Concurrent Programming

1: Introduction

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SDU

Concurrent systems

- Systems where multiple executions take place at the same time.

- Executions may interact with each other.

- Think:

    - Some applications may collaborate together.

    - A single application using multiple CPUs at the same time.

Why concurrency?

- Two main motivations.

- Speed:

  - CPUs are not getting much faster every year…

  - ...but they are getting more cores!

- Networks:

  - Computers are not getting much faster every year…

  - ...but our networks are getting bigger!

Concurrency is hard!

- Programming is difficult enough already.

- It gets harder when you think about *multiple* executions.

- So I designed a hard course…

- …that will hopefully make concurrency easier for you. :-)

I deal with it every day

- I maintain the Jolie programming language (jolie-lang.org)

- It's a language meant for concurrency.

- Open source: I review the patches.

Topic

- Techniques for designing and programming concurrent systems.

- Focus is on:

  - The key concepts behind concurrency.

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Course Structure

- This course uses (a variant of) Flipped Classroom!

- You read the book and do exercises during the exercise classes.

- You then come to the frontal lectures with me:

  - I'll expect you to have read the book chapters I assigned.

  - Live coding and more practical insight.

  - Reflection (quizzes and other surprises).

Course Material

- Slides.

- **The Book:** Java Concurrency in Practice. *Brian Goetz et al. Addison-Wesley*.

- The book has a website: http://jcip.net/

- More resources during the lectures.

What we will strive to learn

- Define concurrency.

- Design and implement concurrent programs.

- Reason about the efficiency of a concurrent program.

- Reason about the **correctness** of a concurrent program.

The General Objective

- Understand how we can exploit having a lot of cores in our CPUs and a lot of devices connected together.

Evaluation

- Final project with report:

  - You will all solve the same problem.

  - External censor, 7-point scale.

  - The problem will be given later during the course.

  - The structure of the report will also be given.

Communication during the lectures

- Don't leave me alone, I'll bore myself.

- So there will be some quizzes.

- Also, I need to get feedback from you.

- The Humming feedback system!