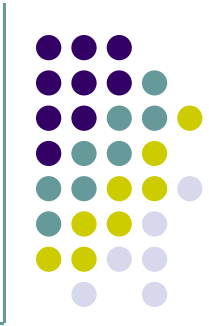
Professor Hausi A. Müller PhD PEng FCAE
Department of Computer Science
Faculty of Engineering
University of Victoria

http://www.engr.uvic.ca/~seng321/
https://courses1.csc.uvic.ca/courses/201/spring/seng/321

Announcements



- New class room as of Wed
  - MAC 288 (original one)
- Midterm rescheduled due to lab clash
  - Fri, Feb 26 in class confirmed !!
- Assignments/Deliverables
  - S0, C0, S1, C1 specs posted
  - Group website spec posted
- Projects
  - Original RFP posted again

Last updated
Jan 19, 2016

Projects

Car Wash - RFP

GPS Enabled Text-Adventure RPG - RFP

Meals for the Moment - RFP

Shower Management System - RFP

Course Schedule Creator - RFP

Good Morning: Wake up smarter - RFP

SERVEitude! - RFP

Location & Time Based Restaurant Specials - RFP

EventCity-The best Queueing System - RFP

Lumin - RFP

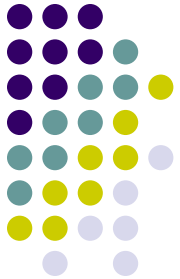
ELW Locker Reservation System - RFP

Ability Hire - RFP

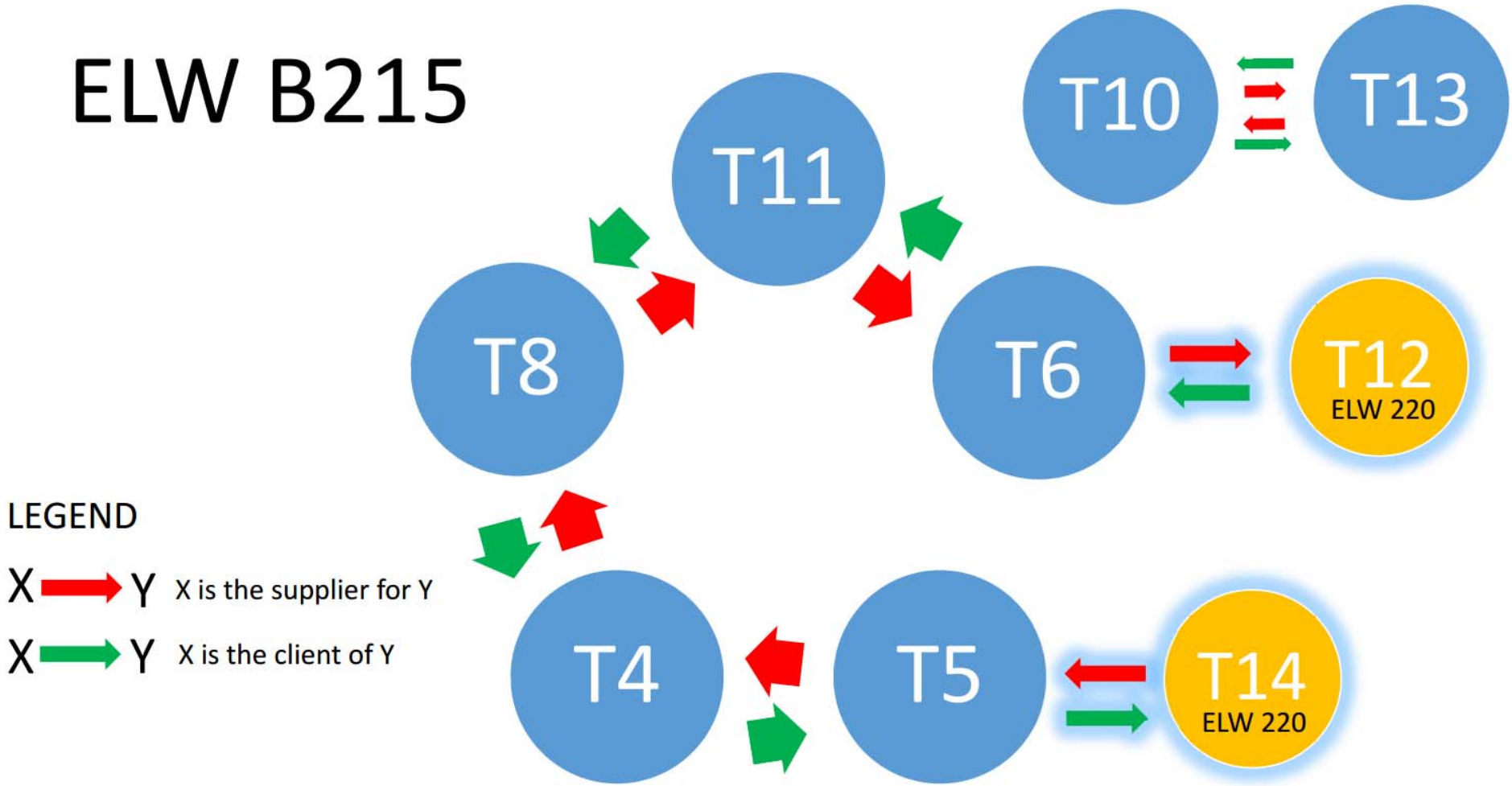
Opportunity App - RFP

Smart Beverage Dispensing System - RFP

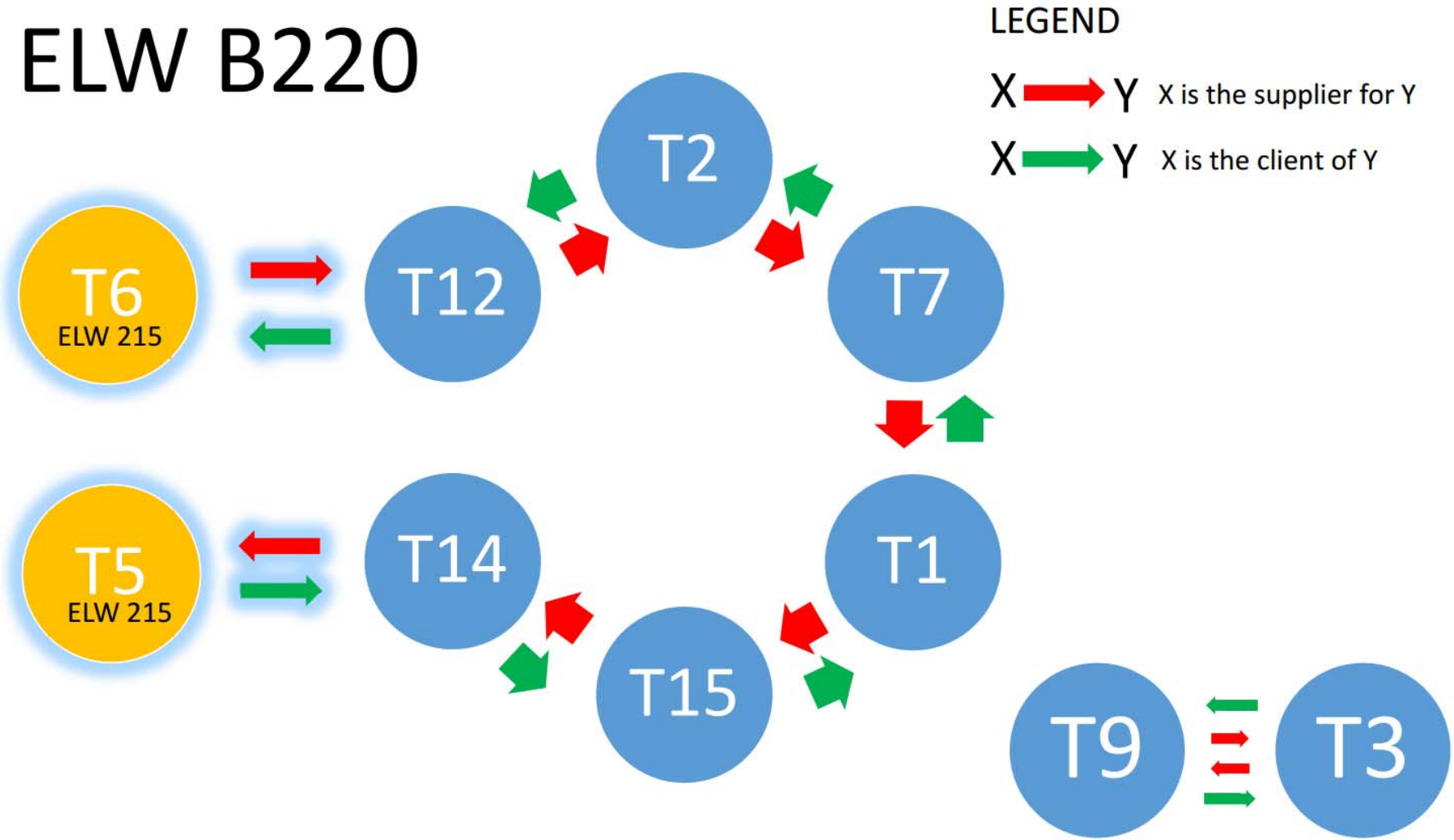
Mobile Lighting Control System - RFP



Harshit Jain



Priya Angara



Students must participate in all project presentations in class & labs
No show results in a 25% reduction in the mark for that presentation

Project Deadlines and Marks

1.	Call for Project Proposals		**6 Jan (Class)**
2.	Request for Proposal (RFP)		**8 Jan**
3.	Project selection		**12 Jan (Lab)**
4.	Team selection		**14 Jan (Lab)**
5.	Related work (S0)	5%	**22 Jan (Lab)**
6.	Project website up and running	5%	**26 Jan (Lab)**
7.	RFP2 Informal Requirements Specification (C0)	5%	**29 Jan (Lab)**
8.	Formal Requirements Spec (S1)	10%	**16 Feb (Lab)**
9.	Customer Feedback on S1 (C1)	5%	**18 Feb (Lab)**
10.	Detailed Requirements Spec (S2a)	10%	**1 Mar (Lab)**
11.	Prototype demo (S2b)	5%	**3 Mar (Lab)**
12.	Customer Feedback on S2a-b (C2)	5%	**8 Mar (Lab)**
13.	Final Requirements Spec (S3a)	15%	**15 Mar (Lab)**
14.	User Manual (S3b)	10%	**22 Mar (Lab)**
15.	Customer Feedback on S3a-b (C3)	5%	**24 Mar (Lab)**
16.	Demo Final Project (S4)	10%	**29,31 Mar (Lab)**
17.	Customer Feedback on S4 (C4)	5%	**29,31 Mar (Lab)**
18.	Instructor and TA Evaluations (S5)	5%	**1 Apr**

Requirements Engineering for Situation-Aware Applications

Requirements Engineering for Situation-Aware Applications

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 soccer
  - Playing basketball
  - Shopping

