

Simulation and Experiment Research on 2D Open Membrane Structure

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ABSTRACT

Membrane structures are characterized by their lightweight and flexibility, which makes them rather sensitive to wind. In this paper, the flow-induced deformation of a membrane in a smooth flow was studied. The investigation focused on the deformation of a 2D open-type membrane roofs. An series of wind tunnel test and simulation on flexible models was performed to investigate the aeroelastic behavior of 2D open-type membrane structures.

In wind tunnel tests, laser displacement meters were used to measure the time-history displacement of roofs. The structural response and the wind velocities above the membrane were measured and analyzed.



Fig. 1 wind tunnel test model

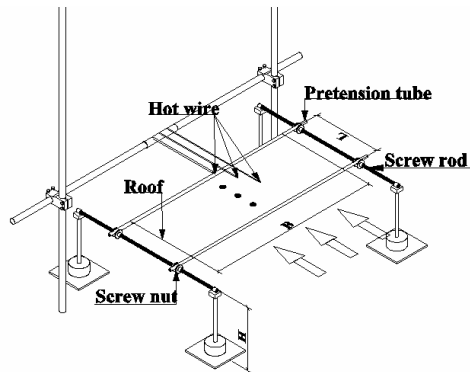


Fig.2 Aeroelastic model and hotwire setup diagrams

CFD simulations of the flexible models were carried out to discuss validate the FSI

simulation based on the wind tunnel tests above. In this paper, the FSI simulation are realized in the software environment shown in Fig.3. The software OpenFoam is applied in CFD simulation, EMPIRE is applied in FSI coupling interface and Carat++ is applied in CSD simulation.

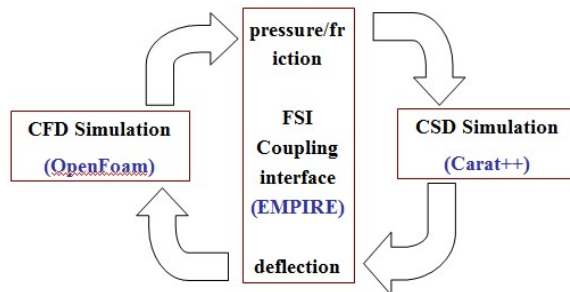


Fig.3 Numerical simulation environment

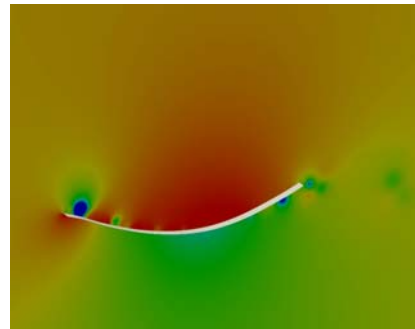


Fig.4 Wind pressure contour at some moment

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