; Prediction Model**



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