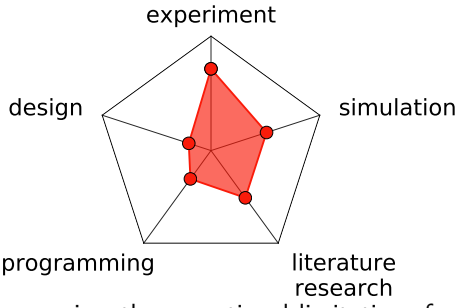
E.ON Energy Research Center | RWTH AACHEN UNIVERSITY

Master Thesis:

Sensivity analysis on the controllability of IoT automation systems regarding cycle time and precision

The building automation system (BAS) is the central connecting component for achieving the desired efficiency of devices within the building sector. This aside, current most-discussed topics related to a progressive system automation are the Internet of Things (IoT) and Cloud-Control (CC). However, frequently proposed advantages are partially opposed to little studied limitations in the operation of such systems. For instance, permitted latencies for a stable operation are currently unclear. The same applys for the resolution and precision of sensor data to still ensure controllability of the system. Therefore, in this thesis, a control technologies and mathematical analysis as well as an experimental analysis shall be performed investigating the limitations under which specific automation systems are still controllable in order to derive, which technologies from the IoT universe would be able to replace the classic building automation.

Scope of Work:



In this thesis, at first, you review the commonly used sub-systems in the building automation sector and characterize them according to their control technology specifications. Subsequently you develop a mathematical context for the controllability in dependence on the cycle time and hence including any latencies as well as the resolution or precision of measurement data respectively for a hydraulic admixing circuit. After this, you validate the found relations using an existing automation system and investigate, on the basis of, different scenarios, the operational limitations for a stable classical PID control. For instance, accuracy and latencies could be varied by adjusting data in the automation system. These limitations will result in clear requirements for the hardware so that, even in the worst case, the corresponding maximum permitted latencies and minimal precisions for each system would be guaranteed.

Our Profile:

E.ON Energy Research Center at Aachen University is concerned with concepts of sustainable energy supply that account for technical feasibility as well as social and economic aspects. Reduction of primary energy consumption in conjunction with increased indoor air quality is a major focus of research.

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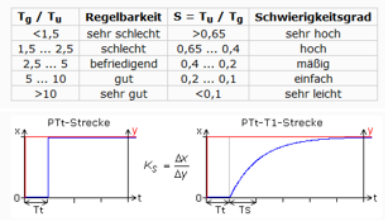

T_g / T_u	Regelbarkeit	S = T_u / T_g	Schwierigkeitsgrad
<1,5	sehr schlecht	>0,65	sehr hoch
1,5 ... 2,5	schlecht	0,65 ... 0,4	hoch
2,5 ... 5	befriedigend	0,4 ... 0,2	mäßig
5 ... 10	gut	0,2 ... 0,1	einfach
>10	sehr gut	<0,1	sehr leicht