

Smart structure maintenance strategies based on Structural Health Monitoring damage indicators

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Over the last decade, the use of structural health monitoring (SHM) systems has been widely investigated in an effort to improve the efficiency of damage detection by giving a real-time status of the health of a structure. Our project focuses on optimizing condition based maintenances under structure safety and cost-effective lifetime constraints. This topic involves many research aspects: damage diagnosis methods, fatigue damage propagation models, quantifications of the uncertainties due to SHM measurements, modeling and physical variability using Bayesian state-parameter estimation methods. These quantifications allow to determine the statistical lifetime distribution of a structure. The maintenance intervals can therefore be calculated improving both safety and cost-efficiency compared to traditional maintenances approaches.

This methodology can be applied and validated to composite materials equipped with piezoelectric actuators.

The objectives of the project are :

- Uncertainty quantification on smart material properties, physical variability, SHM system and measurement errors: Bayesian approach,
- Structure damage model parameter identification using real-time SHM data,
- Determination of the structure lifetime distribution from damage propagation model and uncertainties,
- Optimization of the condition-based maintenances in terms of cost effectiveness and life-safety.

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