Probabilistic Methods in Concurrency

Lecture 5

Basics of Measure Theory and Probability Theory
Probabilistic Automata

Catuscia Palamidessi
catuscia@lix.polytechnique.fr
www.lix.polytechnique.fr/~catuscia

Page of the course:
www.lix.polytechnique.fr/~catuscia/teaching/Pisa/

Basics of Measure Theory and Continuous Probability Theory

- Continuous probabilistic spaces: the need for Measure Theory
- Some introductory examples:
  - Infinite sequence of coin tossing,
  - Intersection, complementation, union and countable union
  - Why countable
  - Concept of cone
- Measurable space, σ-field
- Base, σ-field generated by a base
- Examples
- Probability measure
- Monotonicity and continuity

Prakash Panangaden, Stochastic techniques in Concurrency. Lect notes.
Section 2.1. and 2.4 (till page 16)

Probabilistic Automata

- Nondeterministic choice and probabilistic choice
- Definition of probabilistic automata
- Concept of adversary
- Concept of execution
- The measurable space and the probability measure associated to the executions
- Some examples

- Roberto Segala. Modeling and Verification of Randomized Distributed Real Time Systems . PhD thesis, Laboratory for Computer Science, Massachusetts Institute of Technology, June 1995. Available as Technical Report MIT/LCS/TR-676.

- Roberto Segala and Nancy Lynch.
  Probabilistic simulations for probabilistic processes.
  Nordic Journal of Computing, 2(2):250--273, 1995.
  An extended abstract appeared in the Proceedings of CONCUR '94,
  LNCS 836: 22--25.