

M.Sc. Thesis

CFD Simulation for Pedestrian Wind Comfort Around the LUH Appelstraße Campus using OpenFOAM

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Motivation

Pedestrian wind comfort is an important consideration in the design and planning of urban spaces, especially around tall buildings and campuses. High wind speeds can create discomfort and even safety hazards for pedestrians, making it difficult to navigate through these areas and reducing the quality of urban life. The construction of a building inevitably changes the microclimate in its vicinity. Near high-rise buildings, high wind velocities are often introduced at a pedestrian level that can be experienced as uncomfortable or even dangerous. Even if the overall wind conditions are favourable for pedestrian activities, the introduction of the building restricts wind movement which leads to different wind conditions around the building.

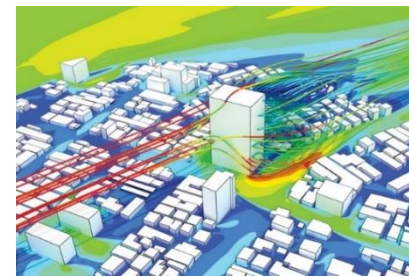


Zones of local high wind speeds around the Appelstraße 9a building [Google Maps]

The LUH Appelstraße Campus is an example of an urban environment where throughout the year we experience high wind speeds in different areas which are often required to be cordoned off for potential safety hazards. With the complex layout of buildings and the potential for strong winds to funnel through narrow spaces, the campus presents at distinct 'hotspots', a challenge for ensuring comfortable pedestrian experiences. Computational Fluid Dynamics (CFD) simulations provide a valuable tool for analyzing the wind flow patterns around the campus and predicting potential areas of discomfort. By identifying these areas, appropriate measures can be taken to improve pedestrian wind comfort, ultimately enhancing the overall experience of the LUH Appelstraße Campus.

Objective

The primary aim of this thesis is to conduct a comprehensive analysis of pedestrian wind comfort for the LUH campus at Appelstraße. To achieve this, the research will consider meteorological data, wind engineering standards, aerodynamics, and comfort criteria. The project will leverage open-source data and tools, including weather station information, street and building maps, and accessible CFD simulation software like OpenFOAM. The goal is to provide a detailed and systematic assessment of pedestrian wind comfort that utilizes all available best practice guidelines that are available in the literature. Additionally, this project serves as an opportunity to explore and learn the use of open source CFD tool-box OpenFOAM and the basics of computational wind engineering and turbulence modelling.



[SimScale]

Contact

If you are interested in the topic and would want to know more details please send an email to:
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References

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