Knowledge Representation - Assignment 3 Report

Minh Ngo 10897402[1], Casper Thuis 10341943[2]

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[1] University of Amsterdam
MSc. Artificial Intellegence
minh.ngole@student.uva.nl

[2] University of Amsterdam
MSc. Artificial Intelligence
casper.thuis@gmail.com

The qualitative model created in current report is based on the commutative vessels. The model represent two vessels with liquids and a pipe between them. The qualitative model should reason about the possible states that can be reached from the initial state. The model has multiple entities that such as, the container left and the container right, the oil in both containers(oil left and oil right), and the pipe between the containers. These entities are described in the scenario and shown in the picture below.

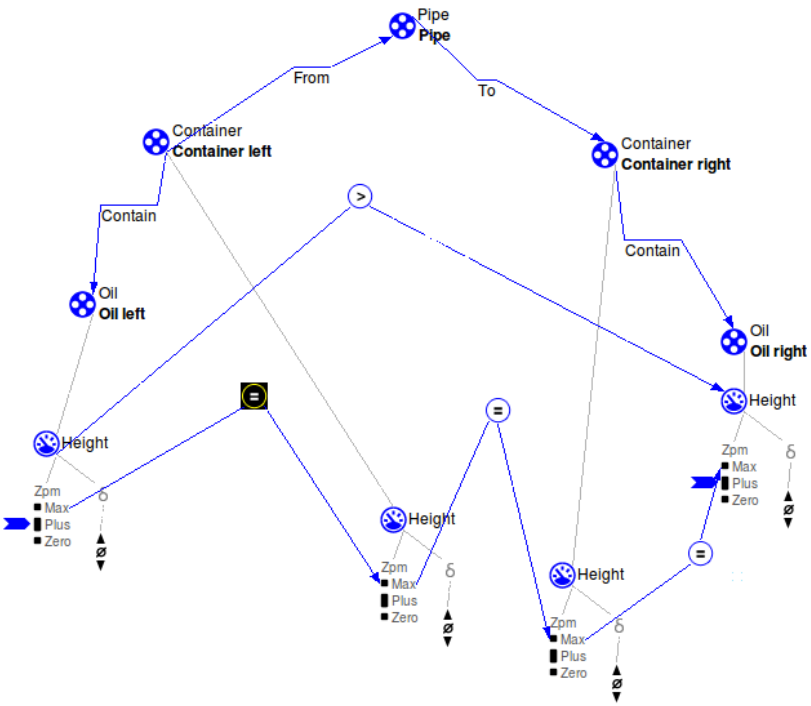

Figure 1: Scenario

The model fragments describe the causal relation between the entries in our model. The causal relations in the model are defined as the proportional relation and influence relations. There are number of causal relation defined in the model fragments. The first model fragment, contained liquid, describes the causal relation of the contained liquid. The causal relations are, the amount of liquid is positively proportional with the height and the height is positively proportional with pressure and they are equal to each other. This causal relation is validate because the width of the vessel is the same. The model fragment, liquid flow, describes the causal relation of liquid flow. The flow is negatively influence the amount of the left vessel while positively influence the amount of the right vessel. This

illustrate the change in amount of liquid in both vessels. The flow has a causal relation with the difference of pressure between the two vessels. These are positively proportional with the left vessel and negatively proportional with the right vessel because of the calculus property, is equal, between the pressures. The termination state is that both pressure are of equal value.

The simulation results of the results of the model without the equal height and with the equal height relation are discussed here.

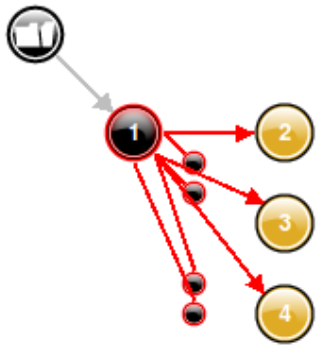

Figure 2: States and termination without the use of equal relation between the height of liquid and height vessel

There are four states in the model without the use of equal relation between the height of liquid and height vessel:

- State 1: At the beginning the amount of oil in both containers is a positive value, that cause to the same state for liquid height. The height of oil in the left is higher so the pressures flows from left to right.
- State 2: Because of the moving of the flow from left to right, the amount of oil in the two containers overflows from the right container, however it is still more in the left container left, thus the termination state is not reached.
- State 2.2: The overflow reaches an equilibrium because both pressures are equal now, however there has been overflow from state 2.
- State 3: Because of the moving flow from left to right, the amount of oil in two containers becomes equal (and the same will be for liquid heights) that cause the equal pressure from both vessels and later stop flowing. In this state there has been no overflow

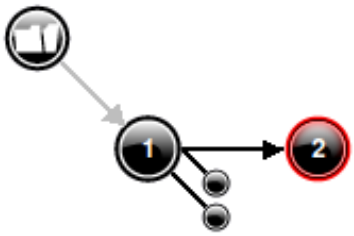

Figure 3: States and termination states with the use of equal relation between the height of liquid and height vessel

In the second simulation additional constraints have been added to be sure that the liquid doesn't overflow the vessel that reduce an amount of states. Therefore, only state 1 and the state 3 from the list above are possible in the second simulation. This is the desired modelling given or problem.