Simulation of pneumatic tire running on sand bed by using the FEM/DEM

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Abstract: The combined finite and discrete element method (FEM/DEM) is applied to investigate the running performance of a pneumatic tire traveling on sand bed. The granular features of the sand particles are simulated by spherical discrete element; the complex structures of the pneumatic tire are accurately predicted by using the finite element method (FEM). This compensates the shortage of both the FEM and the DEM. Furthermore, efficient contact detection methods including the bucket sorting algorithm for the contact detection between discrete elements and finite elements, and the C-grid algorithm for the contact detection among discrete elements are employed to save the computation time. Running performance of the tire traveling on sand bed is investigated by using the developed program. The simulation results such as net drawbar pull, tire sinkage can be obtained and the feasibility of the method is proved by comparing the simulation results with corresponding experimental results.

Keywords: FEM/DEM, sand bed, pneumatic tire, running performance