Vision-Based Space Debris Pose & Distance Estimation

ISAE-SUPAERO + Thales

NICOLAS BAUDIN
INTERNSHIPS IN FRANCE INITIATIVE

Name of the hosting institution in France	ISAE-SUPAERO
Name of the host laboratory / research team	ISAE-SUPAERO / DISC
Address	10 avenue Edouard Belin BP 54032 31055 Toulouse cedex 4 France
Website	https://www.isae-supaero.fr/en/
Name of the supervisor	Emmanuel Zenou
Function	Associate Professor
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Internship offer

Topic of the internship (title)	Vision-Based Space Debris Pose & Distance Estimation				
Proposed dates of the internship	**Start:**	2019-11-01	**End**	2020-04-28 (flexible)	

Scientific and academic objectives of the internship (detailed description of the internship content, work expected from the intern and expected outcomes):

In the frame of a collaboration between ISAE-SUPAERO and Thales-Alenia-Space, an intern position is open for working with a PhD student on the dynamic pose estimation of space objects such as large debris to be de-orbited by a chaser probe. The aim of the project is to develop algorithms, based on the exploitation of a monocular camera coupled with other candidate sensors such as a Lidar or an IR camera, which would enable a chaser object to track a target object in Space environment, in order to allow automated rendezvous and eventually docking or capture. The target object, restraint to a size envelope lower than 10 m, could be a space debris or a satellite which was not conceived to participate in a rendezvous and will not have an active participation in the operation. The project is divided into three main issues: - the development of image processing algorithms that would allow to pass from the images taken by a visible or IR camera -or the 3D clouds of points provided by a LIDAR- to measurements of the relative translation and attitude of the target - The infra-red / Visible / LIDAR fusion algorithms - the development of a distance estimation algorithm from monocular vision. The intern will focus on the Pose Acquisition problem but may address the two other issues. Pose Acquisition is the phase in which the chaser try to estimate an initial pose of the target in order to initialize the tracking. The intern will conduct a comprehensive bibliographic review on existing techniques in Computer Vision and he will try to propose innovative algorithms.

Name of industrial partner	Thales-Alenia-Space
Role of the industrial partner in the internship project	Thales-Alenia-Space is the partner which finances the project and the PhD student
Main contact at the French industrial partner	vincent.dubanchet@thalesaleniaspace.com
Targeted Australian university	Any

Expected profile of applicant

Level of study	Excellent Master (potentially Bachelor) Student
Discipline	Signal & Image Processing, Data analysis, Optimization
Required qualities, knowledge and skills	Computer Vision, Optimization
Other specific eligibility criteria	Flexible dates of internship.