Towards Space Mining: A Smart Space Management Solution to Minimize Indoor Spreading Risk of COVID-19

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can address the pandemic with a sociotechnical system that is readily applicable to a large variety of indoor environments [1, 11]. In analogy to the technology of process mining in the field of business process management [15], space mining refers to collecting, mining and visualizing space-relevant data in order to analyze the current situation in a room to prevent the airborne

informed our research with regards to the instantiation of the IT-artifact, its network components, and the associated infrastructure. Current restrictions and guidelines thus become visible and ‘actionable’ to individuals at any point in time. Indoor carbon di-oxide measurements and recommendations for the behavior of those who are physically present in the room based on spatial data

Table 1. Initial set of derived design principles and the related design requirements.

Design Principle	Description	Related Design Requirement
DP1	The system should perform multisensory real-time measurements to capture different physical states of spaces.	DR1, DR2
DP2	The system should provide a dashboard to visualize the current state of the space as well as recommendations to those physically present in the space.	DR3, DR4, DR5
DP3	The system should capture and visualize the dynamic of spaces based on the real-time data.	DR6, DR7

4 Results and First Evaluation

We have instantiated the derived design principles in a web-based space mining platform. Figure 1 illustrates the underlying architecture.

Fig. 1. Space management system architecture.

Regarding DP1 (related design requirements are DR1 and DR2, see Table 1), we selected and integrated two different sensors to measure the space occupancy and air quality. To measure space occupancy, we use the people counter sensor provided by IMBUILDINGS[1]. In order to measure space air quality, we integrated the ERS carbon dioxide sensor provided by elsys[2]. Both sensors are using LoRa to transmit the measured data to a central storage in the cloud. Due to its low energy consumption and its wide range of connectivity, LORA-based sensors are particularly easy and flexible to install, for example, for retrofitting, in smart home [12], or smart city [7] applications.

The sensors are transmitting the data to a central data base where they are stored. The central system stores information about specific rules that apply in each space (e.g.,

[1] https://www.imbuildings.com/lorawan-people-counter/
[2] https://www.elsys.se/shop/product/ers-co2-v1-5/?v=f003c44deab6

design cycles, in order to help reducing virus transmission in indoor spaces and to further elaborate space mining solutions. From a more abstract perspective, our research explores the evolving role of space and spatial data for the information systems field.