Tendon Geometry Optimization Using Path Integrals

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Abstract

The implementation of prestressed and post-tensioned elements in concrete structures offers a multitude of benefits with regards to the overall structural behavior, with the efficiency of the applied tendons depending entirely on their geometry. However, the derivation of an optimal tendon geometry for a given structure is nontrivial and generally requires the use of complex and often computationally demanding methodologies, e.g. the use of topology optimization strategies [1] [2].

This paper aims to investigate the possibility for optimizing tendon geometries using a path integral based objective function developed at the TU Berlin. For this purpose, the mathematical background is first presented to illustrate the proposed concept. A series of examples are then investigated in order to demonstrate the potential of the methodology. Beginning with a tendon geometry optimization of a simply supported beam and progressing to more complex systems, a generalized approach for doubly curved spatial structures will be presented.

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References

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