Modelling and Validation of Concurrent System

António Ravara

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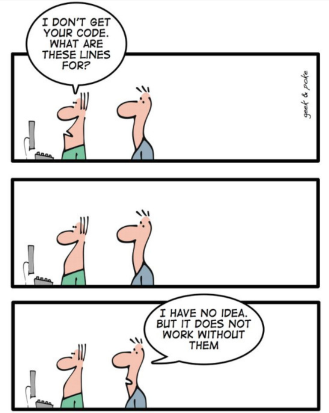

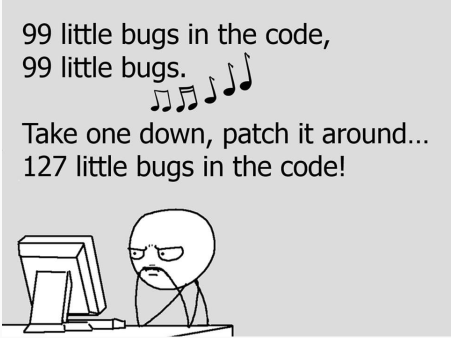

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  In short:
  no room to failures!

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- How to keep them safe?
  Are they hackable?

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Viable approach
Mathematical tools:

- represent rigorously the intended behaviour
- allow to formally verify correctness.

Dijkstra –'72 Turing award: "The humble programmer"

"Program testing can be used to show the presence of bugs, but never to show their absence!"

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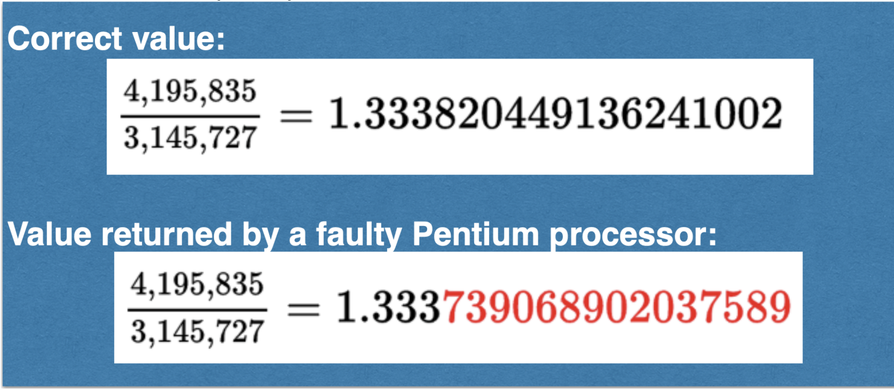
How to avoid these kind of problems:

Hacker-Proof Coding:
`https://www.wired.com/2016/09/computer-scientists-close-perfect-hack-proof-code/`

`https://cacm.acm.org/magazines/2017/8/219596-hacker-proof-coding/fulltext`

Are formal tools really needed? What can go wrong...

Pentium 5 bug (1994): rounding error



https://en.wikipedia.org/wiki/Pentium_FDIV_bug

Formal tools at work

Success stories

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  184701-how-amazon-web-services-uses-formal-methods/
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- Code verification at Facebook
  http://fbinfer.com

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- requirements to model concurrent reactive systems
- the calculus of communicating systems (CCS)

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Friday (optional): Research problems

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- R. Milner: Communicating and mobile systems - the Pi-calculus. Cambridge University Press 1999
- L. Aceto, A. Ingólfsdóttir, K. Larsen, J. Srba: Reactive systems: modelling, specification and verification. Cambridge University Press 2007
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Slides and exercises

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