

Heat Consumption Prediction with Multiple Hybrid Models

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Abstract. Load forecasting plays an important role in modern utilities. However, further improvements can be expected by predicting the load at a consumer level. The latter approach has become available with the advent of low-cost monitoring and transmission systems. Still, due to the limited number of monitored clients, the way groups of consumers should be identified and whether their data is sufficient for high quality prediction models remains an open issue.

The work summarises the results of building prediction models for different consumer groups of a district heating system. The way self-organising maps, multilayer perceptrons and simple prediction strategies can be applied to identify groups of consumers and build their prediction models has been proposed. The hypothesis that a billing database enables group identification has been verified. Significant improvements in prediction accuracy have been observed.

1 Introduction

Numerous artificial intelligence techniques have been used for load prediction of power grids. The problem of load prediction is also a challenge for district heating system (DHS) operators. Not only do they have to supply a sufficient volume of heat via a piping system, but also they should minimise the cost of operation by eliminating unnecessary heat production. The heat distributed by DHS is used for space heating and hot tap water needs. Thus, the volume of heat depends on a number of factors: weather conditions, life style and time of day being the most important of them.

At the same time it is extremely important to build an appropriate control strategy for a DHS. A load prediction module is one of the crucial components of a control system. Should the prediction be too low, it takes a few hours to transfer extra heat from a heat source to a heat consumer. Thus, errors made when predicting the load of the systems result in significant problems in managing it [8]. An overview of problems that have to be addressed when developing the control system for DHS can be found in [1].

Traditionally, the total volume of heat needed by consumers is assumed to be known and is usually calculated based on weather conditions and time of day.