Computational Logic Lab

13/11/2024

Use the SMT-solver z3 to solve the following problems.

(1) Prove that the following syllogism is correct:

All men are mortals.
No mortal is perfect.
_____
Hence: no man is perfect.

whereas the following one is not correct:

All men are mortals.
Some mortals lie.
_____
Hence: some men lie.

(2) Determine whether the following inference is correct or not

There are friends of yours that are not friends of mine.
All friends of mine like skiing.
_____
Some friends of yours do not like skiing.

(3) [Puzzle: barbershop club.]   *There is a barbers club that looks like this:*
 - If a member X of the club cut the hair of some member of the club, then all members of the club cut X's hair.
 - Two club members are named Guido and Cesare.
 - Guido cut Caesare's hair.
 Did Caesar cut his own hair?

(4) Show that the proposed solution of the detective story below is correct:

Someone who lives in Dreadbury Mansion killed Aunt Agatha. Agatha, the butler, and Charles live in Dreadbury Mansion, and are the only people who live therein. A killer always hates his victim, and is never richer than his victim. Charles hates no one that Aunt Agatha hates. Agatha hates everyone except the butler. The butler hates everyone not richer than Aunt Agatha. The butler hates everyone Aunt Agatha hates. No one hates everyone. Agatha, Charles and the butler are different persons. Therefore: Agatha killed herself.

[*Hint*: use constants A, B, C for Agatha, the Butler and Charles. Declare three binary predicates 'hates', 'kills' and 'richer'. Then write down the relevant assertions you can get from the above story description (notice that you do not need to impose specific constraints on the predicate "richer", just treat it as a pure binary predicate symbol).]