Universität Stuttgart

Baustatik und Baudynamik

Master Thesis
Data Compression for Finite Element Simulation Results

Finite element simulations can easily produce several gigabytes of result data. Therefore, compression algorithms are required to reduce the necessary hard drive space. A data compression tool dedicated to compression of finite element simulation results and widely used in industrial applications is "FEMZIP". The aim of this thesis is to understand the ideas and algorithms used in compression tools such as FEMZIP as well as compression algorithms from other fields such as image compression. Furthermore, at least one compression algorithm should be implemented by the student and applied to the result data of the institute's finite element code NumPro.

Example of an original and compressed image; CC0 by Bautsch `https://commons.wikimedia.org/wiki/File:Compression.artifacts.jpg`

The specific tasks are

- Review of publications related to FEMZIP
- Learn about data compression techniques
- Implement at least one compression algorithm
- Apply the compression algorithm to result data from the institute's finite element code NumPro
- Interpretation, evaluation and documentation of results

Recommended fields of interest
Finite element simulation, algorithms for compression of large data sets

Literature
[1] *New Developments in the Compression of LS-DYNA Simulation Results using FEMZIP*, Rodrigo Iza Teran, Clemens-August Thole, Rudolph Lorentz, available online: `https://www.dynalook.com/conferences/european-conf-2007/new-developments-in-the-compression-of-ls-dyna.pdf`