

Master Thesis: CO₂ Concentration as an Indicator for Optimal Room Ventilation for COVID-19 Prevention

Together with the Department of Occupational Health and Safety, we propose this thesis to investigate the meaning of CO₂ concentration as an indicator for optimal room ventilation for COVID-19 prevention. Recent research suggests that many, if not most COVID-19 infections, are caused by aerosols' spread. Besides keeping distance and wearing masks, the warm weather allowed us to gather outdoor and open windows, contributing to the lower incidence we saw in the last months. In winter, optimal ventilation strategies are needed to balance fresh air and warmth. Recently, in public, "CO₂ traffic lights" became popular promising guidance for schools or offices.



Image: Tumisu/Pixabay

Within the University, we have many indoor scenarios. In manually ventilated areas such as seminar rooms and offices, the users need to decide when and how long to open a window. There are also labs and workspace in the main library, which have an automatic air exchange. Here, the global parameters are well known, but local air distribution for a given usage scenario is often unclear.



Image: IMTEK – Sensors

In this work, you will measure CO₂ and aerosol concentration with analytical setups. Based on your findings, you will develop a portable data logger to measure CO₂ and, optionally, the aerosol concentration. Measurements in different rooms of the University round up the thesis work. Finally, the data logger will be distributed to provide awareness and find optimal usage strategies for the rooms.

Thesis Tasks

- Overviewing the actual scientific literature on COVID-19 vs. aerosols vs. CO₂ concentration
- Investigating CO₂ and aerosol concentration with analytical setups
- Developing a data logger with CO₂ sensors, optionally with aerosol sensors and sensor fusion
- Measuring in typical University scenarios (seminar rooms, offices, labs, library)

For this thesis, you will need excellent technical skills (microcontroller programming, electronics) and a rational way of thinking to draw the scientific sound conclusions on an emotionally charged topic. You also need good communication skills. Applications by email should contain a statement of why you are a perfect match for this thesis topic, your CV, and your transcript of records.

Contact

Dr. Jochen Kieninger

kieninger@imtek.uni-freiburg.de

University of Freiburg, IMTEK – Department of Microsystems Engineering,
Laboratory for Sensors (Prof. Urban), Georges-Köhler Allee 103, 79110 Freiburg