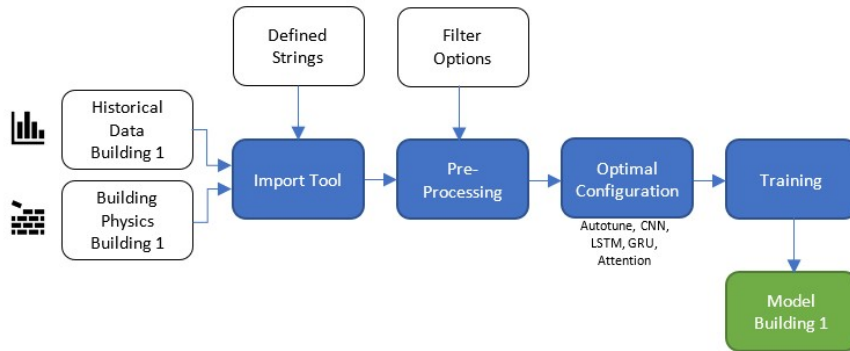


RWTH Technology

Control of a HVAC supply system of a building by means of a neural network



Background

The present technology can be used to control the energetic supply system of a building by means of a neural network. Historically optimized control parameters are introduced as input, so that the neural network completely takes over the optimization of the building control. Thus, the control parameters of the respective building zone can be predicted in real time within a few milliseconds. Due to the low computation time, the optimization can always work with current weather forecast data, which significantly increases the quality of the control, especially in case of weather deviations. The challenge of the invention is to find a suitable neural network that efficiently solves the problem, which can consider the long-term dependency of the control, and which is applicable to all different types of buildings.

Solution

This technology provides a real-time solution for determining optimal control parameters needed for thermal control of buildings. Determining a solution to the optimization problem using the described method takes only a few milliseconds, instead of several hours using the previous classical optimization approach. This real-time optimization allows to react to weather variations, which significantly increases the prediction quality of the control system. A suitable neural network is used which efficiently solves the problem, which can consider the long-term dependence of the control system, and which can be applied to a wide variety of building types. The patent application also addresses the problem of missing historical data for some building models. Furthermore, a super neural network approach was developed to solve the problem. Hybrid learning from temporal sequences (e.g., historical energy consumption) and nontemporal sequences (e.g., building physics) is combined.

Advantages

The requirement of long-term dependence poses a challenge to the structure of the network. For each individual training, the patent solves the problem in an automatic way to automate the quality of the NN used. Automatic preprocessing and various algorithms such as LSTM, GRU, Attention etc. are used for this purpose.

The invention can be directly integrated into an existing optimization routine since it not only provides control parameters but can also provide output values for an existing optimization

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Fields of Application

building control

Keywords

#building; #control; #automation;
#neural network; #HVAC supply;
#real time prediction; #HVAC; #HLK

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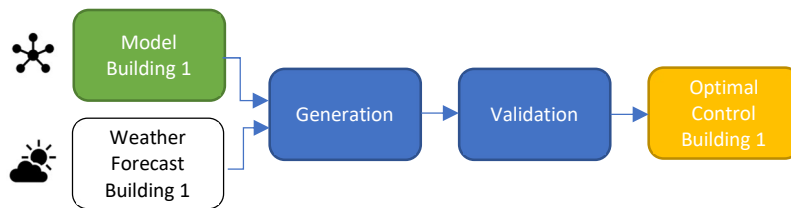
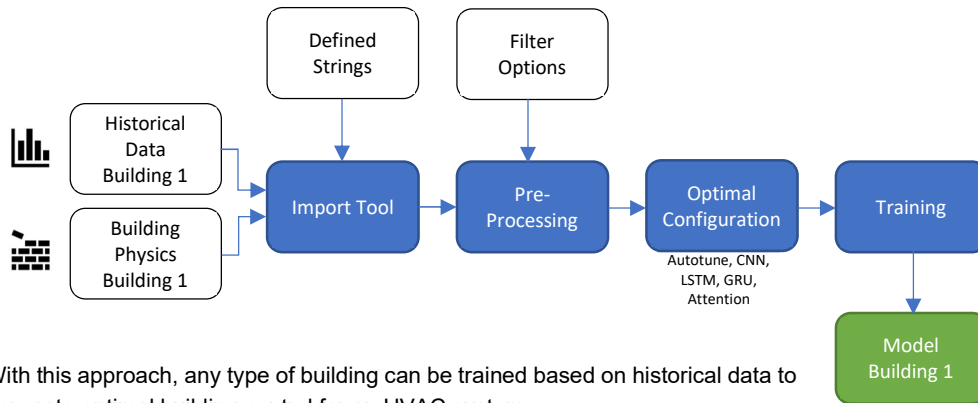
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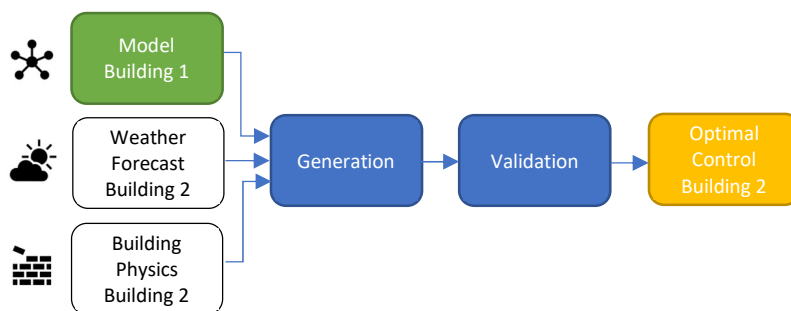
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algorithm. Monetarily, the patent can save the use of a data center. The invention thus solves the currently prevailing problem of scaling companies, which previously had to go hand in hand with ever larger data centers.

- The building model 1, which has historical data but can be trained with a generalized NN patent approach regardless of the type of HVAC system and in an autonomous manner.



- Building model 2, which has no historical data, but the super NN can predict the optimal control data by learning the static parameters and historical data of model 1 and the static parameters for building 2 to predict control data.



Service

- [Patent status:] Patent pending
- [Development status:] Prototype
- [What we deliver:] RWTH Aachen University is looking for partners for patent exploitation OR research partners for development cooperation