Online short-term heat load forecasting for single family houses

This paper presents a method for forecasting the load for heating in a single-family house. Both space and hot tap water heating are forecasted. The forecasting model is built using data from sixteen houses in Sønderborg, Denmark, combined with local climate measurements and weather forecasts. Every hour the hourly heat load for each house the following two days is forecasted. The forecast models are adaptive linear time-series models and the climate inputs used are: ambient temperature, global radiation, and wind speed. A computationally efficient recursive least squares scheme is used. The models are optimized to fit the level of optimal adaptivity and the thermal dynamical response of the building. Identification of a model, which is suitable for application to all the houses, is carried out. The results show that the forecasting errors mainly are related to: unpredictable high frequency variations in the heat load signal (predominant only for some houses), peaks presumably from showers, shifts in resident behavior, and uncertainty of the weather forecasts for longer horizons, especially for the solar radiation.

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