Master Thesis: Multidisciplinary Optimization for Spot Welding Location

Background

The research group “Geometry assurance and robust Design” at the Department of Industrial and Materials Science (IMS) at Chalmers is world leading within geometry assurance. Geometry assurance is a set of methods and tools to secure geometrical quality of assembled products, where a major part of the work is focusing on development of simulation methods.

In today’s car and aerospace industry to secure a high quality, virtual tools and methods are getting increasingly important to ensure robust solutions as early as possible in the product realization process. Among those tools, RD&T, a computer aided tolerance tool (CAT-tool) can be used to predict the geometric robustness of non-rigid assembly process, e.g. the assembly of the sheet metals into the car body. These assemblies are mainly spot welded together. The location of the spot weld known to have a huge influence on the geometric results of the produced units. A method to achieve a desired geometrical outcome and satisfying other requirements (ex. stress or strength) is searched for.

Objectives

- Literature studies of non-rigid variation simulation of sheet metal assemblies.
- Literature review on the multidisciplinary optimization methods.
- Data collection for simulations in at two or more disciplines, including geometrical quality.
- Defining quality criteria for analyzing simulation results and optimization results.
- Modeling and Simulation of spot welded assemblies, using the CAT-tool RD&T and other disciplines.
- Optimization of the location of the spot weld with respect to geometrical variation for the selected models, using a Multidisciplinary Design Optimization (MDO) approach.

Goals

- Developing the multidisciplinary optimization method for spot welding location.
- Combining non-rigid variation simulation with another discipline (ex. stress or strength).
- Identification of improvement potentials in terms of accuracy and calculation efficiency.

Means

The main work will be conducted at Chalmers. Chalmers will cover the potential thesis costs.

Conduction

This thesis work should be conducted by one or two students, skilled in design optimization and simulation software and with a structured mindset.

Information

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