Master's Dissertation at the Div. of Structural Mechanics

VERIFICATION OF BUCKLING ANALYSIS FOR TIMBER ARCHES USING NONLINEAR FINITE ELEMENT METHOD

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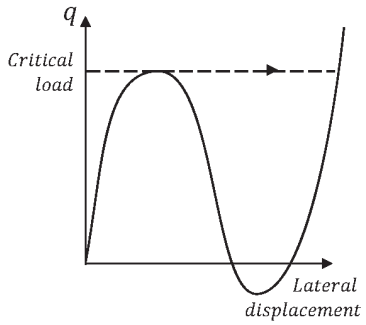

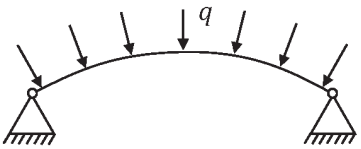

Background
Especially for large span structures, failure can be caused by instability phenomenon. Today's standard procedure in consulting firms is to use linear finite element analysis to calculate critical buckling loads. Linear buckling analysis is based on 2nd order theory which is valid for linear material models and small deformations. The result is therefore a theoretical buckling load.

In a real structure, nonlinear material behavior and imperfections often prevent the system from achieving this theoretical buckling strength, leading a linear analysis to over-predict the load bearing capacity.

Objective and method
The objective of this thesis is to investigate the effect of material properties and behavior by nonlinear buckling analysis using finite element method. Once relevant parameters are determined the model is compared to linear buckling analysis and Eurocode.

This type of analysis can be conducted for several structural elements but it is within the scope of this thesis to examine timber arches. Timber arches are especially interesting since they are normally prone to buckling due to long spans and slender cross sections.

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