

WIND ENGINEERING AND ENVIRONMENT (WEE)

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- Dr. Nurshafinaz Mohd Maruai, Senior Lecturer

NUMBER OF STUDENTS

- Ph.D : 17 students
- Master: 11 students

RESEARCH KEYWORDS

Heat Urban Island, Thermal Comfort, Wind Engineering, Control Application, IoT, Artificial Intelligent, Air Conditioning (HVAC)

OUTLINE OF IKOHZA

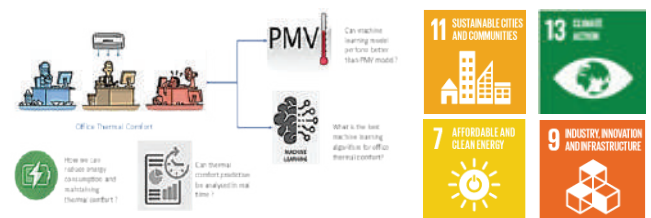
The iKohza Wind Engineering for (Urban, Artificial, Man-made) Environment Laboratory is established to conduct pertinence research that related to the wind engineering applications. Research activities currently undergoing in this lab are concerned particularly on improving the efficiency of urban ventilation, enhancing pedestrian thermal comfort within an urban area, harnessing wind energy for green urban development and other practical interests that are related to bluff body flow. Our

research activities are multidisciplinary, where we stretch out our research activities to the other fields such as human behavior in term of energy consumption, social system, control system and its application, internet of thing, artificial intelligent and green technology. Our strong collaboration with several institutions in Japan and Malaysia provides not only enhance the research activities but also provides a platform for information and technology sharing.

CURRENT RESEARCH

1. THERMAL COMFORT ASSESSMENT BASED ON INTERNET OF THINGS

The thermal comfort IoT monitoring system comprises environment sensors which are a temperature sensor, humidity sensor, wind speed sensor, and mobile application. This study investigates the thermal comfort associated with different air conditioning (AC) thermostat set point temperatures in centralized heating, ventilation, and air conditioning (HVAC) office using IoT and machine learning monitoring system.



2. SMART AIR QUALITY AND INFECTION CONTROL

Indoor air quality typically encompasses monitoring and prediction solution based on the latest IoT sensors and machine learning capabilities, providing a platform to measure numerous indoor contaminants. For this purpose, an IoT node consisting of several sensors for 8 pollutants including NH₃, CO, NO₂, CH₄, CO₂, PM 2.5 along with the ambient temperature & air humidity is developed.



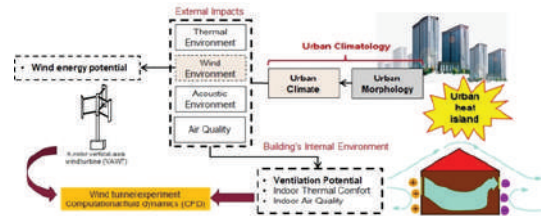
3. AERODYNAMIC NOISE REDUCTION ON WIND TURBINES USING CFD

Wind turbine noise is far more annoying compared to other type of noise at the same A-weighted noise level. Our research focus on the noise generation from the turbulent-airfoil interactions as it was found the main annoying noise source radiated from the wind turbine.



4. URBAN MICROCLIMATE ANALYSIS AND WIND ENERGY HARNESSING POTENTIAL

Adopting computational fluid dynamics (CFD) simulations and wind tunnel experiments, extensive research on various UCL models is performed to create a database that will be used for morphometric analysis, empirical modelling of urban microclimate, and wind energy assessment in low-wind-speed urban areas.

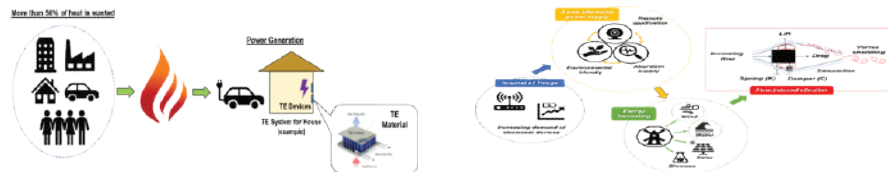


5. THERMOELECTRIC DEVELOPMENT TOWARDS HARVESTING HEAT ENERGY

Complementing the effort of iKohza to stretch out multidisciplinary research work, this study focusses on the theme of renewable energy.

6. NUMERICAL INVESTIGATION ON PASSIVE VIBRATION CONTROL DIMENSION TO ENHANCE THE PROSPECT OF LOW WIND ENERGY HARVESTING

Study of envelopes the prospect of flow-induced vibration from ambient resources such as air and water to produce a reliable and secured energy for microelectronic devices. The mechanism of flow-induced vibration is further explored by means of passive flow control to find a robust configuration of flow energy harvester.



MERIT OF THE TECHNOLOGY

1) WIND TUNNEL LABORATORY

The wind tunnel is powered by a blower of 45 kW that can produce a maximum speed in the test section of 30m/s (108 km/h). It is an open atmospheric wind tunnel with a cross sectional area of 1.35m (w)*1.0m (h) and it is designed with a long test section (9.0m), one of its kind in Malaysia. The test sections are divided into three sub-sections to cater aerodynamics and wind engineering studies.

2) WEATHER STATION DATA

1. Tower Station is located at rooftop Malaysia-Japan Institute of Technology building: Campbell-Scientific® Weather Station CR1000 datalogger c/w Enclosure, NL1 15 Ethernet & Compact Flash Module, 3D Ultrasonic Anemometer, Temp/RH sensor, Silicon Pyranometer & Rain Gauge.

POSSIBLE INDUSTRY APPLICATION

1. WIND ENGINEERING

- Building Aerodynamics- Safety, comfort and urban design
- Wind engineering- Flow induced vibration-energy
- Cross wind- vehicle/train safety

2. AERONAUTICS

- Bio-inspired airfoil: Aerodynamics and Aeroacoustics
- Passenger car aerodynamic performances

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