

Structural Optimization for Extreme Loads to Peak System Responses

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Over the past decades, with the development of modern manufacturing and information technology, demands of smart and economical structural designs have been increasing considerably. Central to this engineering issue is that a good structural design needs to embrace both necessary capabilities to afford critical load distributions and the best arrangement of materials serving the performance criteria using limited resources. Here, a new analysis technique is proposed to achieve optimal structural designs considering peak system responses as design constraints respective to extreme load distributions. In this paper, we address both structural mechanics of extreme load distribution identification corresponding to certain peak system response and numerical nonlinear schemes of structural optimization, and then fuse these two techniques to achieve optimal designs considering peak structural behaviors as design constraints corresponding to extreme loads. We anticipate that the technique will open a door for designing efficient structural systems which satisfy safety requirements under various sophisticated loadings from the environment.

Keywords: Optimal structural design, extreme load distribution, peak system response, structural mechanics