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PROPOSITION DE STAGE EN COURS D'ETUDES

Référence : **DTIS-2026-51**
(à rappeler dans toute correspondance)

Lieu : Toulouse

Département/Dir./Serv. : DTIS/AEI

Tél. : 05.62.25.27.66

Responsable(s) du stage : M.Rognant, A.Albore

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DESCRIPTION DU STAGE

Thématique(s) : Robotique et autonomie

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

Intitulé : Enhancing Autonomous In-Orbit Assembly with Multi-Agent Coordination for Next-Generation Space Structures

Sujet : The robotic Lab of ONERA/DTIS Toulouse is seeking an intern to contribute to the advancement of autonomous in-orbit assembly techniques, a crucial aspect of future space exploration. Our team has developed a framework enabling crawling mobile robots to autonomously assemble large-scale space structures, guided by dedicated on-orbit planning algorithms.[1-3] This approach ensures stable dynamics through the co-design of robots and satellites, incorporating deployable truss beams with standard interfaces for various payloads.

Objective of the Internship:
The primary goal of this internship is to extend our existing framework to accommodate multiple coordinated crawling robots. This enhancement will be crucial for addressing the challenges posed by communication limitations and power budget constraints. Achieving this objective will significantly strengthen the scalability and reliability of our approach, paving the way for its application in next-generation space missions requiring safe and efficient autonomous in-orbit assembly.

Expected Tasks and Deliverables:

- **Analysis and Requirement Definition:** The intern will thoroughly analyze our current framework to identify the necessary requirements for transitioning to a multi-agent approach. This phase will involve defining the key specifications and functionalities needed to support multiple coordinated robots.
- **Algorithm Development and Implementation:** Building on the insights gained from the analysis, the intern will design and implement a new multi-agents algorithm capable of generating diverse assembly plans tailored to a specific space power station application. This task will require integrating considerations for communication and power budgets into the planning process.
- **Validation and Testing in Simulation:** Finally, the intern will validate and test the newly generated assembly plans within a representative multi-robot simulation environment. This step is crucial for assessing the efficacy, safety, and reliability of the enhanced framework under simulated space conditions.

[1] Albore, A., & Rognant, M. (2024, May). Integrated modeling and planning for on-orbit assembly of large space structures with mobile crawling robots. In *MASSpace 2024*.
[2] Rognant, M., Albore, A., Piet, N., & Julien, C. (2024, October). Co-design Robots and Structures Framework for Automated Construction of Modular Space Platforms. In *IAC 2024-International Astronautical Congress*.
[3] Rognant, M., Albore, A., Piet, N., & Julien, C. (2025). A framework for automated construction of modular space platforms integrating structure constraints and automated planning. *Acta Astronautica*.

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 : A renseigner	
Durée du stage : Minimum : Maximum : Période souhaitée :	
PROFIL DU STAGIAIRE	
Connaissances et niveau requis :	Écoles ou établissements souhaités :