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# PROPOSITION DE STAGE EN COURS D'ETUDES


Référence : **DTIS-2021-05**
*(à rappeler dans toute correspondance)*

Lieu : Toulouse

Département/Dir./Serv. : DTIS/IDCO

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## DESCRIPTION DU STAGE

Thématique(s) : Identification et commande des systèmes

Type de stage : ☒ Fin d'études bac+5 ☒ Master 2 ☐ Bac+2 à bac+4 ☐ Autres

**Intitulé : Innovative V&V techniques for robust certification of aerospace control systems**

Sujet : Novel lightweight materials and deployable structures make it possible to conceive new spacecraft architectures and to perform increasingly varied missions. The resulting design specifications become more and more complex, which requires to develop very efficient and highly optimized Attitude and Orbit Control Systems (AOCS), but also adequate analysis and validation methods. The latter are essential to assess the mission risk and to ensure a good trade-off between stability and performance in the face of all admissible uncertainties, external perturbations and internal failures. Unfortunately, the current industrial standard based on Monte Carlo (MC) simulations requires an intensive computational effort, which grows exponentially with the complexity of the problem under consideration. At present, the validation process accounts for 80% of the AOCS total development time in the space industry, and this proportion is likely to increase in the future. Less expensive deterministic alternatives have been developed since the 1980s. Some are now very mature, such as mu-analysis, while others remain more prospective. But what is certain is that this research topic is currently booming. The ultimate goal is to improve the current industrial standard and to fasten the validation process, thus gaining a significant amount of time and money.

The internship falls within this context and will be conducted in parallel with projects involving ONERA, ESA and CNES. The first part will be dedicated to probabilistic mu techniques, which prove more efficient than MC simulations to characterize rare but nonetheless possible events. In the continuity of the theoretical and algorithmic work carried out over the last few years, efficient tools will be implemented and validated on aerospace benchmarks. The second part will be more exploratory. Based on a literature review, it will aim to identify promising techniques, compare them and possibly propose further improvements.

Est-il possible d'envisager un travail en binôme ? **Non**

**Méthodes à mettre en oeuvre** :

☒ Recherche théorique ☐ Travail de synthèse

☒ Recherche appliquée ☒ Travail de documentation

☐ Recherche expérimentale ☐ Participation à une réalisation

Possibilité de prolongation en thèse : **Oui**

**Durée du stage** : Minimum : 5 mois Maximum : 6 mois

Période souhaitée : mars-août 2021

## PROFIL DU STAGIAIRE

| Connaissances et niveau requis : | Ecoles ou établissements souhaités : |
|---|---|
| très bon niveau en automatique, maths applis et anglais, bonne connaissance de Matlab | écoles d'ingénieur et universités |