CS323 - Problem Set #1

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1 The Hanks-McDermott shooting problem

Definition 1.1 *The* Hanks-McDermott shooting problem *(sometimes refered to as the "Yale shooting Problem") is the following story: A person can be either* ALIVE *or* DEAD. *A gun can be either* LOADED *or* UNLOADED. *At a known situation the person is alive, and a gun become loaded whenever a* LOAD *action occurs. Any time a person is shot (i.e., a* SHOOT *action) with a loaded gun, he becomes dead.*

Problem 1.2

1. *Formalize the problem in Situation Calculus. Emphasize which are your Frame Axioms.*
2. *Show the process of LOAD;SHOOT as a chain of situations, emphasising what sentences are true in each situation.*
3. *Add the action WAIT (with the apropriate axioms) to your Database. Show the process of LOAD;WAIT;SHOOT as a chain of situations, emphasising what sentences are true in each situation.*

2 The Missionaries and Cannibals Problem

In this Problem Set we will deal with a *soft* version of the MCP we will call the Elementary-MCP.

Definition 2.1 *The* Elementary-K Missionaries and Cannibals Problem *is the following problem:*

K missionaries and K cannibals get to a river. There is a bridge over the river, and they want to cross over to the other bank. How shall they cross?

Problem 2.2 1. *Enter the formalization of the Elementary-1-MCP given in the handout (and present on the web site) to the PVS. Check that you can prove the solvability of the problem using the proof given in the handout (and present on the web site).*

2. *Formalize the Elementary-2-MCP in Situation Calculus. Alter the formalism given for the Elementary-1-MCP in order to run it on the PVS. Prove that your formalism is solvable using the PVS (You can get the copy of the original file electronically from the web, instead of copying it). Point out the Frame Axioms you used.*

3 Blocks World

Problem 3.1 1. *Formalize the Blocks World s.t. you have 3 blocks, A is on B, B is on the table, and C is on the table. Do that in two ways: One using a 'location' function, and the other using an 'on' predicate.*

2. *What are the signatures of your languages above?*

3. *Using no Frame Axioms, what can you prove in one that you can not prove in the other? Give two models (not isomorphic) for each formalism (without the Frame Axioms).*