Exercise Sheet 2

Due: 20.11.2023

Please include the names of all group members on your hand-in.

Exercise 1   Modelling Terminological Knowledge   (5 Points)

Model terminological knowledge from a domain of your choice (family relationships, sports, public life, economy, social networks, ...) in description logic, using general concept inclusions. Example: $\mathsf{PopularGuy} \sqsubseteq \forall\mathsf{hasFriend}.\mathsf{PopularGuy}$. Which notions can be modelled, which cannot (examples!)? For which notions can one make do with acyclic terminologies?

Exercise 2   Tool Use   (4 Points)

Install the *Protege* ontology editor and use it to write down your example ontology in OWL. This requires independent acquisition of the syntax used in the tool, which deviates from the one used in the lecture. Experiment with reasoners (available as plugins), and report on the results of example queries.

Exercise 3   Deduction in Modal Logic   (6 Points)

Show soundness of the following proof rule:

$$\frac{\phi_1 \wedge \cdots \wedge \phi_n \to \phi_0}{\Box\phi_1 \wedge \cdots \wedge \Box\phi_n \to \Box\phi_0}.$$

Formulate a version of the rule in description logic notation (German DL). Show that, on the other hand, the rule

$$\frac{\neg(\phi_1 \wedge \cdots \wedge \phi_n)}{\neg(\Box\phi_1 \wedge \cdots \wedge \Box\phi_n)}$$

is unsound. Which property of models needs to be required to make the rule sound? Prove soundness assuming this additional property.

Exercise 4   (No) Bisimilarity   (5 Points)

Give two independent arguments showing that the roots of the following tree-shaped Kripke models are *not* bisimilar, one using modal logic and one working directly with the definition of

bisimilarity: