Spring 2020

Knowledge Representation and Reasoning

Project 2: Deterministic Actions with Cost

Assumptions:

Let $\mathfrak{C}_2$ be a class of dynamic systems satisfying the following assumptions:

A1. Inertia law.

A2. Compete information about all actions and all fluents.

A3. Only deterministic actions are allowed.

A4. Only sequential actions are admitted.

A5. Characterisations of actions:

- ▷ Precondition represented by a set of literals (a fluent or its negation); if a precondition does not hold, the action is executed with empty effect;
- ▷ Postcondition (i.e., effect of an action) represented by a set of literals;
- ▷ Cost $\kappa \in \mathbb{N}$ of an action; actions with empty effects cost 0. Each action has a fixed costs, provided that it leads to non-empty effect.

A6. Effects of an action depend on a state where the action starts.

A7. All actions are performed in all states.

A8. Partial descriptions of any state of the system are allowed.

A9. No constraints are defined.

A *program* is a sequence $P = (A_1, \ldots, A_n)$, $n \geqslant 0$, of actions.

Task:

Define an action description language $ADL(\mathfrak{C}_2)$ for representing dynamic systems of the class specified above, and define the corresponding query language $QL(\mathfrak{C}_2)$, which allows us to get answers for (at least) the following queries:

Q1. Does a given goal condition γ hold after performing a given program P in an initial state?

Q2. Does an execution of a given program P cost at most κ?

Q3 Does a given condition hold in the initial state?

Implement the action language and the query language specified above.

Remark: According to the specification given above, $ADL(\mathfrak{C}_2)$ is an extension of the language $\mathcal{A}$ where costs of actions are involved.

Team members:

1. ..... **(Manager)**
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