MASTER'S DISSERTATION AT STRUCTURAL MECHANICS

DEPARTMENT OF CONSTRUCTION SCIENCES | FACULTY OF ENGINEERING LTH | LUND UNIVERSITY

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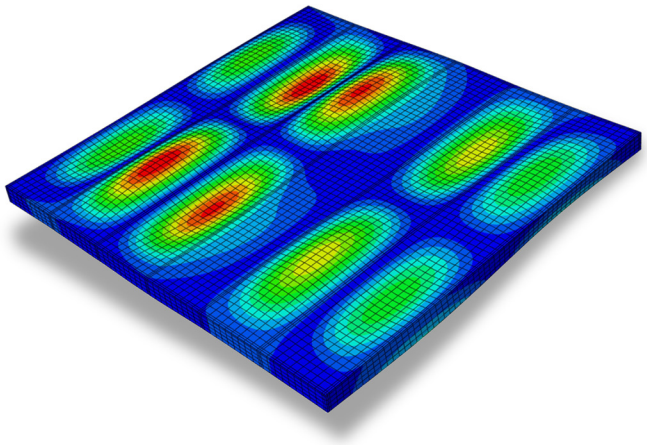
MODELING WOODEN FLOORS IN DYNAMIC ANALYSIS



BACKGROUND

Floor slabs are designed for vertical and horizontal force. The resulting dimensions are often governed by serviceability limit state requirements, relating to deflection and vibration in the vertical direction. Wooden floors are commonly slender structures with relatively low mass which make them sensitive to dynamic loading. The general recommendations for serviceability limit state design of wooden floor slabs in Eurocode 5 have been questioned in the research community and by engineers. When modeling wooden floors, different methods may be used. A simple method is to consider Bernoulli-Euler or Timoshenko beam theory, where the floor is modeled as a one dimensional beam. Alternatively, a more advanced approach may be used where the floor is analyzed in two dimensions according to plate theory. Full three dimensional models are often not feasible to use in a practical engineering context.

Wooden floors can be manufactured in different ways, for example as cassette floor elements with wooden joists as main load carrying element or using cross laminated timber (CLT) elements. CLT elements are manufactured with several layers of laminations oriented with a 90 degree angle between the different layers which results in elements with significant strength and stiffness in two orthogonal directions.

OBJECTIVE AND METHOD

The aim for the Master's dissertation is to examine differences in the dynamic response between an advanced three dimensional model and simplified models based on plate or beam theories. Of specific interest is to investigate simplifications that can be applied to the models so that analyses of the modeled floors predict a realistic dynamic behavior. The finite element method will be used and various advanced models of wooden floors will be created and analyzed with regard to the dynamic response. First, a CLT floor will be modeled during the course of the project, other types of wooden floors may be considered.

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