Simulation of butterfly flapping with the method of dipole domains

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ABSTRACT

The method of dipole domains was proposed in [1] and was tested in [2] for simulation of ideal and viscous incompressible flows. The vortex region is simulated as a set of dipole particles. Each particle induces the velocity field which is equal to field of a point dipole at large distance from the particle. But near the particle the induced velocity field is other taking into account the particle volume and distribution of the dipole momentum inside it. Here the method is applied for simulation of the ideal incompressible flows. The particles are generated at the body surfaces and detach from the trailing edges.

The flows around the flapping plane plate and the model of a butterfly wings are investigated.

The combined movement of the plate consisting of translational and angular oscillations in a uniform flow is considered. The dependence of the propulsive force on the amplitudes and phase shift of the oscillations is investigated.

The model of the butterfly wings consists of two plates with the common edge (see Fig.1). The plates perform angular oscillations about this edge and about Z-axis. The thrust and the lift forces are investigated.

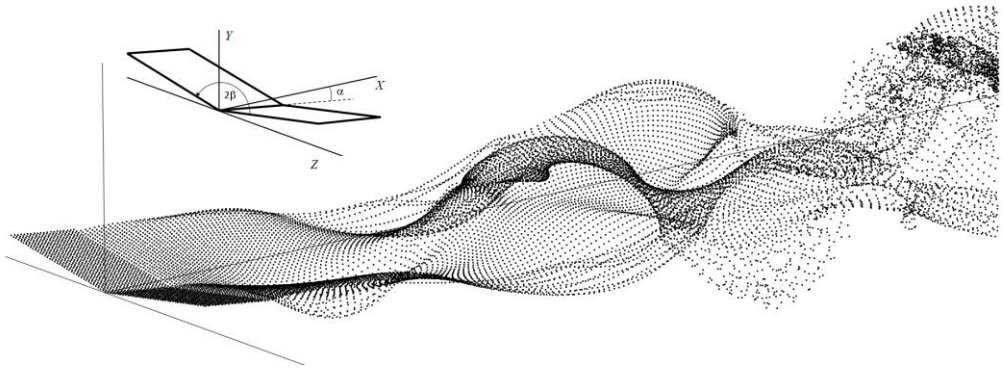

Figure.1 The wake behind the flapping wings of the butterfly model

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REFERENCES

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