30 NOV

🕐 **13h30**

📍 **Amphi Simondon (1B26)**

Phd : Skin Model Shapes Generation and Geometric Operations for Product Specification and Verification

Yifan Qie – Phd defence

Date and place : 30/11/22 at 13h30 in amphitheatre Simondon (1B26)
Phd Supervisor : Nabil Anwer

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Skin Model Shapes Generation and Geometric Operations for Product Specification and Verification

The international standards issued by ISO/TC 213 on Dimensional and Geometrical Product Specifications and Verification (GPS) are committed to defining both tolerancing (for specification) and metrology (for ver- ification) practices in manufacturing industries. New developing standardization efforts are shaped to provide a science-based foundation for GPS to reduce ambiguity and uncertainty within the product development life cycle.

The fundamental concept of Skin Model provides a consistent approach for GPS regarding geometric deviations. While specifications and verification rely on geometric features applied to Skin Model or measurement point cloud, operationalization of Skin Model and geometric operations is still a challenging problem. In this thesis, the generation of Skin Model Shapes that guarantee the operations of Skin Model in a discrete representation schema and the geometric operations applied on the Skin Model Shapes are researched.

Novel methods for generating Skin Model Shapes using Laplace-Beltrami Operator, Generative Adversarial Network, and a hybrid framework are proposed. Novel methods for geometric operations, including curvature-based partitioning, deep learning for invariance class identification, explicit partitioning and invariance class based reconstruction methods are developed.

To facilitate the development of such methods, benchmarks and performance evaluation indicators are investigated, and a novel concept of function-oriented surface reconstruction is put forward as an extensionof geometrical reconstruction operations.

The developed methodologies and proposed concepts follow the principles of generalization, completeness, describability and operability and thus provide scientific foundations for future research activities in the context of geometrical product specifications and verification.

Jury members

- Jean-Yves Dantan, Professeur des Universités, ENSAM Metz, Rapporteur

- Yicha Zhang, Maître de Conférences, HDR, UTBM, Rapporteur

- Denis Teissandier, Professeur des Universités, Université de Bordeaux, Examinateur

- Goran Devedzic, Professor, University of Kragujevac, Serbia, Examinateur

- Lihong Qiao, Professor, Beihang University, China, Examinatrice

- Charyar Mehdi-Souzani, Maître de Conférences, Université Sorbonne Paris Nord, Examinateur

- François Blateyron, VP Research & Metrology, Digital Surf, Invité

- Nabil Anwer, Professeur des Universités, Université Paris-Saclay, Directeur de thèse