Procedure for verifying a reduced model and experimental exploitation for thermal characterization of cracks

Internship proposal, beginning : May 2024

CANDIDATE SEARCH

Context

In the era of Industry 4.0, many industrial sectors face the need to develop non-destructive and real-time control methods to ensure the proper manufacturing of parts. In particular, a significant challenge is the detection and characterization of through and subsurface cracks in metallic parts, in fields such as aerospace, energy, and construction. The TREFLE department at the I2M laboratory in Bordeaux specializes in non-destructive testing using thermal methods. One approach involves using a laser to selectively heat the material near the crack. Sensitivity analysis has demonstrated the possibility, based on the resulting temperature field, of determining the depth of the crack. To achieve this, a model of this problem must be constructed for real-time use. The recent Proper Generalized Decomposition method has been exploited to create a reduced model. The challenge in creating such reduced models is to ensure that the model remains accurate across the entire study domain. Indeed, the construction of such a model relies solely on a few parameters and can lead to errors if are poorly chosen. It is essential to ensure the proper selection of parameters. It is in this context that the subject of this internship is proposed.

Internship Objectives

Two objectives are defined:

1) Create a verification procedure to ensure the accurate approximation of the model. This will involve testing various parameter ranges based on a provided reduced model.

2) Use the optimized model on experimental data to characterize cracks in parts manufactured in the laboratory.

Profile

Equivalent to L3 (third year of undergraduate studies).

Numerical skills, modeling.

Interest in experimental work.

Additional Information

2-3 months internship at the I2M laboratory.

The intern will work with a Ph.D. student from the TREFLE department (Energy and Fluid Transfer).

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