

PRESIDENT'S TECHNOLOGY AWARD 2019

Team comprising:

Dr Poh Hee Joo

Senior Scientist, Institute of High Performance Computing,
A*STAR

Dr Koh Wee Shing

Senior Scientist, Institute of High Performance Computing,
A*STAR

Mr Fachmin Folianto

Senior Research Engineer, Institute for Infocomm Research,
A*STAR

Mr Tan Sze Tiong

Director, Centre of Excellence for Environmental Sustainability Research,
Housing & Development Board

“For their development of the Integrated Environmental Modeller, an advanced modelling tool that is capable of integrating combined wind-solar-noise environmental factors, their interrelationship, and their total impact on an urban setting”

Dr Poh and team are recognised for their groundbreaking development of the Integrated Environmental Modeller (IEM). The IEM is an advanced modelling tool that allows users to project the interrelationships and combined impact of solar, wind, temperature, noise and other environmental factors on an urban setting. Other modellers currently available in the market typically only assess each environmental factor in isolation.

The IEM was developed using both in-house and open-sourced multi-physics environmental modelling code that captures the correlation of environmental factors. It is an integrated and scalable tool to couple the physics of all key environmental factors and their complex interactions into a single simulation platform, using the latest high performance computing technology.

With the IEM, users are able to visualise environmental features such as solar irradiance, air flow, air temperature, and noise levels on a virtual “Digital Twin” platform which allows for efficient refinement of urban design plans. This allows development plans to be tested

computationally before actual implementation and hence reduces the risks inherent in physical testing of the plans. It also provides quantitative and scientific assessments that enable planners to optimise for one environmental factor over another, supporting better decision-making.

The IEM, which is computationally scalable, has also pushed the technological boundaries in high performance supercomputing. It has created the first-ever 3D air-flow simulation at a 10-metre horizontal resolution that depicts all the buildings in Singapore. The simulation was completed over five days with 6,000 processors at the National Supercomputing Centre (NSCC) Singapore.

The IEM was one of the smart planning tools that was applied in the planning of Tengah Town. Using the IEM, HDB's planners, architects and engineers were able to analyse key wind channels, and the solar heat gain by different urban features such as concrete, vegetation, and water bodies within Tengah. This helped them to design open spaces, as well as optimise the building layouts and orientation to enhance the intensity of wind flow and promote natural ventilation within the town. HDB will continue to leverage such planning tools to complement HDB's town planning efforts and provide residents with a new generation of public housing, located in green, sustainable and smart towns.

For their development of the Integrated Environmental Modeller, an advanced modelling tool that is capable of integrating combined wind-solar-noise environmental factors, their interrelationships, and their total impact on an urban setting, Dr Poh and team are awarded the 2019 President's Technology Award.