

Honors Class (Foundations of) Informatics



11 October 2010 – 10 January 2011
Ten lectures on Mondays 17:45 – 21:00

Tom Verhoeff
and invited guest lecturers

Department of Mathematics & Computer Science
Software Engineering & Technology

www.win.tue.nl/~wstomv/edu/hci

Why?

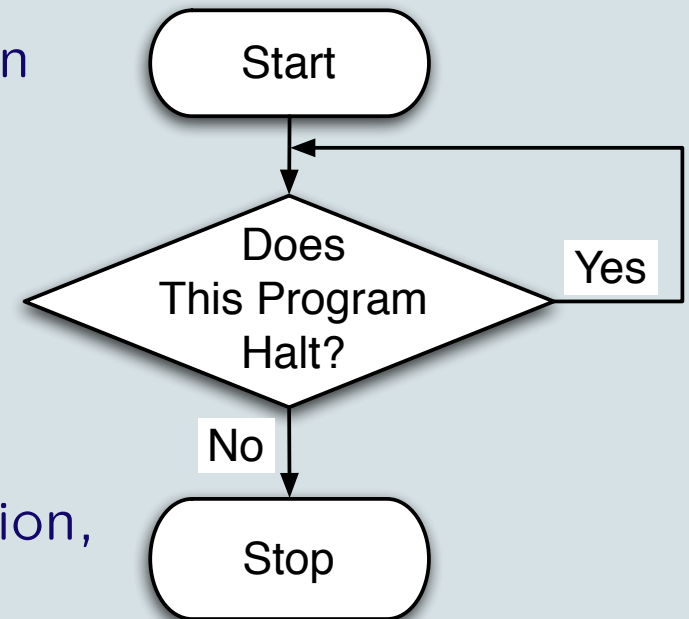
- Most computer science books/courses are about boring details, relevant only in the short term, not deserving the title 'science'
- Computer driving license
- Scientific foundations are important, long lasting, and fun

The Science of Computing

- Informatics is a *Science of the Artificial*
- Related to Mathematics
- A man-made world, limited only by our imagination
- Fundamental: *algorithm* and *information* play a role in all sciences
- Modern scientific models involve/describe *behavior/interaction*

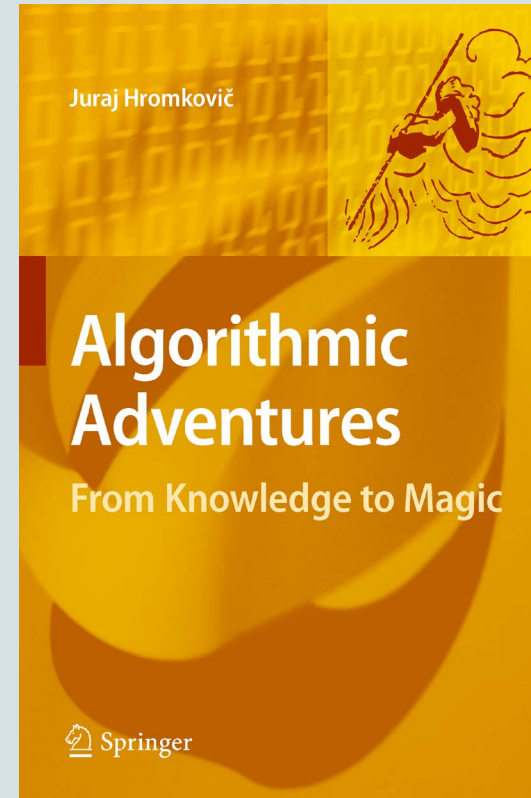
What?

- Algorithm, program, language, (cellular) automaton, universality
- Limits of (efficient) algorithms: computability, $P \stackrel{?}{=} NP$
- Randomization, (numerical) approximation
- Cryptography
- DNA Computing, Quantum Computing
- Optional: Grammars, measuring information, error control codes, data compression



Course Material

Algorithmic Adventures
by Juraj Hromkovič
Springer Verlag, 2009
www.springerlink.com



+ Various handouts

Questions?



Challenge

Consider this parallel program modifying shared integer variable x :

$$(x := x + 1)^{100} \parallel (x := x + 1)^{100}$$

Each of the two parallel components increments x one hundred times.

Each increment $x := x + 1$ is done via a local register (variable) l_p :

$$l_p := x ; l_p := l_p + 1 ; x := l_p$$

The actions of the two components are interleaved arbitrarily.

Initially $x = 0$.

What final values can x get? What is the smallest such value?