

Knowledge Representation and Reasoning

Exercise Session 5

Exercise 1. Type Graph

(*)

Let $\varphi = x \mathcal{U} \neg y$

1. Find the types of φ
2. Construct the type graph
3. Identify initial and final types

Exercise 2. Model Counting

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How many temporal models of **length 2** satisfy the formula φ from Exercise 1?

Exercise 3. KR 1

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1. Construct an LTL_f formula describing the following specification of a (simplified) traffic light; you can use the abbreviations seen during the lecture.
 - the light is either green or red, but never both
 - whenever the light is red, it will eventually turn green

Hint: use the propositional variables **green** and **red**.

2. What characterises the **last** timepoint of all models satisfying this specification?

Exercise 4. KR 2

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1. Extend the specification from Exercise 3 to include two traffic lights (with variables **green_i** and **red_i** ($i = 1, 2$)) such that the two green lights are never simultaneously on.
2. Is this specification satisfiable? If yes, give a temporal model satisfying it; if not, envision a way to fix it

Exercise 5. Model Size 1

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Build a formula that is satisfied by models of **even** length only, or argue why it cannot exist.

Exercise 6. Model Size 2

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Build a formula that is satisfied by models of **prime** length only, or argue why it cannot exist.

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