STRUCTURAL MECHANICS

A SMALL SLIDING BEAM-TO-BEAM CONTACT ELEMENT FOR THE SIMULATION OF OVERHEAD CONDUCTORS UNDER TENSION AND BENDING

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This study addresses RTE's current research on numerically assessing the lifetime of overhead conductors submitted to wind-induced fretting fatigue, aiming to enhance cost-effective asset management strategies. Our focus is on developing a mechanical model for a portion of an overhead cable as part of a multi-scale numerical lifetime prediction tool. In this model, each cable wire is represented by geometrically exact beam elements in large rotations, incorporating frictional contact interactions through small-sliding beam-to-beam contact elements, leveraging the fretting phenomenon. The proposed element is based on the work of [Bussolati 2020]. As the relative displacement of two wires submitted to fretting remains small, the small-sliding hypothesis consists in considering the two contacting beams locally straight in the vicinity of the contact zone. This allows for an explicit determination of the material contact points at every step, hence avoiding the cumbersome contact research phase prone to numerous problems (contact normal discontinuity, CPU-time expensive, etc...). The work aims to rewrite the penalty-based contact element using Lagrange multipliers and generalize the point-wise contact to line-wise, addressing inter- and intra-layer frictional interactions. The presentation will cover theoretical foundations, implementation details, and numerical results, providing insights into the model's performance and accuracy.