

Research Topic for the Arts et Métiers ParisTech - CSC PhD Program

Arts et Métiers ParisTech – LCFC- DANTAN 01

Subfield: Mech. Eng.

ParisTech School: Arts et Métiers ParisTech campus de Metz

Title: Tolerance Analysis of Flexible and Multiphysics systems

Advisor(s): Prof. Jean-Yves DANTAN, Dr Lazhar HOMRI
jean-yves.dantan@ensam.eu; lazhar.homri@ensam.eu

Short description of possible research topics for a PhD:

As technology increases and performance requirements continually tighten, the cost and the required precision of assemblies increase as well. There is a strong need for increased attention to **tolerance design** in order to enable high-precision assemblies to be manufactured at lower costs. Tolerance analysis has become an important issue in product design process; it has to simulate the “real-world” of the product with the minimum of uncertainty. The main scientific challenge concerns the development of approaches to propagate the impacts of geometrical deviations on the mechanical behavior and multiple simultaneous physical phenomena for tolerance analysis of **flexible and multiphysical system**. The main challenge of this project is the deal between both and the computation in an acceptable computer time and managing the accuracy of the results.

To define the global context of this proposal regarding others projects; we can distinguish three main issues in tolerance analysis:

1. The models for representing the geometrical deviations,
2. A mathematical model for calculating the system behavior with deviations,
3. The development of the analysis methods.

This proposal focuses on the second issue for flexible and multiphysical systems.

Required background of the student: Mechanical Engineering, Mechanical design, Tolerancing

A list of 5 (max.) representative publications of the group:

1. Dumas A., Gayton N., Dantan J.Y., Sudret B., “A new system formulation for the tolerance analysis of overconstrained mechanisms”. Probabilistic Engineering Mechanics, Volume 40, April 2015, Pages 66-74.
2. Dumas, J.Y. Dantan, N. Gayton, Impact of a behavior model linearization strategy on the tolerance analysis of over-constrained mechanisms, Computer Aided Design. 62 (2015) 152–163.
3. L. Homri, D. Teissandier, A. Ballu, “Tolerance analysis by polytopes: Taking into account degrees of freedom with cap half-spaces”, Computer Aided Design. 62 (2015) 112–130.
4. B. Schleich, N. Anwer, L. Mathieu, S. Wartzack, Contact and mobility simulation for mechanical assemblies based on skin model shapes, Journal of Computing and Information Science in Engineering. 15 (2015).
5. P. Franciosa, S. Gerbino, S. Patalano, Simulation of variational compliant assemblies with shape errors based on morphing mesh approach, International Journal of Advanced Manufacturing Technology. 53 (2011) 47–61.

FOR APPLICATION, PLEASE CONTACT ADVISOR(S) BY EMAIL WITH COPY TO:
ali.siadat@ensam.eu AND yvon.velot@ensam.eu