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

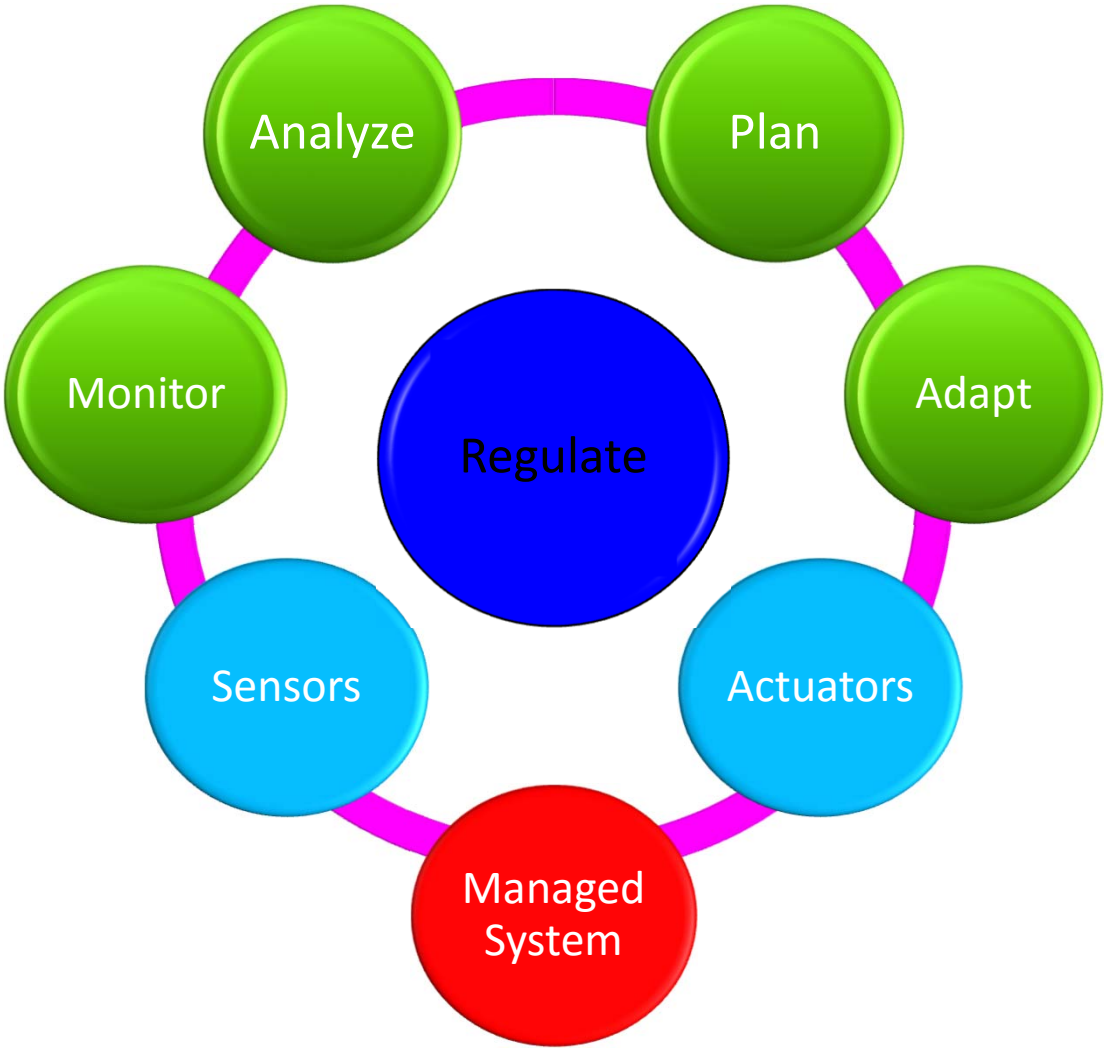
  by adapting itself

iRobot's new drone is a rock-steady flyer

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

Müller and Villegas: Runtime evolution of highly dynamic software, in Evolving Software Systems, Mens, et el. Springer, pp. 229-264 (2014)

