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

Dr. Hausi A. Müller
Professor
Department of Computer Science
University of Victoria

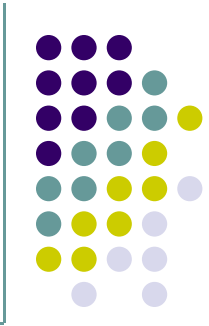
http://courses.seng.uvic.ca/courses/2013/summer/seng/480b
http://courses.seng.uvic.ca/courses/2013/summer/csc/485b
http://courses.seng.uvic.ca/courses/2013/summer/csc/586b

Quiz 2

- Are you sitting next to the same person you did on Fri?
- Did you look up any term or resource related to this course since Fri?

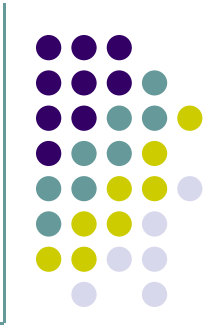
- This course involves a lot of reading!

Course Web Sites



- Course outline
  - Undergraduate students
    - http://courses.seng.engr.uvic.ca/courses/2010/spring/seng/480b
    - http://courses.seng.uvic.ca/courses/2013/summer/seng/480b
  - Graduate students
    - http://courses.seng.uvic.ca/courses/2013/summer/csc/586b
- Course websites
  - http://www.rigiresearch.com/courses/sas
  - Syllabus
  - Lecture slides (pdf)
  - Assignments
  - Materials for reading assignments
  - Everything else you need to know about the course

Assignments

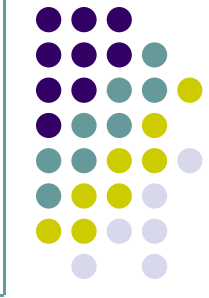


- Reading assignment
  - ULS Book Section 1-3 on-line at
  - http://www.sei.cmu.edu/uls/the_report.html
    - Northrop, et al.: Ultra-Large-Scale Systems. The Software Challenge of the Future. Software Engineering Institute, Carnegie Mellon University, 134 pages ISBN 0-9786956-0-7 (2006) http://www.sei.cmu.edu/uls
- Assignment 1
  - A1 will be posted by Wed

Deadlines

- Assignment 1
  - Thu, May 30 due
- Assignment 2
  - Thu, Jun 20 due
- Assignment 3
  - Thu, Jul 11 due
- Assignment 4
  - Thu, Jul 25 due
- Breaks
  - Reading Jun 4-11
  - Reading July 2
- Midterm
  - Fri, Jun 28
  - In class, closed books, closed notes
- Final
  - Aug 2013 to be scheduled by university
  - 3 hours, closed books, closed notes

Course Requirements



- Undergraduate students
- Assignments 48%
- Midterm 12%
- Final 30%
- Class participation 10%

- Graduate students
- Assignments 36%
- Position paper 6%
- Presentation 6%
- Midterm 12%
- Final 30%
- Class participation 10%

- All materials discussed in class are required for the midterm and final examinations
- Passing the final exam is not required to pass the course, but of course highly recommended

Questions?

- Organization of the course?
- Evaluation scheme?

- Study course web site carefully
- Visit course web site regularly
  - Web site and materials will change almost daily
- Other questions?!?

Keep in mind …

- **Ask questions at any time ☺ !! ☺**
- **Let’s make this a truly interactive course!!!**
- **Take full advantage of this opportunity to work on your communication skills ☺ !! ☺**

Self-Adaptive Systems (SAS)

- A SAS can alter its behaviour at runtime (on the fly) in response to its perception of
  - its environment
  - its own state

  by adapting itself

- SAS abilities
  - Assess its own behaviour
  - Observe its context or environment
  - Adapt without shut down

- Oreizy, et al.: An Architecture-Based Approach to Self-Adaptive Software, *IEEE Intelligent Systems,* pp. 54-62 (1999)
- MacManus: Why Software is More Important Than Sensors in the Internet of Things, ReadWriteWeb (2010)

Situational Awareness (SA)

- SA is the perception of environmental and personal context with respect to time and space
- Comprehension of its meaning and its projection into the future
- Critical to decision-making in complex, dynamic situations

- Applications
  - Mars Curiosity
  - Aviation—UAV, drones
  - Military command and control
  - Emergency services

- Applications
  - Driving a car
  - Crossing a street
  - Playing basketball
  - Shopping

Intuitively we know how critical and valuable context is.
But context is complicated.

