Article Abstract

Title:	**A combined approach of complex eigenvalue analysis and design of experiments (DOE) to study disc brake squeal**
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Abstract:	This paper proposes an approach to investigate the influencing factors of the brake pad on the disc brake squeal by integrating finite element simulations with statistical regression techniques. Complex eigenvalue analysis (CEA) has been widely used to predict unstable frequencies in brake systems models. The finite element model is correlated with experimental modal test. The 'input-output' relationship between the brake squeal and the brake pad geometry is constructed for possible prediction of the squeal using various geometrical configurations of the disc brake. Influences of the various factors namely; Young's modulus of back plate, back plate thickness, chamfer, distance between two slots, slot width and angle of slot are investigated using design of experiments (DOE) technique. A mathematical prediction model has been developed based on the most influencing factors and the validation simulation experiments proved its adequacy. The predicted results show that brake squeal propensity can be reduced by increasing Young's modulus of the back plate and modifying the shape of friction material by adding chamfer on both sides of friction material and by introducing slot configurations. The combined approach of modeling brake squeal using CEA and DOE is found to be statistically adequate through verification trials. This combined approach will be useful in the design stage of the disc brake.
Keywords:	Disc brake squeal, finite element analysis, experimental modal analysis, design of experiments