DM869: Advanced topics in concurrent systems

Introduction

Saverio Giallorenzo
saverio@imada.sdu.dk

Marco Peressotti
peressotti@imada.sdu.dk

IMADA, SDU

https://github.com/mperessotti/acs2019

Course participants

- Who are you?
- What is your study programme?
- What would you like to do in the future?
- Why did you register for this course?

Course Topics

- Why is reasoning (programming, checking, maintaining) concurrent systems hard? Because computation is
  - distributed;
  - overlapping;
  - interdependent;
  - interacting.

We need a formal approach

Heyman's mutual exclusion algorithm (for two processes):

Process 1

```
while true
  [ noncritical section ]
  b1 = true;
  while k != 2
    while b2 skip;
    k = 1;
  [ critical section ]
  b1 = false
```

Process 2

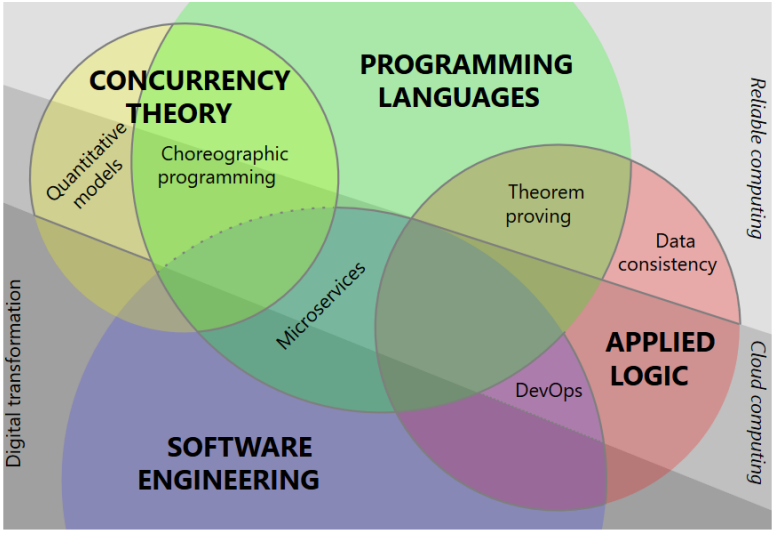
```
while true
  [ noncritical section ]
  b2 = true;
  while k != 2
    while b1 skip;
    k = 2;
  [ critical section ]
  b2 = false
```

How can we be sure that the algorithm is correct? (SPOILER: it is not!)

Course focus

- Research&Development!
- Models for the unambiguous definition of concurrent systems.
- Reasoning techniques for proving interesting properties.
- Practices and tools for designing, developing, and maintaining concurrent systems.

Course teachers (and research group)



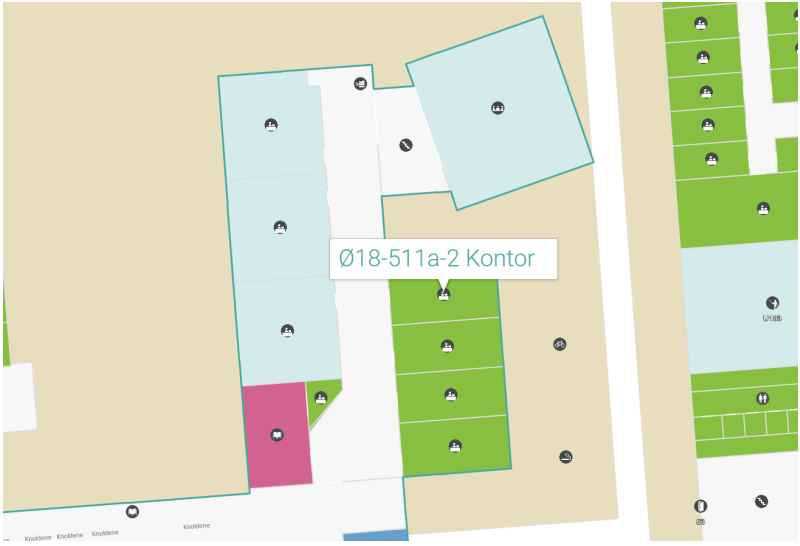
concurrency.sdu.dk

- Luís Cruz-Filipe
- Jacopo Mauro
- Fabrizio Montesi

Yours truly

- Saverio
- Marco

Course teachers



Course structure & material

Structure:

- Frontal lectures;
- Reading groups;
- Exercises.

Material:

- Slides
- Online lecture notes
- Research papers

Course “page”: `github.com/mperessotti/acs2019`

Continuous feedback: quiz on `www.socrative.com` room DM869

Learning objective

Understand and reason about bleeding-edge techniques for concurrency.

- Describe the main contributions of selected articles about concurrency;
- Compare advantages and disadvantages of different approaches;
- Reflect and report on findings extracted from the literature in a systematic way;
- Criticize the state-of-the-art and propose new variants and solutions.

Evaluation

- Oral defence
  - Seminar (reporting on an assigned topic and selection of papers)
  - Questions (about anything covered in the course, not only your seminar)
- External censor, 7-point scale

Reading groups and attendance

- We will select and assign papers to a different “reader” (one of you).
- The reader has to read the paper and prepare a presentation.
- In the following week, the reader presents the paper (seminar).
- During and after the presentation, we discuss the paper (split in defenders and detractors).
- Everybody has to read the paper!
- Attendance is important, because of these seminars.
- We will be the first readers, to give an example.