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Evaluation of Peak Pressure Coefficients Using Neural Network

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ABSTRACT

The aerodynamic database disclosed at the Wind Engineering Research Center of Tokyo Polytechnic University could be used as an alternative to wind tunnel experiments in the initial stage of wind-resistant design by training a neural network. It is said that wind tunnel tests take a couple of weeks, LES calculations take a couple of days, RANS calculations take a couple of hours, and AI calculations take a couple of minutes (Kim, 2023).

Peak pressure coefficients for low-rise buildings were evaluated using neural network. The input layer is where the data is entered. The hidden layer is where the data is training by neurons. The output layer is where the decision output based on data training. Six input values were used, there are width, depth, average roof height, roof slope, the power-law exponent of approaching flow α, and turbulence intensity at the average height of the model. Output values are positive and negative peak pressure coefficients, one for each zone.

The good training case is the positive peak pressure coefficients on the roof surface. The accuracy of a training result is 99.1%. The bad training case was the negative peak pressure coefficients for wall surface Wa. The accuracy is 78.6%.

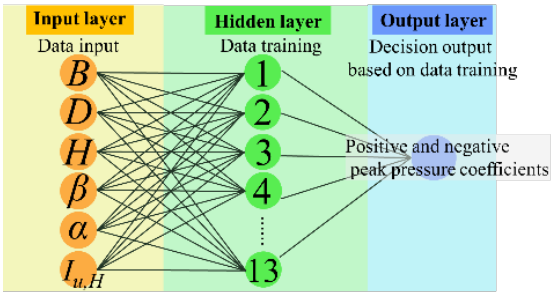

Fig. 1 Structure of neural network

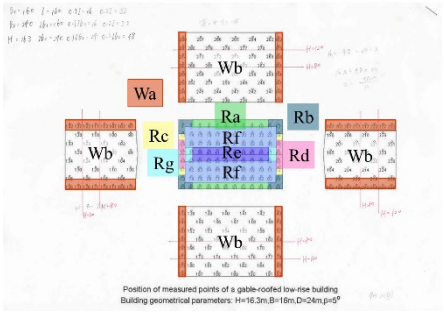

Fig. 2 Zoning of surfaces (gable roof)

REFERENCES

Yong Chul Kim, Current Issues in Wind Engineering, International Journal of High-Rise Buildings, vol.12, No 4, pp. 287-297, 2023.

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