

Università degli Studi di Pavia

Dipartimento di Meccanica Strutturale

in collaboration with
Centro di Simulazione Numerica Avanzata – CeSNA
Istituto Universitario di Studi Superiori

The circle-arc procedure for non linear bending

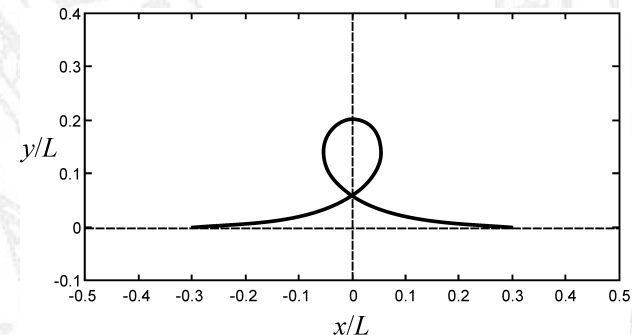
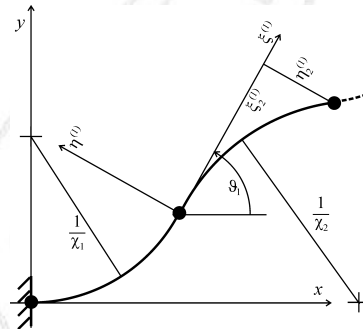
The elastica problem represents one of the classical issues of mechanics. It deals with the determination of the deflections of an inextensible bending beam, rigid in shear and subject to small strains but finite deformations. Analytically, the elastica problem is approached by the so-called exact Bernoulli-Euler equation, whose solution is quite challenging due to the non-linear nature of the problem and the need of imposing equilibrium on the deformed shape.

The standard solution approach of this problem (“elastica”) is represented by non-linear FE analysis. In some special cases, closed-form solutions are available, which involve elliptic integrals and functions.

The elastica is particularly relevant in the prediction of the deformation behaviour of thin leaf springs, and in general of compliant mechanisms, which are often realised as arrangements of bending elements. Compliant mechanisms are usually designed by means of formal optimisation requiring a very large number of single computations, which motivates the search toward fast and effective analysis methods.

The talk deals with an alternative solution method, which is based on the discretisation of the deformed beam into circular arc segments. The approach is fast and simple to implement and suits therefore well for design and optimisation of compliant kinematics.

Furthermore, concepts and prospects concerning the implementation of the circle-arc procedure for the time-effective solution of general non-linear beam trusses are shown.



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Friday 5 February, Aula MS1
Seminar tentative schedule: 12.00 – 13.00
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Via Ferrata,1 – Pavia