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HEATING SYSTEM CONTROL WITH NEURAL NETWORK

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Abstract – Buildings have a significant impact on humans' life and ecology, as buildings account for 39 % of total greenhouse gas emissions and consume about 40 % of total global energy. Smart building control is one of the key points to achieve high energy efficiency. Each year, the complexity of building state control grows due to the increase in the number of controlled elements that are used to achieve better indoor climate. Therefore, in the manual analysis and implementation of the building control program, the possibility of errors is high due to the human factor. Artificial intelligence (AI) algorithms could be used as an alternative solution. They could evaluate building dynamics independently. One of the strategies for automatic building control adaptation to its dynamic is a model-based predictive control, where neural network is used for different control strategies evaluation. Performance of such control technique is highly dependent on control strategies evaluation accuracy. To achieve the top accuracy, several hyperparameters of neural network could be tuned. In addition, a data set for specific construction should be prepared. The preparation of the data set could cause a problem because random control of building for generation of dataset could be not acceptable for building users; it could also damage the construction. In this paper authors process optimization of experimental building heating system control algorithm to achieve smaller fluctuations of temperature indoors. For dataset generation several data were used from weather station, as well as heating system parameters and temperature indoors. The building was controlled by thermostat with the built in PID regulation. For evaluation of building dynamics was used temporal convolutional neural network. To achieve high accuracy results of control strategies evaluation, several hyperparameters of neural network were tested. The final model was tested on a physical building. The results indicate that in some cases the developed control model could prevent temperature fluctuations which could be caused by limits of heating system power.

Keywords – Artificial intelligence; building control; heating system

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