Numerical Simulation of Bird Strike with Material Point Method

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Summary

The analyses of bird strike are of great concern to aircraft designers, because bird strikes can cause very serious problems to flight safety. Meshfree particle methods are suitable for simulating bird strike problems owing to their advantages in dealing with large deformation, fracture and fluid-structure interaction. The material point method (MPM) is employed to analyze the impacting of bird on windshield in this talk in which both the bird and the windshield are discretized by material points. The material model of the bird is accompanied by an appropriate equation of state (EOS) to model the flow behavior during impact, while the windshield is modeled by a solid strength model with damage and failure. The contact between the bird and the windshield is treated with an efficient local contact algorithm. Several numerical tests are conducted to validate the MPM simulation. Results for different impact angles and impact positions are obtained. The influences of impact velocities, boundary conditions and bird shape are discussed as well.