Artificial Intelligence — Final Test

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1 Propositional Logic

Formalize the following facts in propositional logic

1. If Paolo is thin, then Carlo is not blonde or Roberta is not tall.
2. If Roberta is tall then Sandra is lovely.
3. If Sandra is lovely and Carlo is blonde then Paolo is thin.
4. Carlo is blonde.
5. Roberta is not tall

and show whether fact (5) can be deduced from facts (1-4), i.e., whether the formula corresponding to (5) is a logical consequence of the set of formulas corresponding to (1-4). Prove your answer using either Variable Elimination or DPLL.

2 Logic

Formalize the following statements about long-distance travel in First Order Logic:

1. It is not possibile to travel within the same city.
2. If it is possible to travel from city A to city B, then it is also possible to travel from city B to city A.
3. If it is possible to travel from city A to city B, and from city B to city C, then it is also possible to travel from A to C.

Answer the following questions, providing proofs reasoning on interpretations:

- Are the sentences consistent?

- Given the domain $D = \{genoa, turin, milan, venice\}$ and the interpretation function g such that

$$g(CanTravel) = \{(genoa, turin), (milan, venice), \\ (milan, turin), (milan, genoa)\}$$

  tell whether the interpretation satisfies all the sentences or not;

- Tell whether the sentence "If it is possible to travel from A to B and from B to C, then it is also possible to travel from C to A" is a logical consequence of the statements or not.

3 Planning

Use PDDL-STRIPS to formalize a domain of garden landscaping considering the following constraints:

- flowering plants are made available in a crate; the crate can contain several plants;
- to be placed in the garden, a plant must be placed in a vase; a vase can contain only one plant;
- both the crate and the vases are available at a single location in the garden (the "store");
- plants in vases can be moved to spots in the garden; each spot can contain only one plant;
- some spots are reachable directly from the store, some are reachable through other spots; passing by a spot is possible only if the spot is not occupied by a vase.
- a gardener robot can either put a plant in a vase or move a vase to a spot in the garden, handling one plant and one vase at a time.

The scenario is the following:

- there are four plants in a crate and four empty vases located in the store;
- there are four spots in the garden, of which two are reachable from the store directly, and two are reachable through other spots; in particular, spot A and spot B are reachable directly, spot C is reachable through A and spot D is reachable through B.

The goal is to have all the plants put in the vases and placed in the spots.