Topics for Formal Methods for Software Development (CSE 914)
Spring 2014

Instructor: Dr. B. Cheng, 1129 Engineering Bldg., chengb at cse dot msu dot edu

Class Time: T, Th: 3:00-4:20, 1230 Engineering Bldg.

Class web page: TBD

Required Text:
• Papers from the Literature

Grading:

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<tr>
<td>Written Assignments</td>
<td>45%</td>
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<td>Presentations and Questions</td>
<td>20%</td>
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<td>Term Project</td>
<td>25%</td>
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<td>In-class participation</td>
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Course Scope:
Dynamically adaptive systems are generally more difficult to specify, verify, and validate due to their high complexity. Particularly, when involving multi-threaded adaptations, the program behavior is the result of the interaction among threads and other software/hardware components. This class will study recent work that addresses assurance of dynamically adaptive systems at different points throughout the development process. Additional complexity is posed by the different sources of uncertainty that must be handled, both from the environment and with the system. The class will cover techniques ranging from those to be applied as part of requirements engineering to those that are applied at run-time. An emphasis will be on those techniques that are amenable to automation, address the assurance of adaptive systems, and/or can be used to handle uncertainty. In particular, we are interested in techniques from disciplines outside of software engineering, such as evolutionary computation, robotics control, and machine learning to address uncertainty, assurance, and adaptation.
Course objectives:
The objectives of the course are to review, present, and discuss current literature relating to managing uncertainty for dynamically adaptive computing-based systems. Students will have opportunities to develop and/or improve their technical writing and research skills.

Tentatively, we will cover the following topics:
  o Representing uncertainty
  o Assurance for adaptive systems
  o Managing uncertainty in computing-based systems
  o Run-time vs design-time techniques for adaptive systems
  o Search-based techniques for adaptive systems
  o Balancing tradeoffs for multi-objective concerns
  o Adaptive control theory applied to adaptive systems

Format of Course:
  • Lectures by instructor
  • Presentations by students
  • Student-led discussions regarding research challenges