Welcome to
SENG 480B / CSC 485B / CSC 586B
Self-Adaptive and
Self-Managing Systems

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http://courses.seng.uvic.ca/courses/2013/summer/seng/480b
http://courses.seng.uvic.ca/courses/2013/summer/csc/485b
http://courses.seng.uvic.ca/courses/2013/summer/csc/586b

Announcements

- A4
  - Due Thu, Aug 6
  - Yesterday
- A4 Group Presentations
  - Tuesday, Aug 6/7
  - In class
  - Send slides for posting to hausimuller@gmail.com

- Review for final exam
  - Wed, Aug 7
  - Last day of classes
- Final exam
  - Tue, Aug 13, 9:00-12:00 am in ECS 124
  - Closed books, closed notes
  - Materials: entire course
  - Format: like midterm
- Final marks
  - Should be ready by Aug 21

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Final Exam Review
Tue, Aug 13, 9:00-12:00 am in ECS 124

- All materials presented in class
  - Before and after midterm
  - More questions from after midterm
  - Including grad presentations
  - All on-line lecture notes
- Study sample final questions
- Study midterm questions

- Format
  - Same format as midterm
  - Crib sheet in the form of a paper
  - Argue convincingly
  - Define terms
  - Essay questions

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Crib Sheet for Final Exam

- **Crib sheet**: a concise set of notes used for quick reference
  H.A. Müller and N.M. Villegas: Runtime Evolution of Highly Dynamic Software, in *Evolving Software Systems*, T. Mens, A. Serebrenik, and A. Cleve (eds.), Springer, 38 pages, July 2013. In Press.

- Summarizes a significant part of this course
- You will have access to a hard copy during final exam
- Contains answers to selected final exam questions

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Topics
Autonomic Computing

- Autonomic manager
- MAPE-K loop
- Monitoring
- Analysis
- Symptoms
- Planning
- Policies
  - Action, goal, utility-function
- Sensing
- Actuating

- Knowledge bases for AC
- ACRA
- The role of standards
- Manageability interfaces
- WSDM stack
- Maturity levels
- Applications to IT processes

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Topics
Control loops

- Types of feedback: positive, negative, bipolar
- Hellerstein feedback loop model
- Controller
- Managed element, process, plant
- Disturbance input
- Noise input

- Transducer
- Reference model
- Simulation model
- Model identification
- MIAC
- MRAC
- PID controller
- PID paper

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Topics
Applications of feedback loops

- Run-time V&V
- Continuous testing
- Run-time governance
- Run-time checking of functional and non-functional requirements
- Run-time checking of quality attributes
- Regulation of requirements
- Trade-off analysis of requirements
- Requirements traceability
- Continuous evolution
- Run-time governance

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Interesting Potential
Final Exam Questions

- Design a concrete and viable
  - action policy
  - goal policy
  - utility-function policy
  - Design a Green utility-function policy
  - How can cost be integrated into a utility-function?
- PID controllers
- Explain the notion of adaptive control
  - MRAC architecture
  - MIAC architecture
  - How do they relate?
  - How do they relate to ACRA?

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Interesting Potential
Final Exam Questions

- What is the difference between anticipated and un-anticipated adaptation?
- What is the difference between fully autonomous systems and human-in-the-loop systems?
- What is the difference between design-time and run-time adaptation?
- What are self-* properties?
- What are requirements at runtime?
- What are models at runtime (MART)?
- What is runtime V&V?

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Interesting Potential
Final Exam Questions

- Describe the Kramer-Magee architecture for self-managed systems
- Describe the Garlan et al. Rainbow architecture
- Describe the Oreizy et al. Figure 8 model
- Describe the McKinley et al. notion of compositional adaptation
- How do the ACRA and Kramer/Magee models relate to each other?
- How do does MAPE-K loop relate to the Kramer/Magee model?

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Interesting Potential
Final Exam Questions

- What aspects of the environment should a self-adaptive system monitor?
  - The system cannot monitor everything in the environment
  - What aspects of the environment are truly relevant?
- How should a self-adaptive system react if it detects changes in the environment?
  - Maintain high-level goals
  - Relax non-critical goals to allow the system a degree of flexibility
  - Goal trade-off analysis

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How was your experience in this course?
What should we do differently next time?
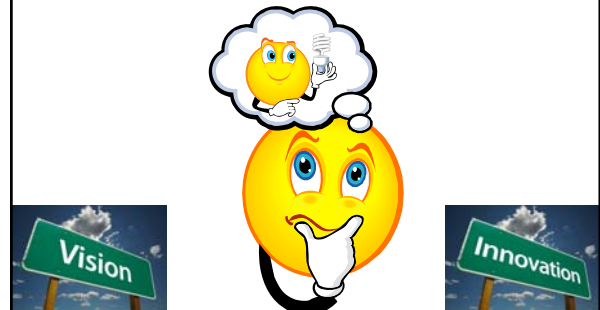
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Spring 2013

The End

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