Instituto Superior Técnico

Artificial intelligence and decision systems

Mini-project 2

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2.

a)

To encode the problem in planning domain description language (PDDL) to the conjunctive normal form (CNF) and posteriorly to DIMACS like advised, the procedure proposed in the project was followed.

To diminish the number of clauses, the at-most-one axioms wasn't done, once it is not necessary and the number of clauses reduced is substantial.

b)

To do the solver the Davis-Putnam-Logemann-Loveland algorithm (DPLL), present in the course notes was followed. To improve this algorithm three improvements were made:

1. Before starting the DPLL cycle, all the unit clauses present in the beginning sentence were eliminated and the value of the atoms present in this clauses was assigned in the dictionary.

2. The pure symbols routine was removed, because it is very inefficient. The clauses removed in this routine do not compensate the time that takes to do it.

3. In the assignment routine, the value assigned was always zero because the performance of the program is better this way. It was also tested the assignment of one or zero depending on the number of times that the atom appears positive or negative in the sentence, but the time that the program takes to solve the problems was bigger. If the value assigned was always one, the performance was also worst.

DPLL + Encoder times	**Tivial 3**	**Blocks 2**
DPLL	0.267 s	10.171 s
DPLL without pure symbols	0.177 s	4.046 s
DPLL removing unit clauses in the beginning	0.155 s	6.571 s
DPLL with assignments = 0	0.224 s	9.752 s
Final DPLL	0.049 s	2.326 s

Table 1: Table with the times obtained with no improvements, each improvement and all improvements

As can be seen in the previous table, with the improvements made, the performance improved a lot. For the blocks 3 the solution is achieved but the performance is not good. It takes one hour and twenty seven minutes to achieve the solution.