Introduction to Formal Methods
Chapter 00: Course Overview

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Target

- The course will be given in English.
- The course is intended for 1st or 2nd year M.S. students in computer science ("corso di laurea magistrale in informatica"), but it is open to whoever may be interested, in particular to PhD students of ICT school.

Requirements

- A background knowledge on the following topic is strongly advisable for the course:
  - Boolean logic
- Some background knowledge on the following topics is advisable for the course:
  - automata & formal languages
  - basic algorithms and data structures
  - SW engineering

Motivations & Goals

- Formal methods are increasingly used as powerful specification, verification and early debugging methods in the development of industrial SW and HW systems.
- This course provides an introduction to Formal Techniques and Tools for the specification and verification of Hardware and Software platforms.
- The course will concentrate mainly on formal validation and verification and, in particular, on Model Checking (MC).
- A laboratory will be given in which the students will experience MC techniques by means of the MC NuXMV.

Topics

FM Course:

- Introduction on formal techniques and their benefits
- Formal specification & formal validation
- Model Checking (MC)
- Temporal logics: LTL & CTL
- Ordered Binary Decision Diagrams (OBDDs)
- Explicit-State MC, LTL MC
- Symbolic MC, CTL MC
- SAT-based MC
- More advanced developments:
  - Abstraction in MC
  - MC with Timed and Hybrid Systems

Topics (cont.)

Laboratory:

- The MC NuXMV
- Modeling and verifying systems with NuXMV

References

- Notes from the lessons
- Slides (available from the URL of the course)
- Other material (available from the URL of the course)
- The NuXMV manual
- Suggested books (in alternative):
  - *Edmund Clarke, Orna Grumberg and Doron Peled*.
    "Model Checking"
    MIT Press
  - *Christel Baier and Joost-Pieter Katoen* .
    "Principles of Model Checking"
    MIT Press

Disclaimer

Some of the material presented in these slides (text, figures) is courtesy of the following people, listed in alphabetical order:

- Massimo Benerecetti (`bene@na.infn.it`)
- Alessandro Cimatti (`cimatti@fbk.eu`)
- Paritosh Pandya (`pandya@tifr.res.in`)
- Marco Pistore (`pistore@disi.unitn.it`)
- Marco Roveri (`roveri@fbk.eu`)
- Stefano Tonetta (`tonettas@fbk.eu`).

Furthermore, some examples are taken from the book:
[E. Clarke, O. Grunberg & D. Peled, “Model Checking”, MIT Press]

Timetable & Office Hours

Timetable: 2nd Semester, February 17th-May 29th

- CLASS: Tuesday 11.30-13.30 Room A203
- CLASS: Thursday 14.30-17.30 Room B105
- LAB: Friday 09.30-11.30 Room A202

Office hours:

- no weekly fixed-day
- anytime in the week, upon appointment
- appointments to be set in class or via email
- Office hours only during class period (see above)!

Exam

2 parts:

- Script
  - a lab part on NuXMV
  - the script test, on the topics of the course
- Oral Interview
  - interview on the topics of the course.

N.B.: students from the previous year(s) having already their lab or script part passed/approved can skip the lab or part part respectively.

To copy at exams very dangerous is!