**Software Lab Project**

Macro Element Method for Crashworthiness Analysis

The macro element method offers an alternative to the commonly used FEA for crash related problems. It is based in the study of the typical folding pattern of prismatic beams and columns under crash situations. A fold will represent a "deformable cell" on which the macro elements are defined, for example the super beam element (Figure 1). This semi-analytical method allows a coarser discretization giving a considerably faster computation time compared to FEM, with the drawback of less accurate results due to the predefinition of the folding patterns.

*Figure 1.
SBE modeling
concept* [1]
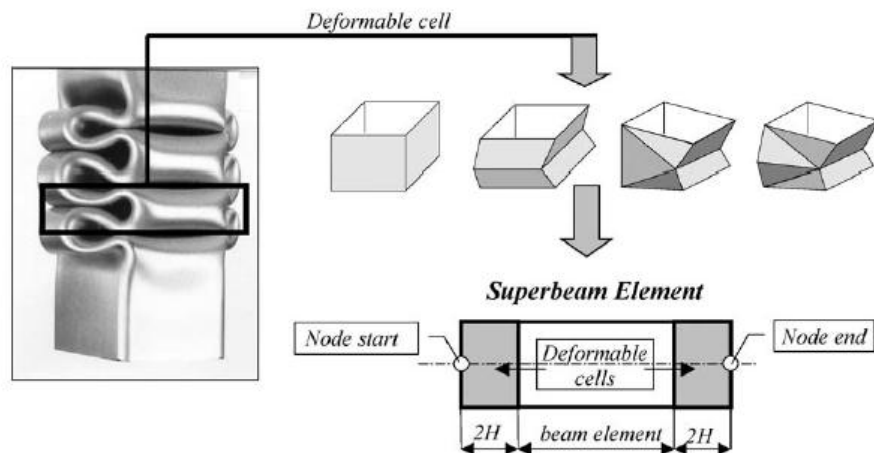
The objective of this work is to implement a software based on the macro element method for crashworthiness analysis, to achieve this, the following tasks should be completed:
- Literature review on the method
- Implementation of the element formulation and iteration loop
- Study of single prismatic columns
- Interface between multiple structural members and its study

The software should be object oriented and written in Python. The FE solver LS-Dyna should be used as reference to asses the accuracy of the new software.

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[1] Abramowicz, W. (2004). An alternative formulation of the FE method for arbitrary discrete/continuous models. International Journal of Impact Engineering, 30(8-9), 1081–1098.

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