ADAPT IN REAL TIME



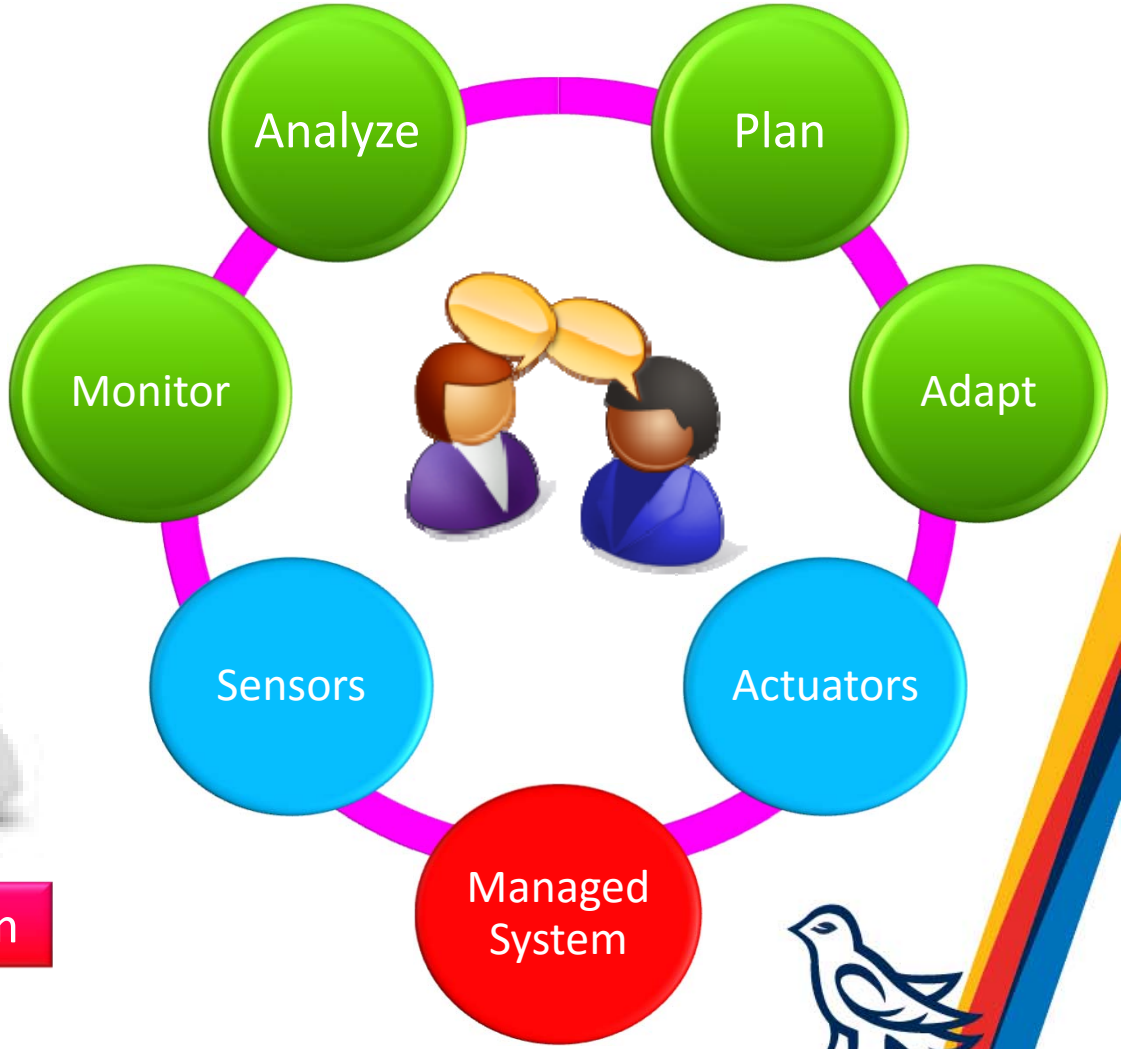
- Sensors give us the ability to monitor and recognize patterns
- Depending on the findings, changes can be affected through actuators

HUMANS ARE SELF-ADAPTIVE

GOAL: STAY UPRIGHT

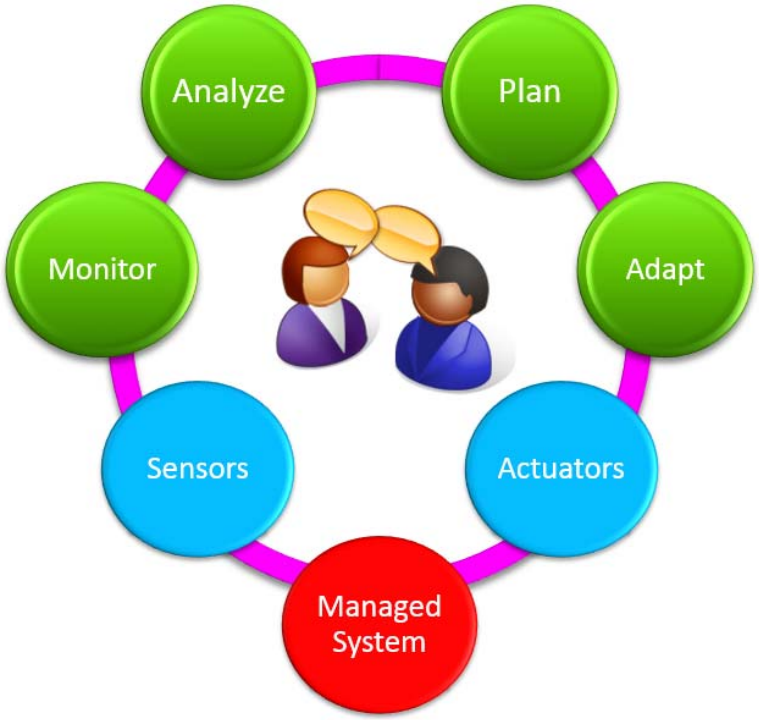
Controller

Managed system



EXERCISE

Identify and discuss the actions performed by sensors, monitor, analyzer, planner, adapter and actuators



