Europa fördert Sachsen. ESF Europäischer Sozialfonds — Freistaat Sachsen

A²LICE

Ambient Assisted Living in Intelligent Controlled Environments

26379_a_2_Franke

Design of a prototype neural network for smart homes and energy efficiency

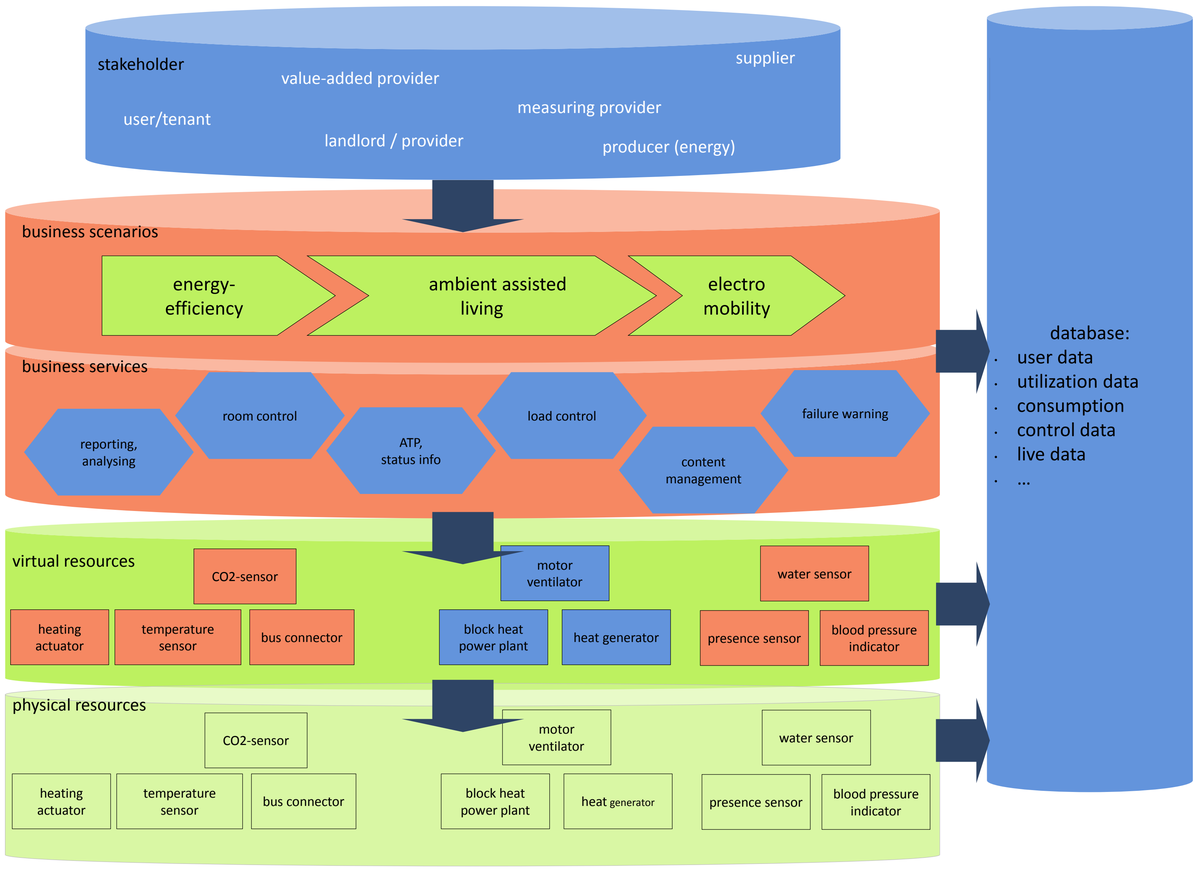
Abstract

Improving building standards and facility services in residential buildings is one major effort for future energy savings. Smart meters and intelligent systems that contribute to environmental awareness enable private home owners or tenants to see and actively control their cost of lifestyle. As a part of smart homes, a subsystem consisting of three components including a neural network is designed to provide personalized services. Unique factor combinations of building specifics, user profiles and external influences lead to the necessity of self-adaptive systems for personal comfort. The system supports room temperature control in order to heat rooms energy-efficiently at a set time. Smart home systems require a software architecture that allows services to be deployed on virtual and hardware devices. The design of automated processes is the first step of later programming and implementation into smart home systems that will automatically supervise and re-train its components and will also allow live feedback.

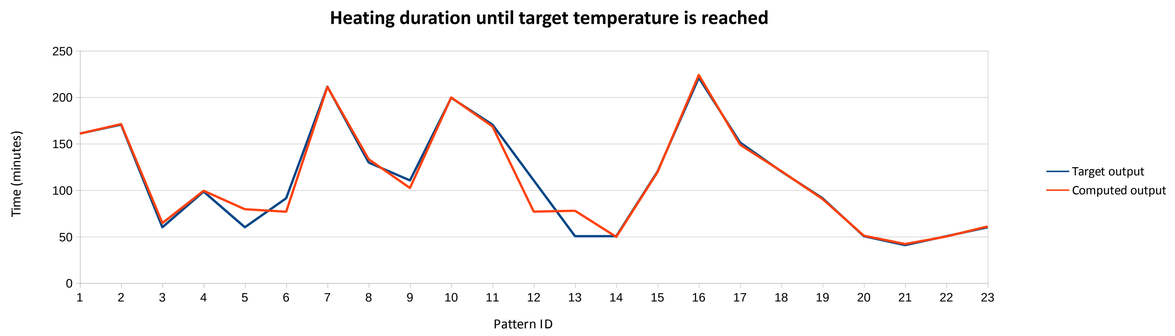
Scope and perspectives for smart homes

- increasing individual comfort and safety
- dynamic systems for context aware and highly personalized services
- provide stable and reliable solutions for multidimensional and interdependent scenarios
- minimize amount of manual maintenance, automated re-training
- self adaptive elements allowing and registering live feedback
- supporting role for energy saving concepts
- anticipation and leveling of energy demand peaks, balancing thermal loads of overall and sub-systems
- integration into superior facility management system, contribute to Smart Grid
- future intelligent subsystems for smart homes and ambient assisted living services

