Research and Challenges in Software Performance Engineering

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Software Performance Engineering

Goals:

Systematic quantitative approach to constructing software systems that meet performance/reliability objectives based on the methodical assessment of performance/reliability issues from design to implementation/operation and maintenance

Past Research:

- Methods and tools for the automatic derivation of performance/reliability models starting from software specifications (e.g., using model driven techniques)

Challenges and Research

Challenges:

- quality and quantity of information available

  e.g., at design time information about performance characteristics is often not available

Research:

- Including the **uncertainty** management in the model derivation and analysis using a set of techniques including

  probabilistic methods,

  fuzzy methods and

  neural networks

Challenges and Research

Challenges:

System growing complexity:

    a) new types of systems (e.g., Cyber Physical Systems)

    b) large decentralized systems

Research:

a) Defining a multi-modeling approach for performance engineering taking into account the different abstraction level and characteristics of these new systems

b) Defining approaches where the overall system behavior emerges from local decisions and interactions exploiting opportunistic techniques

Challenges and Research

Challenge:
- Need to adapt to changing system environment or quality requirements

Research:
- Defining strategies and formal models driving quality-aware adaptation for software systems
  - Convergence of measurement and modelling
  - Uncertainty
  - New models?
  - Scalability (model definition and solution)
  - Feedback (visualization of results, optimization, trade-off)