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Homework Assignment 1: Knowledge Based Agents with CP0 Logic

Grau en Enginyeria Informàtica

# Introduction

This work had the goal to develop an intelligent agent that, having a grid of n x n cells with some envelopes hid, the agent had to find it out using a sensor to discover the position of the envelopes in the world. The agent located in a position (x, y) can receive these different readings from his sensor:

1. If there are some envelopes at positions {(x + 1, y – 1), (x + 1, y), (x + 1, y + 1)}, it will receive the reading: 1.
2. If there are some envelopes at positions {(x + 1, y + 1), (x, y + 1), (x - 1, y + 1)}, it will receive the reading: 2.
3. If there are some envelopes at positions {(x - 1, y – 1), (x - 1, y), (x - 1, y + 1)}, it will receive the reading: 3.
4. If there are some envelopes at positions {(x + 1, y – 1), (x, y - 1), (x - 1, y - 1)}, it will receive the reading: 4.
5. If there is an envelope at position (x, y), it will receive the reading: 5.

Using these readings in certain steps that the agent takes over the course of the execution, the agent must infer which locations might have an envelope and which locations will not have an envelope.

# **Our agent knowledge**

The agent starts the execution with information about the world dimensions and the fact that there is at least one envelope in the world. It also know that the envelopes in the map do not move, therefore when we find a not possible location for an envelope, we know it will always be not possible. Moreover the agent knows for sure that in a certain position there can not be more than one envelope. Finally, our agent can’t receive contradictory information.

# Propositional logical formulas

To build our Γ we started defining our variables:

* : We will use this variable to know the detector’s response in a certain position and for modelling the new readings we obtain at the current time.
* : We will use this variable to indicate that in the position (x, y) there can be an envelope and for modelling the new state resulting after we use the information from the new readings.
* : We will use this variable to save the informations about the envelopes into our agent’s memory and for modelling the previous state, just before we get a new sensor reading.

Our set of clauses:

For all the positions that are only in the range of one sensor reading, we create a clause that means that if there’s no sensor reading, there can’t be an envelope.

For all corners, that can be detected by two different sensors, we create a clause that means that if both sensors don’t give a reading, there can’t be an envelope since we know that there isn’t an envelope if only one server gives the reading.

To insert these clauses into the formula we had to transform them to CNF, like this:

* , and we use the same transformation for similar clauses.
* , and we also use this transformation for similar clauses.