COMPLIANCE COMPENSATION

Assignment

Develop, implement and test a compliance compensation method by superelement generation, such as Craig-Bampton, for a high-tech system and prove the accuracy of this method.

Activities

- Make a FEM model of the system to be tested.
- Apply traditional FEM analysis and state-space generation for a baseline analysis.
- Study the theory behind different superelement generation methods and develop a method best suited for the application.
- Test and verify the accuracy of this superelement based method.
- Apply your method on an in-development high-tech system.
- Use the developed method to combine multiple FEM models or add discrete damping.

Context

In the development of high-tech mechatronic products and systems, the need for a first-time-right solution is increasingly important. Essential for such a requirement is predictive modelling. Here, the system is modelled and simulated to gain insight into its performance up-front.

Internship overview

- Master Student
- Internship Assignment
- Mechanical / Control Engineering
- Location: Nuenen

Technologies

- Predictive modelling
- Modal analysis
- Substructuring
- Finite element analysis
- Superelements

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Sioux Technologies
Eindhoven | Nuenen | Mijdrecht | Delft

+31 (0)40 2677 100
jobs@sioux.eu
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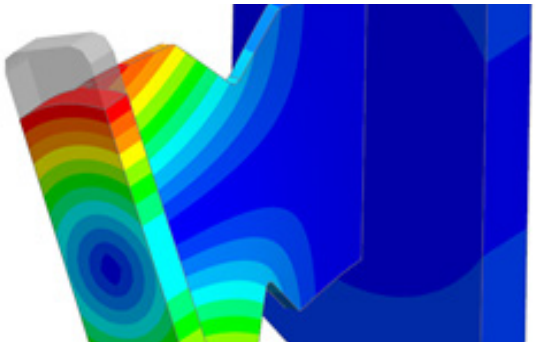
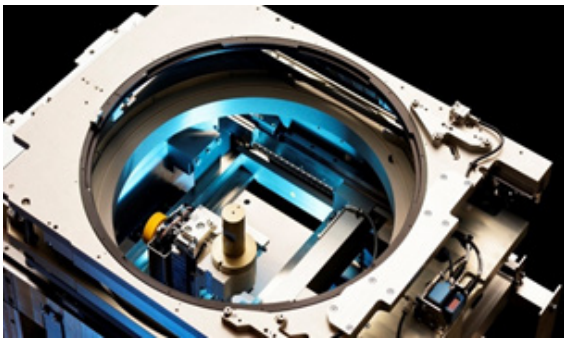
Traditionally, lumped-mass rigid-body modelling has been used for this purpose, but as 3D geometries become more complex, a shift is made to finite-element-modelling (FEM) analysis. FEM analysis is capable of handling complex systems, directly relates to the designed geometry and comes with intuitive visualization.



example of a compliance analysis (FEM)

Sioux has developed tooling to extract a state-space representation from the FEM analysis and actively uses this method for the design of its systems, e.g. by performing time-simulations or frequency domain analysis in MATLAB. The next step is to interconnect multiple of these models, a process called substructuring. This enables, for example, to interconnect viscoelastic materials and predict their damping contribution.

However, due to the limited number of Eigenmodes calculated, the inter-component compliance is not correctly represented. Superelement generation methods, such as the Craig-Bampton method, do allow for an exact match of the compliance of the system. This then enables substructuring of multiple of systems while simultaneously providing a more accurate representation of standalone systems.



example of a high-tech product

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Would you like to know more about this student assignment?

Contact:
Joep Linssen
+31 (0)40 - 263 5000
jobs@sioux.eu