

Using Statistical Models to Detect Occupancy in Buildings through Monitoring VOC, CO₂ and other Environmental Factors

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ABSTRACT

Dynamic models of occupancy patterns have shown to be effective in optimizing building-systems operations. Previous research has relied on CO₂ sensors and vision-based techniques to determine occupancy patterns. Vision-based techniques provide highly accurate information; however, they are very intrusive. Therefore, motion or CO₂ sensors are more widely adopted worldwide. Volatile Organic Compounds (VOCs) are another pollutant originating from the occupants. However, a limited number of studies have evaluated the impact of occupants on VOC level. In this paper, continuous measurements of CO₂, VOC, light, temperature, and humidity were recorded in a 17,000 sqft open office space for around four months. Using different statistical models (e.g., SVM, K-Nearest Neighbors, and Random Forest) we evaluated which combination of environmental factors provide more accurate insights on occupant presence. Our preliminary results indicate that VOC is a good indicator of occupancy detection in some cases. It is also concluded that a proper feature selection and developing appropriate global occupancy detection models can reduce the cost and energy of data collection without a significant impact on the accuracy.