

PROPOSITION DE STAGE EN COURS D'ETUDES

Référence : **DTIS-2022-60**
(à rappeler dans toute correspondance)

Lieu : Toulouse

Département/Dir./Serv. : DTIS/SEAS

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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 : Generation of Test cases for an Autonomous Robot based on Skill and Fault models

Sujet : The development of decisional autonomous systems, like drones or mobile robots, now makes it possible to perform tasks without human supervision for extremely varied environments. However, the failures of these systems can have unacceptable consequences for the mission. These failures may appear at low functional level of the architecture of the system (e.g., sensors), but also at higher levels where decision are taken (e.g., behaviour management). When developing these systems, a major challenge is to check if all the possible failures have been considered and mitigated.

To do so, a relevant approach is to combine (1) failure analysis (e.g. through Fault Tree models) to list the possible failures and how they are supposed to be handled, and (2) testing, to have an evidence that the architecture correctly implements the handling of these failures. For this internship, we will focus on a three-layers architecture: (1) a functional layer developed with ROS (Robot Operating System) that manages all sensors, actuators, and basic control, (2) a decisional layer at the top where high-level behaviors are implemented, and (3) an intermediary skill management level between the functional and the decisional layer, that checks the correct preconditions and resource states of the functional layer when executing behaviours planned by the decisional layer.

A previous work has performed a Fault Tree analysis of the skill- and functional- layers in order to identify the possible failures and how they are managed in the architecture. This methodology has been applied on a case study, consisting of a drone performing the mapping of a rescue area, in which several failures may occur (e.g., GPS failure, loss of communication with the pilot, or sensor failures). Some tests have then been defined specifically for the architecture of this drone, in order to evaluate the relevance of the fault-tree analysis.

The objective of the internship is then to propose a more generic framework for designing test cases to evaluate if faults have been correctly managed, with respect to the analysis performed using Fault-Trees. The current analysis is partly based on formal models of the skill-layer. The intern will have to investigate if models of the functional layer can also help is complementing the fault-tree analysis, and then propose a test case generation methodology that would link the Fault-Tree model, and skill-layer model, and the functional-layer model. The proposed test generation framework will be evaluated on some autonomous robot applications developed at ONERA.

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

Méthodes à mettre en oeuvre :

- | | |
|---|--|
| <input type="checkbox"/> Recherche théorique | <input type="checkbox"/> Travail de synthèse |
| <input checked="" type="checkbox"/> Recherche appliquée | <input type="checkbox"/> Travail de documentation |
| <input type="checkbox"/> Recherche expérimentale | <input type="checkbox"/> Participation à une réalisation |

Possibilité de prolongation en thèse : **Oui**

Durée du stage :

Minimum : 5

Maximum : 6

Période souhaitée : 2022

PROFIL DU STAGIAIRE

Connaissances et niveau requis :

Computer Sciences, Discrete-Event Systems,
Embedded Systems, Artificial Intelligence,
Robotics

Ecoles ou établissements souhaités :

GEN-F218-3