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Project Numerical Analysis: 'Beams and Frameworks of Beams'

The Project is about static and dynamic implementation of the finite element method applied to beams (bars) and frameworks of beams. It is organized in 3 steps.

Step 1: pure bending of a single beam, static case.

1. Implement static deformation of cantilever beam (pure bending) according to the guidelines in the first script.
2. Use a suspension different from the canilever case (for instance beam supported at both ends).
3. For several simple load cases (for instance constant load density or load or bending moment only at free end point) find analytic solutions (yourself or from online-literature) and compare with numerical results.

Suggestion: this part of the project should be finished by the end of May.

Step 2: pure bending of a single beam, dynamic case.

Generate movies of beam vibration using the Newmark-method (second script). Suggestion: first compute a solution to the static case. Then remove the load and compute the vibration of the beam. Consider also vibrations computed from eigenvalues and eigenvectors (script 3).
Suggestion: this part of the project should be finished in the second week of June.

Step 3: Vibration of frameworks of beams (script 4)
A framework is a construction of several connected beams. Mathematical methods are the same as in steps 1 and 2. However, the matrices are more complicated.

Results of project (basis for grading):

1. Codes and examples.
2. Oral presentation (video, 10-20 minutes)
3. Written report (about 20 pages)

Deadline is flexible. You may send me the final results in July, August or even September.