Static Structural Analysis of an E-Buggy Chassis Using Finite Element Method

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Abstract:

This article aims to evaluate the stress and displacement distribution on an E-buggy chassis to ensure designs meet safety. However, the body is excluded from the weight-support analysis as the chassis structure carries the E-buggy's entire load. Finite Element Method (FEM) is an effective numerical method for simulating behavior of solid mechanics, which is used for this article. Furthermore, this study also investigates simulation results using two FEM meshing techniques: solid-element and beam-element meshing. The results indicate that the beam-element approach is comparable to the solid-element mesh, with an average error of less than 5 percent. Notably, beam-element mesh significantly reduces the element count, resulting in faster computation times. Consequently, the beam-element approach was selected for the FEM analysis for the E-buggy chassis. The results yield a maximum stress of 39.48 MPa, a maximum displacement of 1.058 mm, and a minimum factor of safety is 5.95 under static load.

Keywords:

Static Structural Analysis, E-buggy, Chassis, Finite Element Method.