

Master internship proposal

Frugal controller synthesis

This internship will take place in [LaBRI](#), Bordeaux, under the direction of [Hugo Gimbert](#). An office and a computer will be provided to the intern, as well as the minimal legal internship grant.

Game theory and controller synthesis

Controller synthesis aims at automatically generating hardware devices or programs given a logical specification. A correct controller has to drive the system by means of actions and ensure that the behaviour of the system is correct whatever be the interaction of the system with its environment. For example, the program controlling an ATM should guarantee that no cash is delivered until the correct pin code has been produced by the current user of the ATM.

Controller synthesis can rely on models and algorithms developed by game theoretists. Various models of interaction have been developed by mathematicians, economists, biologists, computer scientists together with algorithms to analyze and predict the behaviour of rational agents playing these games. Synthesizing a good controller amounts to computing an optimal strategy in a game.

In practice, systems have huge state space and controllers should be small compared to the system and should work without full monitoring of the system, which is very costly.

This problem has been addressed in two recent papers:

- [Minimal Disclosure in Partially Observable Markov Decision Processes](#)
- and [Controllers with Minimal Observation Power](#)

The goals of the internship are:

- understanding the two papers and implementing them as an extension of the tool [GAVS+](#),
- finding new algorithms for the synthesis of "frugal" controllers.

This work can be continued in PhD afterwards.