CS323 - Winter 97 - Homework #3

Due date: February 18th

February 6, 1997

1 Abnormality Theory

Problem 1.1 *Write the following in Situation calculus (Note that there are some times where I write words such as 'usually' and 'in general', and other times where I omit these words). Decide where should abnormalities be used.*

1. *Tweety is a bird. Birds normally fly. Penguins normally do not fly. Penguins are birds. In general things do not fly. Birds are 'things'. Mammals are things. Mammals normally do not fly. Bats are mammals. Bats normally fly.*

2. *A tool is normally usable. A boat is a tool. Boats usually have oars. Oars are tools. A broken oar is not usable. Boats are usable only in the presence of usable oars. A motorboat is usable even in the absence of oars. A motorboat requires gasoline for its actions.*

Problem 1.2 *Take one of the formalizations you give for the previous problem, and prove that it "works" using Circumscription (you are supposed to come up with the way the abnormality should be circumscribed, and with the proof that it results with the right outcome).*

Problem 1.3 *Take the formalization you took in the previous problem, and express it in Reiter's Default Logic. Show the extensions you get (and prove that it is an extension).*

2 PVS vs The Missionaries and Cannibals Problem

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

> *3 missionaries and 3 cannibals get to a river. There is a boat on their bank of the river, and they want to cross over to the other bank. They do have a problem though. The boat can carry two people at one time, and if ever the Cannibals outnumber the Missionaries in either bank, these last will be eaten. How shall they cross?*

Problem 2.2 *1. Formulate the MCP in the PVS using Situation Calculus. Your formalization can either use names (e.g., $M1$, $M3$, $C2$, etc.), or counting of the cannibals and missionaries on either bank, or any other formalization that comes in mind. Prove that the problem is solvable using the PVS.*

Note: *Note that this time you have the* boat *and the preconditions on the quantities on each bank.*

2. Discuss the benefits and drawbacks of the approach you chose versus one other possible approach (your pick). Lead: Find out what happens when you hear that one of the missionaries is Jesus Christ (who presumably can walk on water and is not incapacitated when eaten).