Overview

- **Supervisors:** Stéphane DONCIEUX, Alexandre CONINX, Achkan SALEHI (ISIR AMAC Team)
- **Duration:** 6 months

**Topic description**

**Industrial Need**

The increasing complexity of modern video games has made Game Testing (GT) an essential component of the game development process. Currently, GT relies on intensive human labor, which results in high financial costs for game companies. This is mainly due to two factors. First, human testing is slow, and second, the discovery of complex/rare bugs requires creative gameplay that might not necessarily occur to developers and testers. Given these issues, automation of GT seems desirable.

The algorithmic and software tools developed during this internship will help in GT automation of Space Engineers [1], which has sold more than 3.5 million copies [2] as of this writing.

**Internship goals and roadmap**

Using the usual Reinforcement Learning terminology, we will define a game-playing agent as a policy function mapping game states (e.g., as given by the game’s internal state, or RGB image sequences) to actions. The aim is to find policies that exhibit interesting behaviors in terms of GT, for example, policies that lead to a software crash, or to a state where the player’s progress becomes inhibited by faulty game logic.

Creative exploration of diverse policy behaviors can be done through divergent exploration methods such as Novelty Search (NS) [7], which can help achieve a uniform coverage of the behavior descriptor space if the latter is bounded [6]. Furthermore, given some undesirable game state \( s_i \), Quality/Diversity (QD) [3] methods can be leveraged to construct and maintain an archive \( A_i \) of diverse agents whose execution results in \( s_i \).

The current roadmap for the internship is as follows:

1. Experiment with simple, navigation-only related actions and low-dimensional, trajectory based behavior descriptors in static environments.
2. Use the previously acquired policies to construct more complex actions [5] in order to build more complex behaviors, and design/learn more sophisticated behavior descriptor spaces [4] that capture plausible player behaviors.
3. Optionally, work on generalising the developed tools to dynamic environments.
Candidate profile

The candidate should have a strong interest in machine learning and be enrolled in a MSc or engineering school program in computer science, machine learning or related fields. Familiarity with evolutionary methods is a plus. Good development skills and proficiency in Python are expected. Good development skills in C++ is appreciated. The project will require working in close cooperation with several researchers and engineers and requires good teamwork abilities. A working knowledge of English is required; knowledge of French is appreciated but not necessary.

How to apply

Send an e-mail to stephane.doncieux@sorbonne-universite.fr, alexandre.coninx@sorbonne-universite.fr and salehi@isir.upmc.fr with [Game test automation] in the topic along with a CV and motivation letter.

References

[1] https://store.steampowered.com/app/244850/Space_Engineers/