

The Hebrew University of Jerusalem Introduction to  
Artificial Intelligence Problem Set 3  
Knowledge Representation, Planning

Due Date 10.06.2020

## 1 Resolution

### 1.1 Question 1

[33 points]

Athos, Aramis and Porthos belong to the Hoofers Club. Every member of the Hoofers Club is either a skier or a mountain climber or both. No mountain climber likes rain, and all skiers like snow. Porthos dislikes whatever Athos likes, and likes whatever Athos dislikes. Athos likes rain and snow.

Use resolution with one or more heuristics to find whether there is a member of the Hoofers Club who is a mountain climber but not a skier. Specify what kind of heuristics you used during the process of resolution.

### 1.2 Question 2

[33 points]

From “Horses are animals”, it follows that “The head of a horse is the head of an animal”. Demonstrate that this inference is valid by carrying out the following steps:

1. Translate the premise and the conclusion into the language of first-order logic. Use three predicates:  $\text{HeadOf}(h, x)$  (meaning “h is the head of x”,  $\text{Horse}(x)$ , and  $\text{Animal}(x)$ ).
2. Negate the conclusion, and convert the premise and the negated conclusion into conjunctive normal form.
3. Use resolution to show that the conclusion follows from the premise.

## 2 Planing

### 2.1 Question 3

[34 points]

Write the following planning task in SAS (i.e. as  $\langle V, A, I, G \rangle$ ):

There is a table  $T$ , a crane  $C$ , and  $n$  blocks.

Each block can be either on table, in the crane, or on one other block.

The crane can:

- *pick* a block from the table (if it is not holding a block).
- *drop* a block on table (if it is holding that block).
- *stack* block  $x$  on top of block  $y$  (if it is holding block  $x$  and there is no block on top of block  $y$ ).
- *unstack* block  $x$  from block  $y$  into the crane (if it is not holding a block, and there is no block on top of block  $x$ ).

Initially the blocks  $1 \dots n$  are stacked in a tower, and we want to swap the lowest two blocks ( $n - 1$  and  $n$ )