Software Verification & Validation

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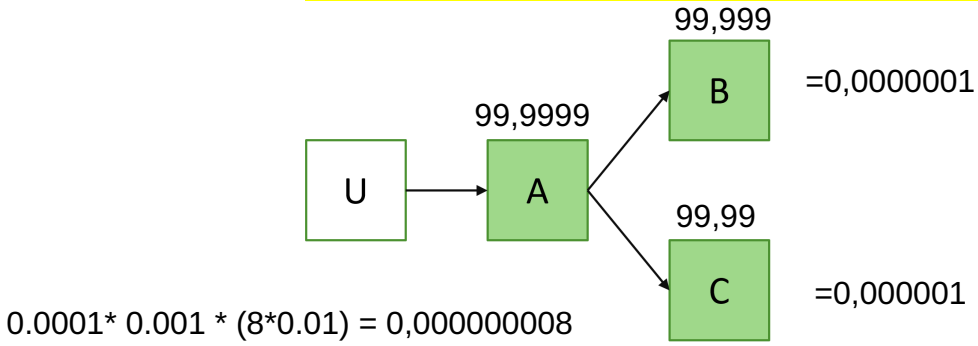
Assignment #3

Adapted from work by Peter Heusch

Exercise 3.1: Reliability

We will consider a software system that answers queries from a user. Module A receives queries from the user. In order to respond, it has to query module B once and module C eight times. Module A has a six nines reliability (if it receives correct answers from module B and module C). Module B has five nines and module C has four nines.



1. What is the probability of a correct answer to a user's query by module A assuming the answer will always be wrong when either of its queries is answered incorrectly?
2. How does this probability change if module A can detect errors in answers from module C and will simply re-query module C if it receives an incorrect answer?

Exercise 3.2: Loop Programs and Primitive Recursive Functions

For each of the following problems, write a Loop program and define a primitive recursive function that compute the required result.

- Given parameter `a` compute `2 * a`. xi := xj + xj
- Given parameters `a` and `b` compute `a * b`. xj := xi + xi
  LOOP a DO xj END
- Given parameter `a` compute `a^2`.
- Given parameter `a` compute `2^a`.
- Given parameters `a`, `b` and `c` compute `a^b + c`.
- Given parameter `a` compute `a!` (factorial).
- Given parameters `a`, `b` and `c` compute `max(a, b, c)`.