"Context is the new battleground between
Android, iOS, Windows, Symbian and
Apple, Google, IBM, Microsoft, Nokia, Samsung."

The Age of Context

Simple can be harder than complex. You have to work hard to get your thinking clean to make it simple.

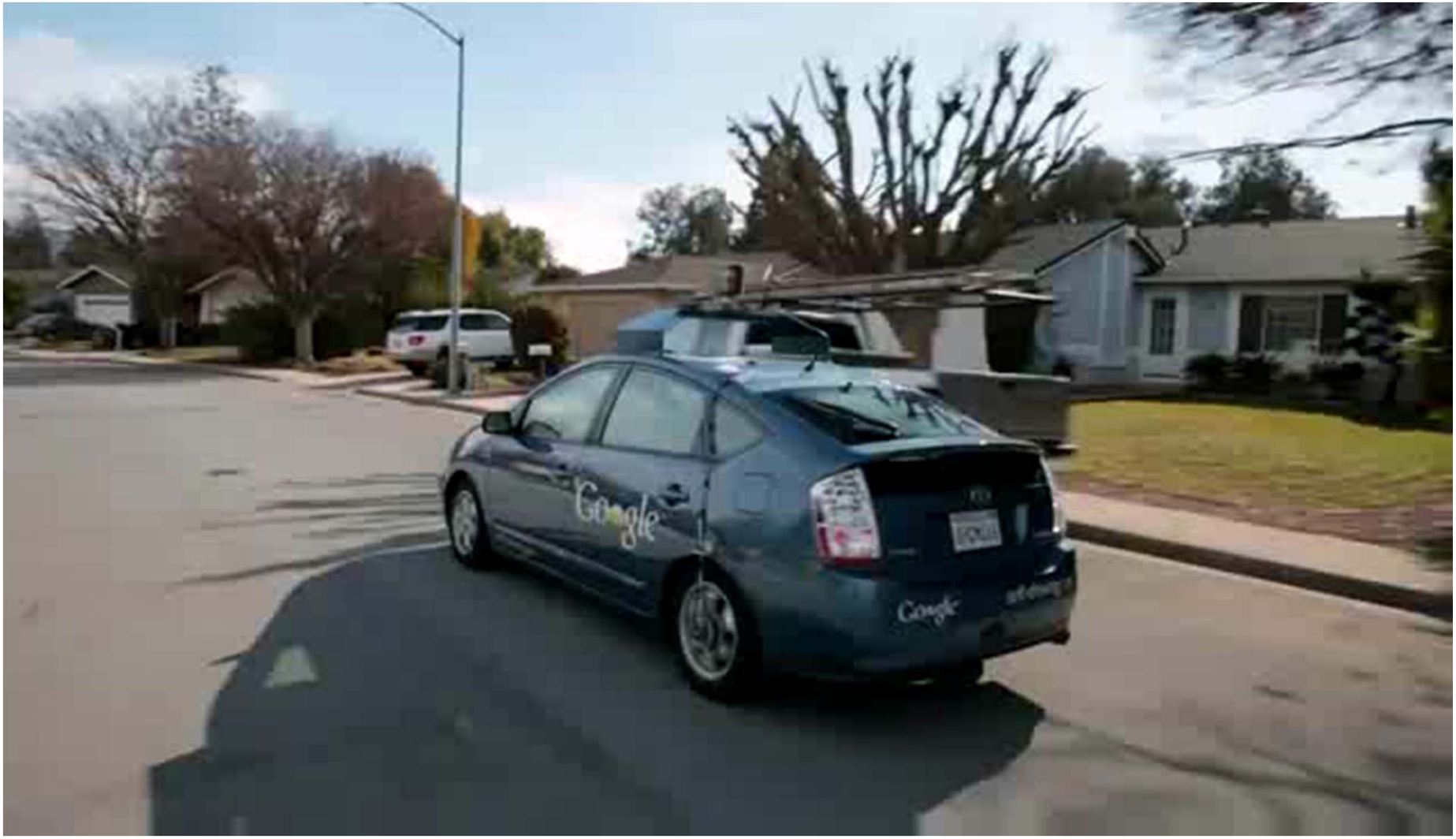
Steve Jobs, BusinessWeek, 1998

Context is Big Data

Capture Context with Sensors and Wearable Computers

Google Driverless Car

Licensed in Florida, Nevada, California



http://www.youtube.com/watch?v=cdgQpa1pUUE

How does it feel through Google Glass?

http://www.google.com/glass/start/how-it-feels/

The 3 I's of Smart Systems

Instrumented Interconnected Intelligent

- IBM: What 'Smarter' Means, http://www.ibm.com/smarterplanet/us/en/index.html?re=sph (2012)
- IBM: Smarter Government, http://www.ibm.com/smarterplanet/ca/en/ (2011)
- Siegele: Smart Systems: Living in a see-through world, *The Economist* (2010)
- Siegele: Smart Systems, *The Economist,* Special Report, http://www.economist.com/node/17388368 (2010)
- IBM: The Internet of Things, http://www.youtube.com/watch?v=sfEbMV295Kk (2012)
- G. Golden: IBM Watson and the Future of Work, http://www.garrygolden.net/2011/10/15/future-of-work-202-ibm-watson-siri/ (2011)

Great Videos

Something profound is happening ...

Instrumented

We now have the ability to measure sense and see the exact condition of practically anything.

Interconnected

People, systems, and objects can communicate and interact with each other in entirely new ways.

Intelligent

We can respond to changes quickly and accurately and get better results by predicting and optimizing for future events.

