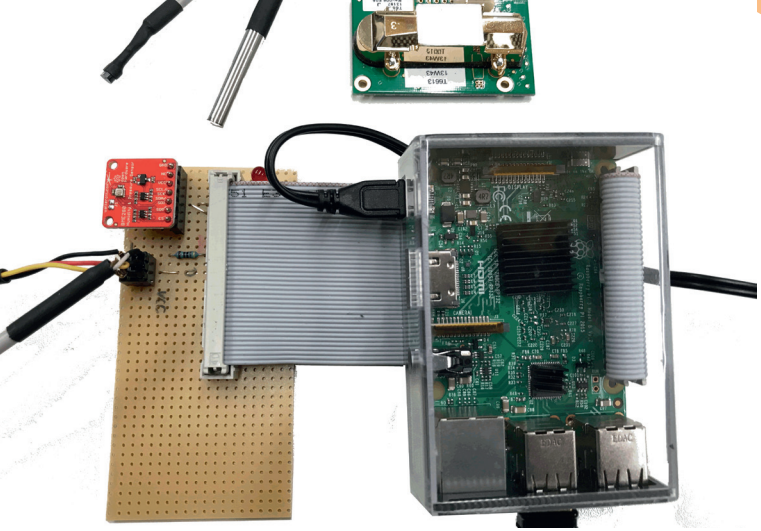
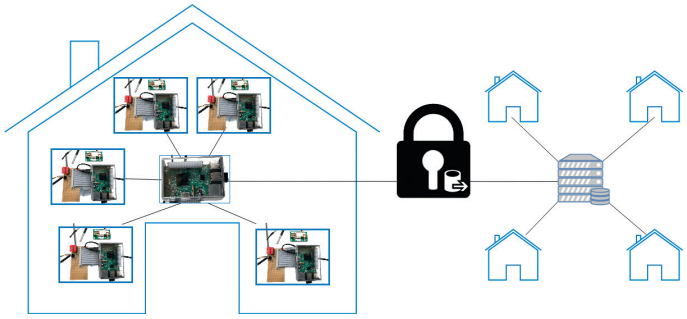


IT SECURITY

Protecting data in the internal network of the flat and securing the outgoing communication is a key target in this research project. Communication over Internet was secured by the implementation of a new Crypto-Algorithm, which is also resistant against attacks from quantum computers. The implemented algorithm's processing time and memory efficiency was optimized, so that one can scale the measurement system to a larger volume of values.



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The Research Centre IFE

Interdisciplinary research for distributed, sustainable and secure energy concepts

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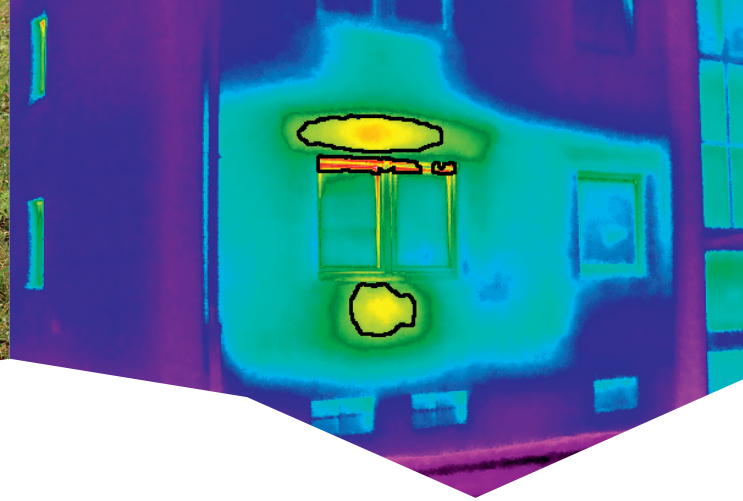
The Research Centre IFE „Interdisciplinary research for distributed, sustainable and secure energy concepts“

The Research Centre IFE is an innovative approach to the integral design of the energy-efficient, sustainable and secure renovation of old buildings. The research team from FSP IFE works inter-disciplinarily in three subprojects with a focus on the areas of measurement technology, intelligent data analysis and IT security. The goal is to develop a system that helps residents in renovated apartments to learn energy-efficient ventilating behavior and to maintain a long term healthy living climate.



LOW-COST AIR QUALITY MEASUREMENT SENSOR

For long-term observation of air quality, a flexible and easy expandable monitoring system has been developed, which is based on a so-called single-board computer (Raspberry Pi) connected to several sensors. The measured data is continuously recorded and saved directly on the monitoring system. The target is to obtain information as to whether the tenants ventilate enough or remedial actions are necessary to develop a healthy indoor climate. The sensors measure the CO2-level, air humidity, room temperature, average heating temperature and temperature of the outer wall. Through the CO2-level, the ventilation behavior can be analyzed. The air humidity and the temperature of the room and outer wall are used to detect thermal bridges, where mould could have appeared or potentially appear. To analyze the heating behavior, the radiator temperature is used.

INTELLIGENT DATA ANALYSIS

SmartMonitoring

SmartMonitoring collects information from all sensors. For example temperature and CO2-values. Furthermore, it is able to receive user inputs, such as a resident feel-good-factor. Each flat has its own display, allowing users to see their data and giving feedback about the indoor climate. Data is transferred, securely encrypted, to the university's servers. Here the data is anonymized and evaluated. The results are helpful for calculating necessary renovation customized to resident's needs. Currently, measurement systems are operating successfully in taking long term measurements in flats in Sennestadt in the city of Bielefeld. SmartMonitoring is being continuously developed and enhanced by the research team.

3D THERMOCOPTER

A 3D thermocopter was developed for aerial photographs of thermal and normal images. The images are processed to form 3D models and displayed in a 3D environment. With the help of image processing algorithms, heat bridges can be identified in the facades of the buildings.