

A reaction-force-validated soccer ball finite element model

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Abstract

The soccer ball is one of the important pieces of equipment in the game of soccer. It undergoes various forms of impact during the game. In order to numerically investigate the occasions of ball impact such as soccer heading, a validated finite element model of a soccer ball is required. Therefore, a model was developed incorporating material properties obtained from literature. To ensure the accuracy of the model, it was validated against an established soccer ball model and experimental data of the coefficient of restitution, contact time, longitudinal deformation and reaction force. In addition, a parametric study of the mesh density was also performed to determine the optimal number of elements. The developed soccer ball model was found to be in a good agreement with the literature and experimental data. This suggests that, the soccer ball model is capable of replicating the impacts of interest. This article details the development of the model and the validation processes.

Keywords

Finite element model, soccer ball, reaction force, experimental validation, sports ball