Virtual resources in business services

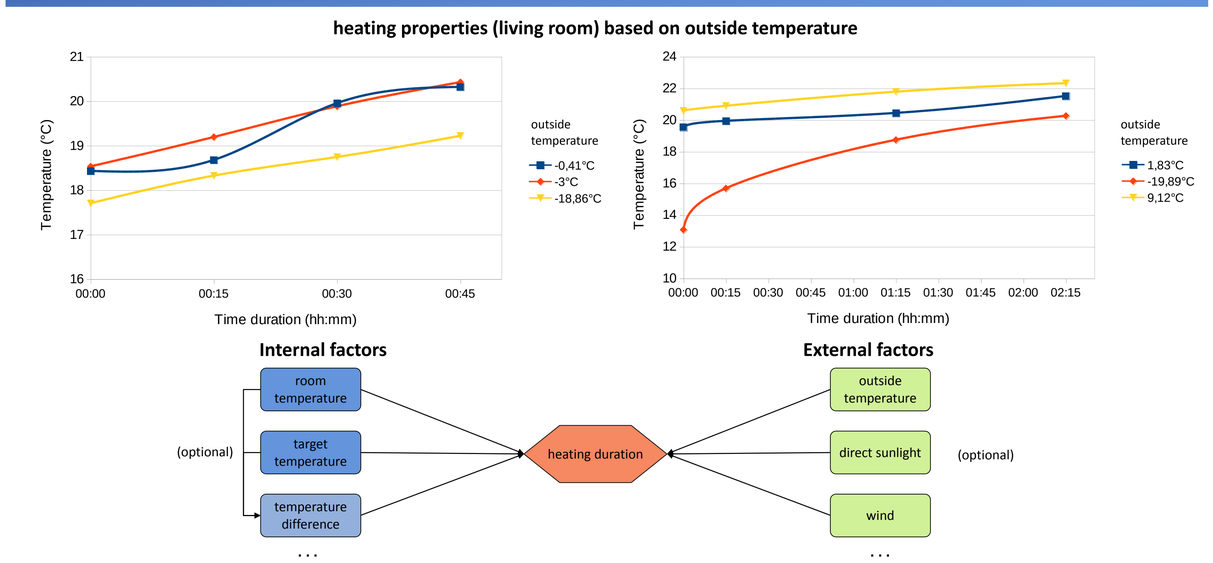


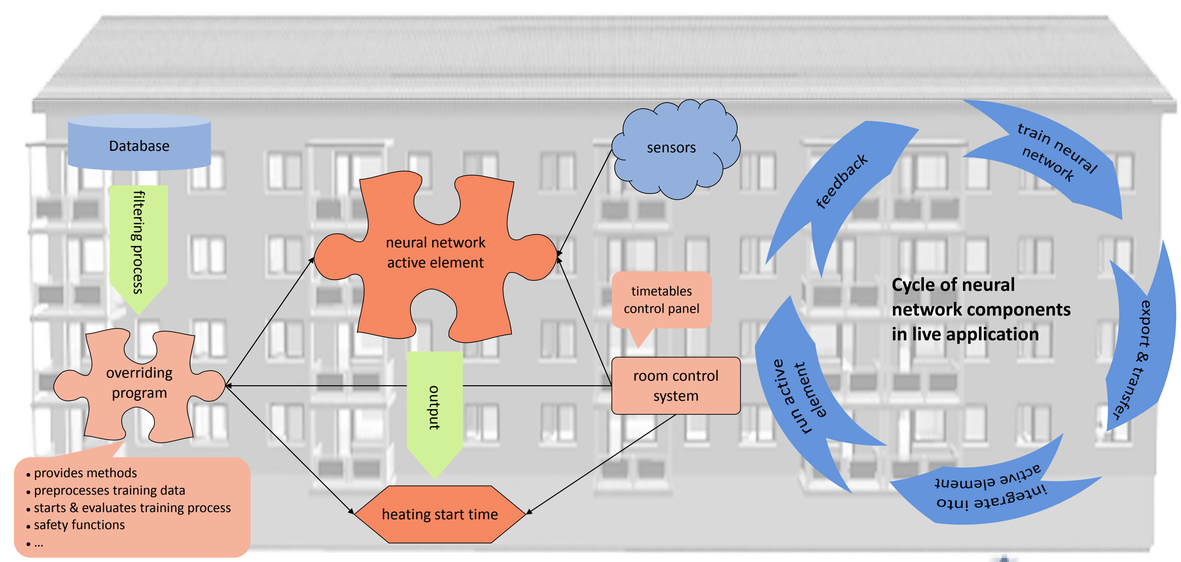
Prototype process



- create neural network that can be trained to map room specific heating profiles
- start heating process to reach target temperature at desired time
- provide interfaces between neural network components and virtual infrastructure
- organize software into independent, encapsulated and reusable modules and services
- design automated processes for necessary functions, e.g. data filtering, encoding, decoding, interpretation of quality
- safety functions that prevent use of unrealistic results
- algorithms to evaluate success of live system
- re-train neural network if deviations over time
- lean subsystems and components to save resources
- use room control information to determine heating start time on demand (via timetables)

Room based heating properties





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