1SC2891 – Adversarial games for software design

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Department: DOMINANTE - INFORMATIQUE ET NUMÉRIQUE
Language of instruction: FRANCAIS
Campus: CAMPUS DE PARIS - SACLAY
Workload (HEE): 40
On-site hours (HPE): 27,00

Description

- During this week of integration teaching will be addressed the problem of testing software and cyber-physical systems (embedded systems,analog-digital ...). It will be proposed an exploration of the links that can be made between the test based on models and the game theory, specifically the theory of adversarial games. The goal is to be able to exploit game theory concepts and results as part of the test.

Quarter number

ST2

Prerequisites (in terms of CS courses)

- Have taken courses in algorithmic and complexity and modeling.

Syllabus

1. Conformance testing consists of verifying the conformity of an implementation with respect to its specification.

In conformance testing, both implementation and specification are defined using the formalism of Input Output Symbolic Transition System (IOSTS). We can then systematically re-express IOSTS as two-player games with perfect information. Indeed, we can consider that the 2 players are respectively the tester and the system under testing, the shots played by these 2 players being: for the tester the inputs, and for the system the outputs.
The objective of this EI is to be able to implement a test tool based on the theory of the adversarial games, and to apply this tooling on a system under testing (which can be a small real program or that simulates a physical system).
The 25 students will then be divided into 3 groups of 8 to 9 students. One

group will be in charge of describing and implementing the system under test representing a concrete case, while a second group will describe the specification of the system. Finally, the 3rd group will be in charge of implementing algorithms to generate tests from techniques from adversarial games to ensure the conformity of the implementation against its specification. At the end of the week, the whole will be integrated to make it possible to check the conformity of the concrete case with respect to its specification, and this by means of the tooling developed by the 3rd group.

Grading

- The afternoon of Friday (the last day of the EI) an evaluation will be made by a presentation of each group in front of the entire promotion having followed this thematic sequence.

Resources

- Teaching team : Marc Aiguier, Erwan Mahé and Arnault Lapître (CEA-List)
- Size of the classes : maximum 25 students
- Software tools and number of licenses required: python language and Diversity software developed by CEA that students will install on their personal machine.

Learning outcomes covered on the course

- Being able to model a problem for a computer solution, and knowing how to check its behavior by conformance testing techniques by means of results from the theory of adversarial games.