

Verification of Supervisory Control Problems

Stage Master 2 (SIF)

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1 Encadrants

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2 Lieu du Stage

Ville : Rennes

Désignation de l'établissement : Laboratoire IRISA

Équipe : SemLIS

3 Description

3.1 Context

Although epistemic temporal logics and imperfect information games are two theoretical frameworks which address different issues, they both deal with the same basic and intuitive notions of action, time and knowledge.

On the one hand, supervisory control theory involves complex notions which can be expressed by a combination of terms dealing more or less implicitly with actions, time and knowledge. The complex notion of P -supervisor is a paradigmatic example of such combination. On the other hand, epistemic temporal logics are logics where it is possible to express complex statements which are explicit combinations of these notions. So far, there has been little interaction between these two theoretical frameworks.

In [Aucher, 2014], we embedded the framework of supervisory control theory in an epistemic temporal logic. The originality of our results stems from the fact that they are all formulated in terms of model checking problems in the epistemic temporal logic CTLK. The reformulation of supervisory control theory in epistemic temporal logic highlights their main underlying intuitions in terms of formal expressions involving the modalities of action, time and knowledge.

3.2 Objectives

The objectives of this internship are twofold :

1. Investigate the exact computational complexity of the different model checking problems elicited in [Aucher 2014];

2. Implement the theoretical framework and results of [Aucher 2014] in model checkers of epistemic temporal logics such as MCK (Model Checking Knowledge) [Gammie, van der Meyden, 2004a, 2004b] or MCMAS (Model Checking Multi-Agent Systems) [Lomuscio, Raimondi, 2006, 2009].

A number of software tools have been developed for supervisory control theory, such as Supremica, Sigali and GIDDES (Graphical Interface for the Design of Discrete-Event Systems).

An interesting line of research would be to investigate whether the reformulation of supervisory control problems into epistemic temporal logic makes the implementation of the solutions of these problems more feasible and efficient. A detailed comparison between these two kinds of implementation is foreseen and a series of benchmark will definitely be needed for that.

4 Mots-Clefs

Verification ; Supervisory Control Theory ; Epistemic Temporal Logic.

5 Bibliographie

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