MSIT-SE-M-01 Models of Software Systems

Project 2: Z Modeling

Innopolis University **Due: October 28, 2015**

The purpose of this project is to give you experience in modeling a realistic system as a Z specification. The example that we will use is the Infusion Pump. A general description of an Infusion Pump can be found in the General Project Documents folder on the class blackboard.

You should carry out this project in your assigned team. Make sure that everyone in the group contributes to the overall effort. Each team should submit a single write-up of the project, due at the beginning of class on the project due date. We have posted a template for a group project write-up under the LaTeX section of the course web site.

Task 1 (90 points):

From a certain level of abstraction, a machine with multiple, concurrent threads may be considered to be a machine with a single thread, particularly if we do not permit events to occur simultaneously. From this point of view, it is possible to treat an N-channel infusion pump as a sequential system where events may occur in any one channel, but at different times. Moreover, the specification of events' timing is a non-trivial task and we can abstract away when the events must occur.

Your first task is to develop a specification of a 3-channel pump. Use the description of the model from the Blackboard site to define the requirements for the pump. Your model should show how the pump operates in the presence of failures and, also, consider the behavior in the presence or absence of electric power. As a hint, consider separating the model of a channel from the model of a pump that houses 3-channels. You should use promotion (just as in the Library Problem) to extend a model of a channel to the model of the pump.

Be sure to document your specification with appropriate explanatory prose

Effective use of the schema calculus will be one of the evaluation criteria for your specification.

Be sure to typecheck your specification using fuzz, Z-Eves, or CZT.

Answer the following questions in your project write-up:

1. Describe any decisions that your team made in resolving ambiguities in the English description. Also describe alternatives you considered and rejected.
2. Would your model be more complicated if there were more channels?
3. What happens when the pump is out of liquid?
4. Is it possible to dispense medicine without first setting a rate?
5. Is it possible to start the pump when the key is locked?
6. What happens when the the pump is out of power?
7. Are there any extensions in your model not defined in the written description of the pump?

The full specification should be attached to your project write-up. Hand in a hard copy and email a soft copy to the course teaching assistants before class on the due date.

Task 2 (10 Points):

For the second part of your project you should write a short essay (less than 1 page) that speculates on a more-complete Z model of the infusion pump. In particular, consider how you might use the Z schema calculus to introduce start- and end-times and duration into your model. Additionally, reflect on the experience of developing a model in a group; concentrate on how the formal model helped or hindered you in understanding the infusion pump.