

Spin: Exercises - Part B*

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Thi Thieu Hoa Le, Alessandra Giordani, Patrick Trentin for FM lab 2005/15

Exercise 1: oscillator

Exercise: Write a Promela model that initializes a global integer variable **sum** to be 0. Model a process **P**, stuck in an infinite loop, which:

- draws a random value included in $\{1, 3\}$ and assigns it to **v**
- updates the value of **sum** as follows:
 - if **sum** is positive valued, it subtracts **v** to its value
 - otherwise, it adds **v** to its value

Verify the following **ltl** properties:

- the value of **sum** is equal to 0 infinitely often
- the value of **sum** is never larger than 3 or smaller than -3
- it always the case that if **sum** is greater than 0 then it will eventually be smaller than 0, and if **sum** is smaller than 0 then it will eventually be larger than 0

Q: why is the third property **not** verified? can you fix it?

Exercise 2: railway station

Exercise: In a railway station **trains** are continuously arriving and leaving. Goods are contained in some cargos and, depending on the weight, they are moved from/to either **trucks** or **vans**.

Write a Promela program that models this scenario considering **each cargo as a message** that should be sent/received through the right channel. Each **channel** (train, truck and van) can contain **16 cargos** as a maximum. The **maximum weight** of each cargo in a van is **128**.

You will need two processes:

- ‘‘split’’, that splits goods from the train channel, dividing them over the other two channels, truck and van, depending on the weight values attached
- ‘‘merge’’, that merges the two streams back into one, most likely in a different order, and writes it back into the train channel.

Here are the initial cargo weights on the train: 345, 12, 6777, 32, 0;

Example 3: word counter

Exercise: In each sentence (string hereafter) the number of the characters composing the string is greater or equal than the number of the words contained in the sentence. A word is characterized by delimiters:

- space ' '
- tabulation '\t'
- endline '\n'

Write a spin function **count()** that performs property-based slicing of a string channel, counts the number of characters **nc** and the number of words **nw** and checks if the property $nc \geq nw$ is always true.

Use the `init` function to pass to `count()` a string (remember that you can model a string as a channel of integers corresponding to ASCII characters).

Exercises Solutions

- will be uploaded on course website within a couple of days
- send me an email if you need help or you just want to propose your own solution for a review

- learning programming languages requires practice: try to come up with your own solutions first!