Controller

Managed system

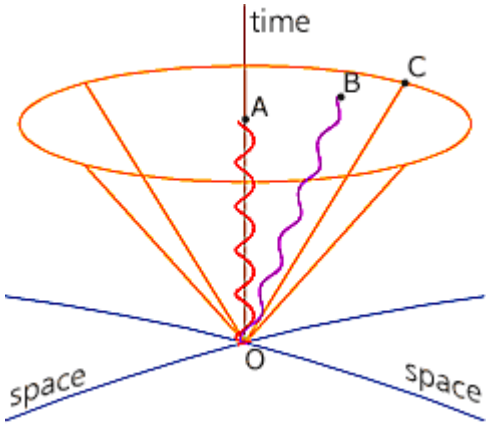
GOAL: ACHIEVE EQUILIBRIUM

- Sensors
  - Touch points
  - Force sensors
  - Direction sensors
  - Eyes/pupils
  - Breathing
- Monitor
  - Number of touch points
  - Measure force
  - Measure force direction
  - Taking a deep breath
  - Pupils enlarge
- Analyzer
  - Push or pull pattern
  - Gentle or strong pattern
- Planner
  - Push ➔ push back with same force
  - Pull ➔ pull back with same force
  - Gentle or strong pattern
- Adapter & Actuators
  - Fire muscles to push or pull lightly or strongly

SITUATION AWARENESS (SA)

- Perception of the environment within a volume of space and time
- Comprehension of their meaning
- Projection into the future

—Endsley 1999

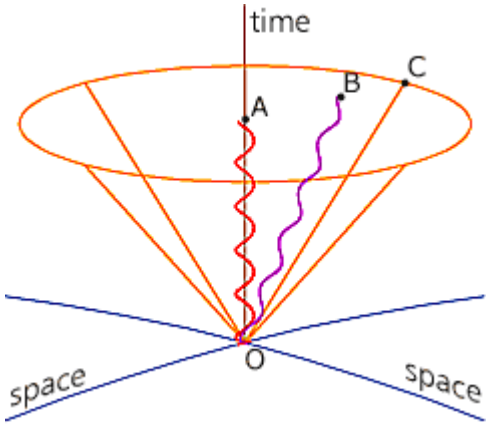


Bombardier Challenger 300

Survival

SITUATION AWARENESS (SA)

- Perception of the environment within a volume of space and time
  - Sense the local environment
    - Surrounded by plant
- Comprehension of their meaning
  - Analytics
    - Surrounded by edible plant
    - Surrounded by meat-eating plant
- Projection into the future
  - Planning, adapting
    - Eat edible plant
    - Be eaten by meat-eating plant



SA APPLICATIONS

Applications

- Mars Curiosity
- Aviation—UAV, drones
- Command and control
- Emergency services

Applications

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

James Rodriguez
World Cup 2014
Top Goal Award

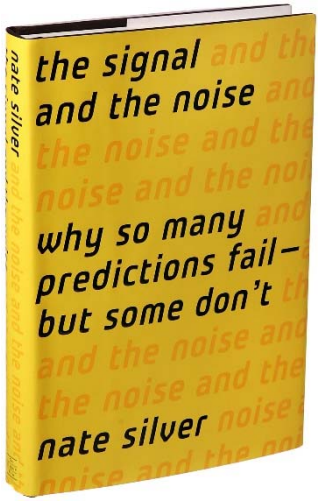
CONTEXT AWARENESS

"Context is the new battleground between Android, iOS, Windows as well as Apple, Google, IBM, Microsoft, Samsung."

PILLARS OF CONTEXT

- The Internet of Things
  - Sensors for location, light, motion, temperature
  - Record, transmit findings to control instruments
- Semantic web, big data, analytics
  - Clouds store massive data on everything
  - Everything accessible on the web
- Digital mapping
  - Every square inch of the world is mapped
- Really smart mobile devices
  - Every person has one
  - Highly customized smart applications
- Mature social media
  - Highly personalized virtual networks
- Wearable computers
  - Microsoft HoloLens, Apple watch, Google driverless car

Scoble, Israel:
The Age of Context: How It Will Change Your Life & Work, 2013.



