

Distributed System for Indoor Temperature Control

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Abstract- This paper presents a system designed for the optimal use of thermal energy in residential buildings along with keeping human thermal comfort. It is proposed a distributed temperature control system achieving high precision for all the rooms at any external conditions and prescribed temperature dynamics. It was considered a heating process in a dwelling having a central heating system based on natural gas fired water heater. The system itself adapts to process parameters that are strongly dependent of external conditions, it optimizes settings and memorizes these parameters for the future operation cycles. For off-line verifying of the distributed control system functionality, it was developed a hardware-in-the-loop system that has used a simulated process of the rooms heating, as well presented in this paper. The system consists of a number of controllers with different functions like: a “M” master for control of the entire system (including the gas boiler), several “T” type slaves for acquisition of current temperature in the rooms or to detect human presence and to set temperature in the rooms, and several “C” type slaves for the actuators control. Communication between controllers is realized in a LIN network over a two-wire DC power line. Also, the system is open to innovative energy management algorithms.