Analysis of ventilation strategies for improved air quality in a classroom with CFD-driven Machine Learning

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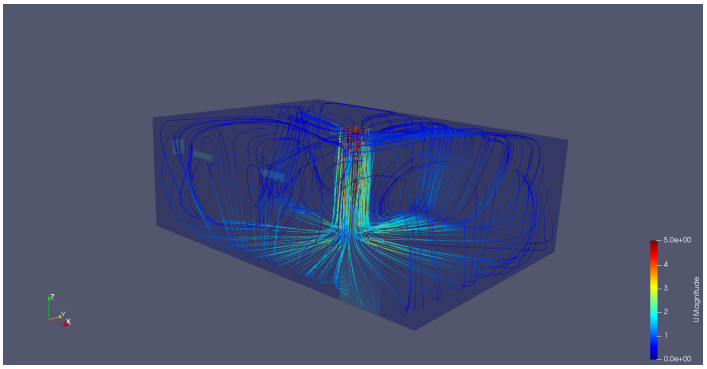
Abstract

Air residence time denotes the total time the air particles have spent inside a control volume. Analysis of a room's ventilation in terms of air residence times is vital to understanding critical zones and reducing the spread of infectious diseases that can spread via air. This case study performs flow and air residence time analysis for a classroom in the Department of Chemical Engineering, IIT Bombay, for various placements of exhaust fans. Based on the analysis, the optimal placement of exhaust fans and an additional intervention to improve the ventilation in the room are suggested. An ML model is also trained on the CFD data to predict air residence times without running the flow simulations, saving computational time and power.



References

[1] Sinha, K., Yadav, M. S., Verma, U., Murallidharan, J. S., & Kumar, V. (2021, November 1). *Effect of recirculation zones on the ventilation of a public washroom*, Physics of Fluids https://doi.org/10.1063/5.0064337

[2] Fluid-Mechanics-101.(2021). *Calculators and tools* https://www.fluidmechanics101.com/pages/tools.html (accessed: 10.04.2024).