NATE SILVER

- American statistician and writer who analyzes baseball and elections
- In 2008 correctly predicted the winner of US presidential election in 49 out of 50 states and all 35 US Senate races
- 2009 *Time Magazine* World's 100 Most Influential People
- In 2012 correctly predicted the winner of all 50 states and 31 out of 35 US Senate races by analyzing social media ← context

India

MINDBOGGLING SITUATION AWARENESS

Japan

HUMANS ARE AMAZINGLY ADAPTIVE

STREAM OF CONTEXT

STREAM OF CONTEXT

CAPTURE THE STREAM OF CONTEXT

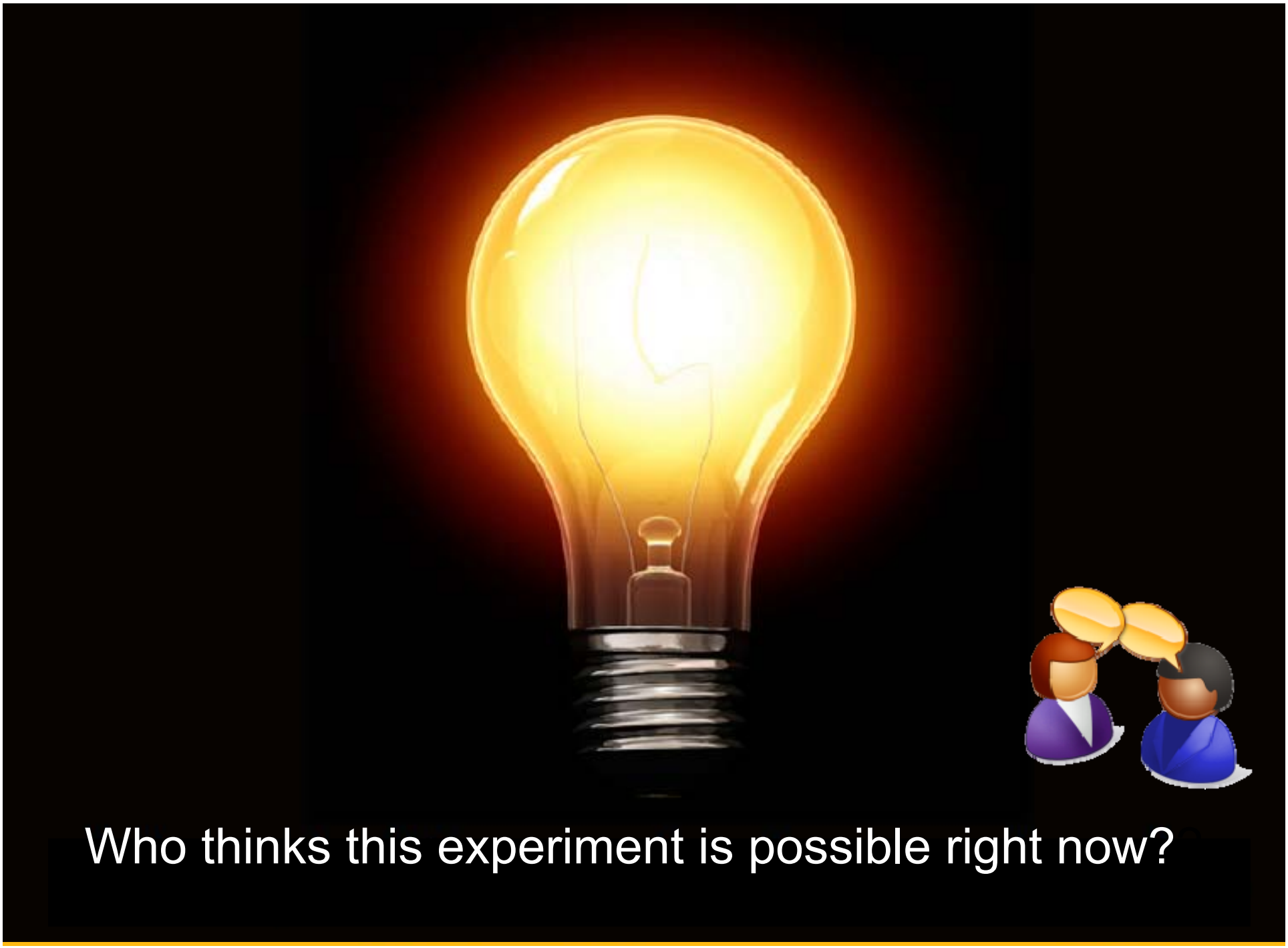
Google

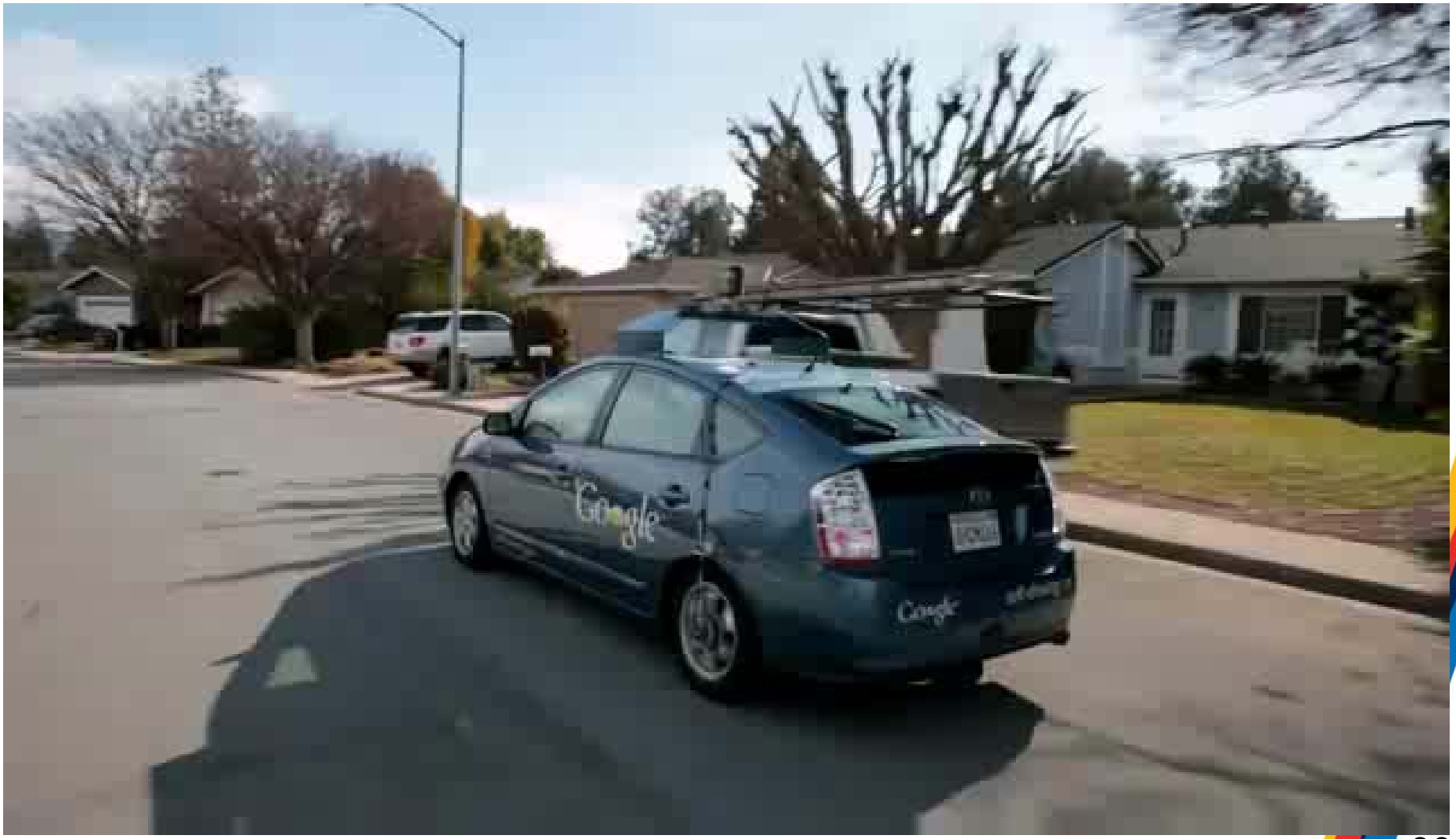
INSTRUMENT PEOPLE

KILLER APPLICATION

EXERCISE

- Who wants to be a volunteer for conducting experiments with this killer application?
- You will get to use some cool devices such as HoloLens!


Who thinks this experiment is possible right now?

GOOGLE DRIVERLESS CAR — 2:07 MINS

LICENSED IN CALIFORNIA, NEVADA AND FLORIDA