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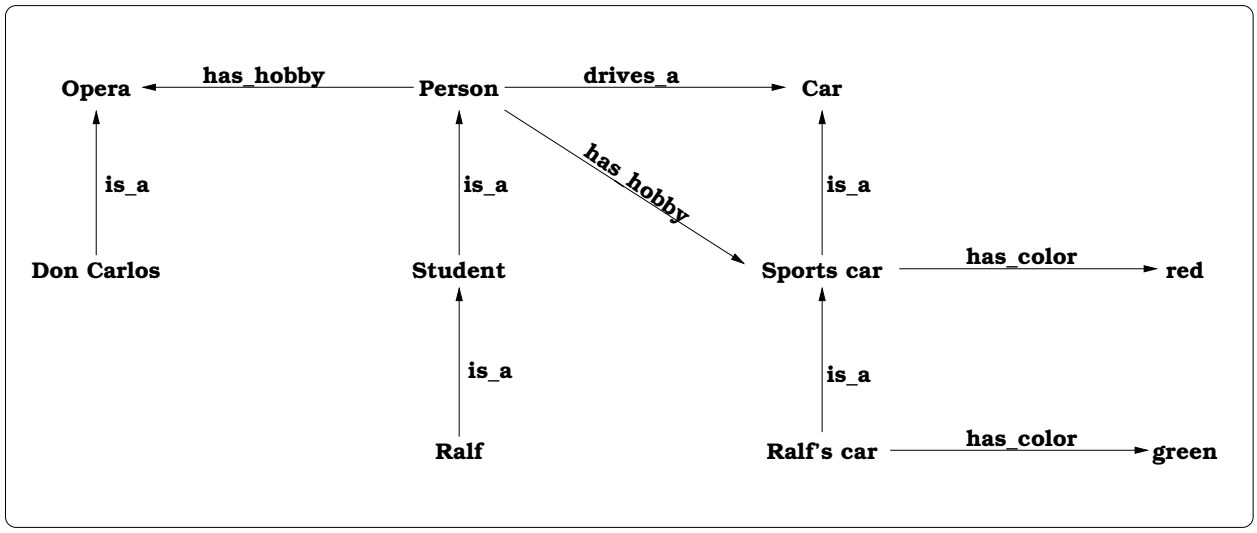
2. Exercises for the Course 'Description Logics'

Exercise 3:

Consider the following semantic network:



(a) Which nodes are concepts, which objects?

(b) Describe some possible meanings of property edges.

(c) Which color has Ralf's car?

(d) What are the communalities between sports cars and operas?

Exercise 4:

Construct a semantic network that (partially) describes supermarkets. Use concepts such as Supermarket, Shop, Food, Employee, and property edges such as sells and works-for. Find additional concepts and relationships.

Exercise 5:

Define a generic frame that describes the prototypical object "computer science course". Use slots

- *Title*,
- *Lecturer*,
- *Type of course*, and
- *Hours per week*.

Find other meaningful slots. Then construct an instance frame for the generic frame.

Exercise 6:

Let φ and ψ be propositional formulae. Prove or disprove the following propositions:

(a) If $\varphi \to \psi$ and φ are valid, then ψ is valid.

(b) If $\varphi \to \psi$ and φ are satisfiable, then ψ is satisfiable.

(c) If $\varphi \to \psi$ is valid and φ is satisfiable, then ψ is satisfiable.

(d) If $\varphi \vee \psi$ is valid, then ψ is satisfiable.

Exercise 7:

A propositional formula using only the constructors $\wedge$, $\vee$, and $\neg$ is in *negation normal form* (NNF) if negation occurs only in front of propositional variables.

Prove that each propositional formula can be transformed into an equivalent one in NNF in polynomial time.