Project 3: PDDL and Planning

Due: November 18, 2009 (Midnight)

Description: This project involves three parts: modeling wumpus world in PDDL, solving problems with three planners, and analyzing the results. Part one is worth 15 points, part two is worth 15, and part three is worth 20. Part one is due on November 11 by emailing a domain and problem instance to the grader and myself. If you do not complete part one, you will lose all points for it, but we will give you the domain description (and you will still need to formulate the problem instances).

Modeling Wumpus World in PDDL: A PDDL instance consists of two input files to a planner, a domain (or operator) file, and a problem (or fact) file. For info on writing domains in PDDL, visit: <http://www.ida.liu.se/~TDDA13/labbar/planning/2003/writing.html>

The requirements for the domain file are the following:

* Use typed variables.
* You decide on predicates required to express state and action schemas. Make sure that all variables of predicates are typed.
* Create one action schema for each action available in the fully-observable version of the wumpus simulator (used in project 1): turn-left, turn-right, move-forward, shoot, grab-gold.
  + No action can be done if you are dead.
  + You have unlimited arrows.

The requirements for each problem is as follows:

* Use typed objects.
* Specify true variables in initial state.
* Specify goal is to have gold.

The requirements on the set of problems that you generate are as follows:

* You must generate five different problems for each grid size 4, 8, 16, and 32.
* At least one problem of each grid size must be unsolvable and at least one must be solvable.
* It is okay to write code into the simulator to generate the problems for you, and it is also okay to write the problems by hand.

Solving the problems: Use three planners (Blackbox, FF, and SGPlan) to solve each problem and collect total runtime and plan length results. Create plots of the results. Use a timeout of 30 minutes and a memory limit of 1GB (e.g., with “ulimit”).

We have put these three planners on linux11.bluezone.usu.edu along with several examples of PDDL problems (however feel free to find the source or binaries on the web and build your own). Access the planners as follows:

* ssh [user@linux11.bluezone.usu.edu:2273](mailto:user@linux11.bluezone.usu.edu:2273)
* Password: user
* The planners and sample domains are in a folder named CS5600.
* This is a public machine and you can copy the files to another linux machine to run your tests. Possibilities are linux01.bluezone.usu.edu to linux12.bluezone.usu.edu, using the same credentials.

Analysis: In analyzing the results of the planners, answer the following questions (5pts each bullet):

* How do the methods differ as problems become larger, from 4 to 32 sized grids? What might you attribute the differences in scalability to?
* How do the methods differ when comparing solvable and unsolvable problems? Does any one planner excel at showing no solution exists? Are the results consistent as the size of the grid changes?
* How do the methods differ in terms of plan length? Is it possible to scale best and have the best quality plans?

The last five points is for the quality of the presentation of the results (i.e., appropriate use of figures and/or tables) that back up your answers to the questions above. That is, answering the question is not enough, you also need to prove your point using the collected data.

References for the planers are:

Blackbox: <http://www.cs.rochester.edu/~kautz/papers/aips98-kautz.ps>

FF: <http://citeseerx.ist.psu.edu/viewdoc/download;jsessionid=C298292941277005F9732CCEABB07704?doi=10.1.1.28.7589&rep=rep1&type=pdf>

SGPlan: http://manip.crhc.uiuc.edu/programs/SGPlan/index.html