Investigation of the role of frictional contact interactions in the mechanical response of spiral strands using 1D finite strain beam model

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In this study, the role of frictional contact interactions in the mechanical behavior of spiral strands is investigated. To this end, the wires have been modeled using 1D finite strain beam model with point-wise frictional contact interactions. It is shown that the frictional contact interaction does not play a significant role in the tensile response of the strand, while this is not the case for bending. It is well known that the interwire frictional contact causes a nonlinear bending behavior for spiral strands. In order to explain the experimental results, in which the spiral strands exhibit very high bending stiffness without any external tensile force, the presence of residual stresses due to manufacturing process is suggested. Due to the unknown state of residual stresses, the effect of these stresses has been considered by a simple method.