



Simon Boller

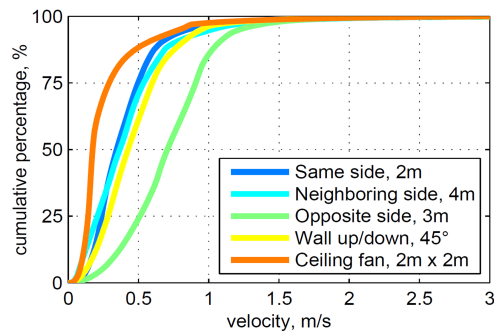
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Subject Area	Environmental Engineering

# Simulation of Comfort Cooling Using Wall- and Ceiling-Mounted Fans

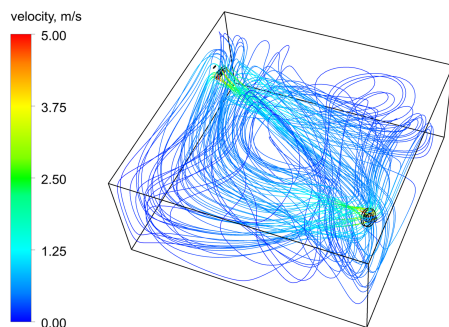
## Simplified Approach to Simulate Fan for Indoor Climate Control



Experimental setup at the Nanyang Technological University with a stand fan during the validation measurement process.



Statistic analysis helps to compare the results of different types and locations of fans.



The streamlines show the air flow in the test room with wall mounted fans. This simulation includes the simplified fan model, with a momentum source.

**Introduction:** A comfortable indoor environment is desired all over the world and many people therefore use HVAC (Heating, Ventilation and Air Conditioning). In tropical regions rooms are often cooled down using air conditioning that has a high energy consumption. In this thesis, simulation for a comfort cooling using wall- and ceiling mounted fans with less energy consumption is done. The project was performed and written during a research exchange at Nanyang Technological University (NTU), located in Singapore.

**Approach/Technologies:** The simulation model is validated by experiments measuring the air velocity. The simulation is based on Computational Fluid Dynamics (CFD). To reduce the complexity of the simulation the geometry is replaced with a simplified shape and a momentum source. A simple software has been created to handle the large amount of data. Afterwards all results have been imported to Matlab where different analysis have been carried out, for example a contour plot or cumulative distribution of the air velocity.

**Result:** The research provides results for different types of fans as well as different locations. The highest median air velocity are given by fans located on opposite sites of a room, with a vertex resulting around the middle of the test room. Also wall mounted fans with an inclined angle from approximately twenty five degree achieve a well ventilated room. A further recommendation for everyone is to use a combination of air conditioning and fans to reduce energy consumption.