6Demo - Air Quality Control and Energy Efficiency in Production Environments
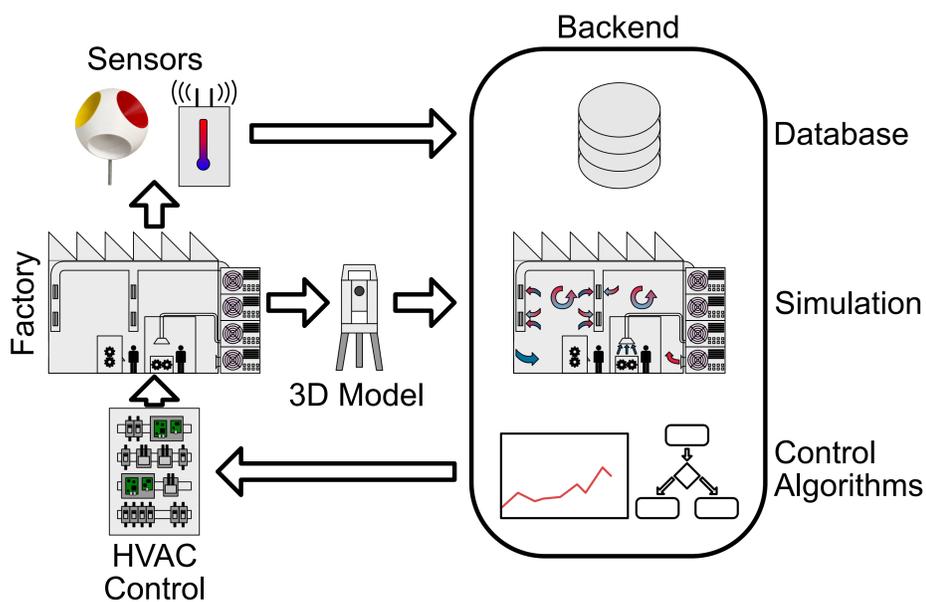
Jan Schlichter*,[a], Benjamin Effner[b], Max Juraschek[b], Lars Wolf[a], Christoph Herrmann[b]
[a]Institute of Operating Systems and Computer | [b]Institute of Machine Tools and Production Technology
*Corresponding author: schlichter@ibr.cs.tu-bs.de

Overview

• Monitoring of 3D airflow and other environmental parameters for a demand-driven heating, ventilation & air conditioning (HVAC) system control

• Low-cost sensors for the collection of spatial emission data

• Timesaving approaches for digital shadow creation and simulation

• Integration with existing systems

• Demand-driven control algorithms for improvement of energy efficiency and safety at work

• Deployments at four factories

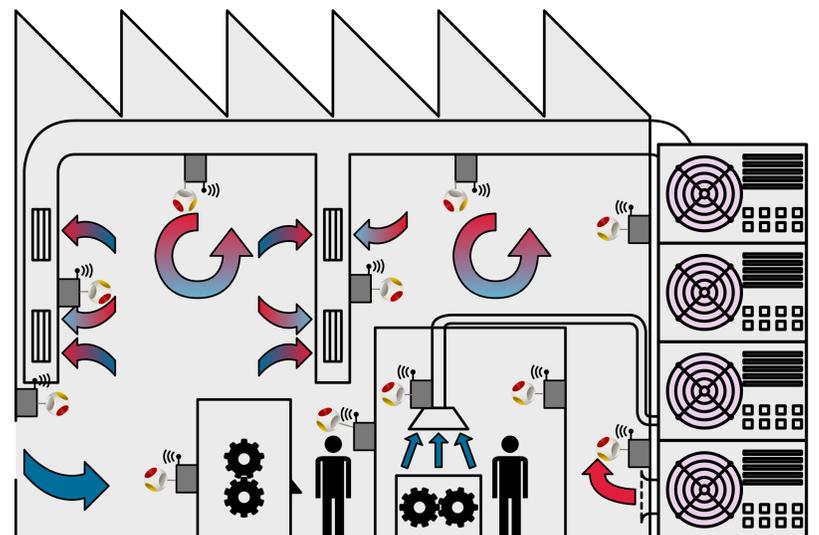• Comparison of business models for sensor-based HVAC control systems

Simulation & HVAC Control

• Low cost approaches for 3D model creation of factories

• Particle simulations to predict emission propagation

• Comparison of 0D and 3D approaches for flow simulations

• Visualization of emissions and conditions for workers

• Recommendations and aggregated data for HVAC experts

• Automated control to reach the desired tradeoff between energy efficiency and occurring emissions

Data Acquisition

• Highly customizable sensor node platform

• Collected values: CO_2, Temperature, Humidity, Air Pressure, Particle Concentration, 3D Air Flow

• Different form factors for stationary and mobile monitoring

• Energy Harvesting to prolong node lifetime

• Multiconnectivity to increase reliability.
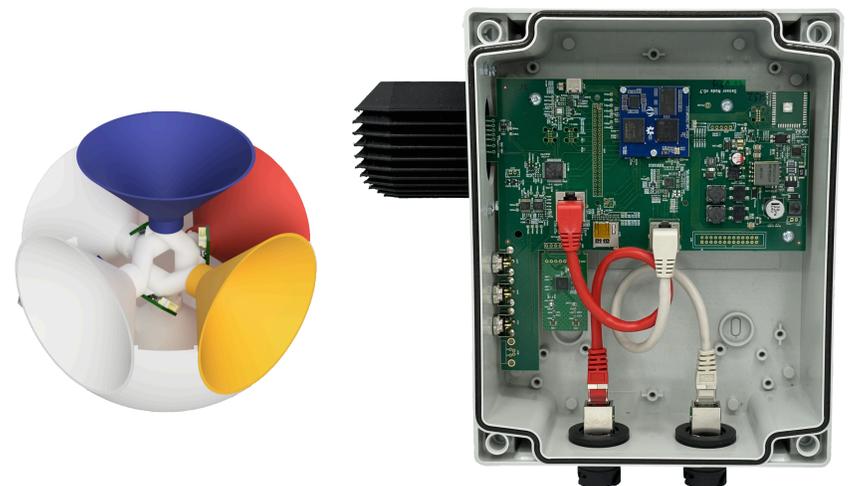
Integration & Business Models

• Deployments in four factories from automotive, chemical, aerospace and food industrie

• Integration with existing HVAC systems and infrastructure

• Sensors for temporary stand-alone measurements

• Development of a scalable business model as an example for new platform technologies