Assignment A3: Logical Agent

CS 4300
Fall 2015

Assigned: 3 September 2015

Due: A3a: 29 september 2015; A3b: 8 October 2015

For this problem, handin a lab report pdf (include name, date, assignment and class number in pdf) which develops and studies a Hybrid-Wumpus-Agent function as described in Figure 7.20 (p. 270 in the text) which incorporates the *Tell* and *Ask* functions using propositional logic and resolution theorem proving. The exploitation of the knowledge can be with simple rules, but should use A* path planning where appropriate (e.g, to go back to start and exit). Use the following five Wumpus boards to demonstrate the behavior of your agent (e.g., step through state transitions and KB as actions are selected and executed – see Figure 1); Red is a pit; blue is the Wumpus, Yellow is the Gold; and the agent is facing toward the end with the square.

Discuss the advantages and disadvantages of using the (propositional) logical approach and document based on your results.

A3a: Resolution Theorem Prover (due 29 September 2015)

Implement and demonstrate this as a separate function from the agent behavior. The function should be as described at the end of this assignment. There are no statistics in this report (i.e., no Analysis unless you ask questions that need to compute on the data). You should show that the method works, and probe things like the number of sentences produced during the resolution theorem proving, what's the relation, if any, between number of clauses in the KB or disjuncts in the theorem to the number of sentences produced or the time taken or number of iterations in the loop (if you use the brute force pairwise combination search).

A3b: Hybrid-Wumpus-Agent (due: 8 October 2015)

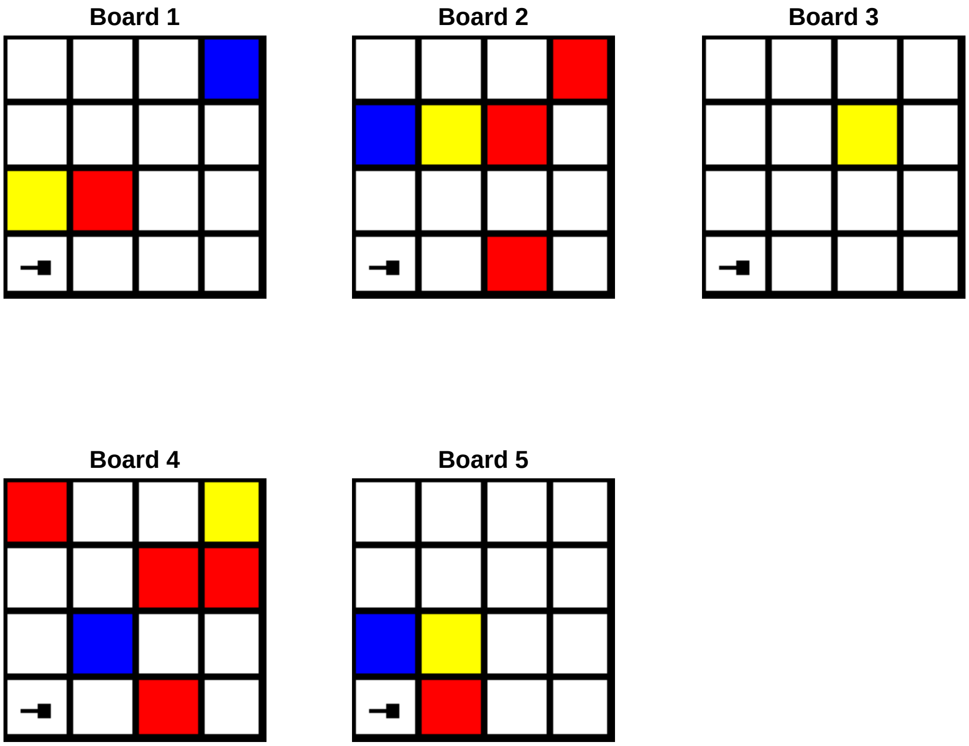

Figure 1: Five Boards to Test.

Implement the Hybrid-Wumpus-Agent using the resolution theorem prover in A3a. Here you should focus on:

- getting the hybrid-agent skeleton to work (e.g., combining the use of the KB with A*.
- develop and demonstrate a *MAKE-PERCEPT-SENTENCE* function.
- develop and demonstrate a *TELL* function.
- develop and demonstrate a *ASK* function.

Develop an appropriate KB to demonstrate the functions above.

For each, you should handin the report pdf as well as the source code developed in the study. The code should conform to the style requested in the class materials.

In addition, please turn in a hardcopy of the report in class before the start of class on September 29, 2015 (A3a) and October 8, 2015 (A3b).

Write a lab report in the format (please do not deviate from this format!) described in the course materials.

```
function Sip = CS4300_RTP(sentences,thm,vars)
% CS4300_RTP - resolution theorem prover
% On input:
%     sentences (CNF data structure): array of conjuctive clauses
%       (i).clauses
%           each clause is a list of integers (- for negated literal)
%     thm (1xk vector): disjunctive clause to be tested
%     vars (1xn vector): list of variables (positive integers)
% On output:
%     Sip (CNF data structure): results of resolution
%        []: proved sentence |- thm
%        not []: thm does not follow from sentences
% Method:
%  Let S1 = S.
% Let i = 1.
% LOOP until i = n + 1.
% Discard members of Si in which a literal and its
%    complement appear, to obtain Sip.
% Let Ti be the set of parent clauses in Sip in which Pi or
%    -Pi appears.
% Let Ui be the set of resolvent clauses obtained by
%     resolving (over Pi ) every pair of clauses C U {Pi} and
%     D U {-Pi} in Ti.
% Set Si+1 equal to (Sip\Ti) U Ui . (Eliminate Pi ).
% Let i be increased by 1.
% ENDLOOP.
% Output Sn+1.
% Call:  (example from Russell & Norvig, p. 252)
%     DP(1).clauses = [-1,2,3,4];
%     DP(2).clauses = [-2];
%     DP(3).clauses = [-3];
%     DP(4).clauses = [1];
%     thm = [4];
%     vars = [1,2,3,4];
%     Sr = CS4300_RTP(DP,thm,vars);
% Author:
```

```
%     Your name
%     UU
%     Fall 2015
%
```