Software Engineering
The University of Auckland

SOFTENG 752
Formal Specification and Design
Assignment #2

Due: 5pm, Friday 21 October, 2022.

This assignment is an extension to assignment 1. You are required to refine the B design of assignment 1 using the UML Object Constraint Language (OCL) and the Communicating Sequential Processes (CSP) language. The first part of the assignment is to provide a OCL description of the design and validate it with the UML Specification Environment (USE). As the assignment 1 was focused on the formal specification itself, the assignment 2 should extend the design into an UML object oriented model with OCL specifications and focus more on exploring the dynamics of the design through validation. You are required to specify the design model in the USE format and simulate the design by creating a set of objects/instances and checking the structure, invariants and pre/post-conditions of the specification.

The second part of the assignment is to further extend the model you have and focus more on event based modelling (i.e., describing the interactions) in your design using the CSP notation. You need to clearly specify the processes in the system together with the descriptions in terms of events and communications. Your CSP design should be simulated and verified using the ProB model checker.

Finally for this assignment, you are required to provide a summary on discussing the relationships of the four models you developed in assignment 1 and 2 (i.e., Z, B, OCL and CSP), in terms for the connections in their designs, pros and cons, lessons learned, etc.

Project requirements and what to submit:

- This assignment could be worked on as a single person task or in a group of no more than two students.
- Submit an OCL formal specification model of the project in the USE format.
- Submit an USE simulation file which includes the commands for creating objects, checking of the structure, invariants, and validating pre-/post-conditions of operations.
- Submit a CSP model in ProB format, and you should use the ProB tool to assist the modelling and verification.
- Submit a summary discussion of the Z, B, OCL and CSP modelling in PDF format, which should be individually written.

The assignment submission should be made via Canvas as a single zipped file containing all the required documents.

Assessment

The assignment will be assessed for 100 marks in total (= 15% of the final grade), which consists of:

- UML specification and validation (55 marks), i.e.,
  - structure and properties (10 marks)
  - concise and correctness (10 marks)

  - complexity and completeness (15 marks)
  - simulation and verification of the design (20)

- CSP specification and verification (35 marks), i.e.,
  - structure and properties (10 marks)
  - concise and correctness (10 marks)
  - complexity and completeness (10 marks)
  - simulation and verification of the design (5)

- Summary of Z, B, OCL and CSP modelling (10 marks).

The due date of assignment 2 is Friday, **October 21st, 2022, 5:00PM**.