Something profound is happening ...

We now have the ability to measure sense and see the exact condition of practically anything.

"When you can measure what you are speaking about and express it in numbers, you know something about it, but when you cannot measure it your knowledge is of a meager and unsatisfactory kind"

—Lord Kelvin

Something profound is happening ...

Over the past three years people have given up their location and time privacy —willingly

Something profound is happening ...
The Smart Systems Revolution

Instrumented Interconnected Intelligent

Confluence of Sensors, Networks, Devices, Clouds, and Apps

SensorCloud®
Powered by LORD MicroStrain®

Sensor Data and the Cloud

http://www.youtube.com/watch?v=Ya9Zu3PGTO0

IBM Initiative
Smarter Systems for a Smarter Planet

The world is getting smarter

More instrumented, interconnected, intelligent

Smart traffic systems

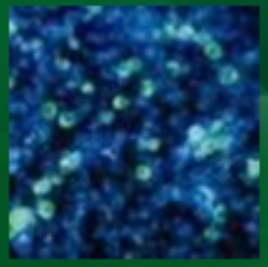
Intelligent oil field technologies

Smart food systems

Smart healthcare

Smart energy grids

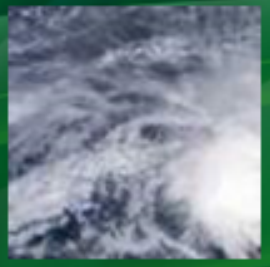
Smart retail



Smart water management

Smart supply chains

Smart countries



Smart weather

Smart regions

Smart cities

What's the Sound of a Planet Talking?

1912

- People conversing in person or over wired networks

2012

- Not just everyone is conversing, but also every thing is talking to every other thing, constantly

Internet of Things

Create value

- Be less destructive
- Make goods and services smarter
- Optimize value
- Improve user experience

Decade of a Smarter Planet

The Internet of Things (5 minutes)

http://www.youtube.com/watch?v=sfEbMV295Kk

What caught your eye?