

# CSE 6324 From control to actuators

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Tuesday, 13 September, 11

## This is a robot building course

- You will build your very own(\*) robot
- Expect to spend significant time in the lab, working on robotic systems
- Expect to spend significant time dealing with the realities of getting your machine to work

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## Evaluation

- Two parts.
  - Part I - building the robot.
  - Part II - experiments with the robot.
- Likely 2-3 groups for part I.
  - Constrained by hardware resources
- Part II - probably more groups

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## Evaluation

- Expect (as a class) to write a CRV-format paper describing the hardware design (part I)
- Expect to write a CRV-format paper describing your approach in part II
  - Both will be submitted to a conference. (Take this as a practice in writing an academic paper)

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# Meetings

- Nominally M/W as advertised
- No class the week of the 19th (I am in Germany)
- We will move to the lab and test areas quickly I hope.

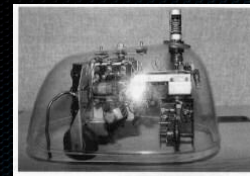
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# Questions?

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There have been robotic systems since the 1940's..

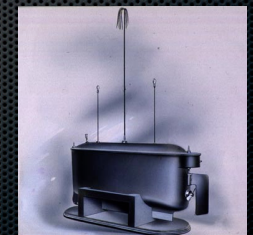
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Grey Walter's "Tortoise"



V1 Flying Bomb



Tesla's Underwater Robot

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# What is an autonomous robot?

“The Encyclopedia Galactica defines a robot as a mechanical apparatus designed to do the work of a man. The marketing division of the Sirius Cybernetics Corporation defines a robot as “Your Plastic Pal Who’s Fun to Be With”

- Douglas Adams



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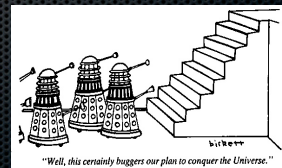
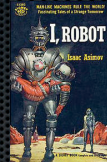
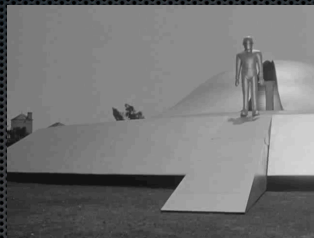
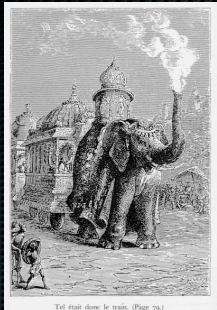
# Mobility is key



- An effective autonomous system must be able to
  - Move about space
  - Sense its space
  - Reason about space
- Tasks distributed in space define the problems associated with mobile robots.

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# Fictional Robots



do not suffer from the realities faced by real robots

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# Real Robots: the Problems

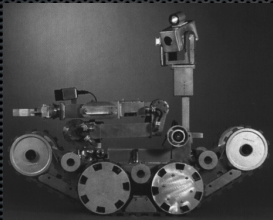
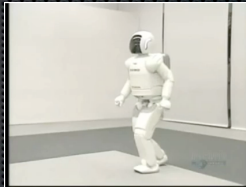


- Locomotion
  - How to make a robot move
- Sensing
  - How to enable a robot measures properties of its environment
- Reasoning
  - How to enable a robot to transduce its measurements into actions

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# Locomotion



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# Locomotion

- Wheels work well for structured environments but more complex environments require alternative solutions.



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# Sensing



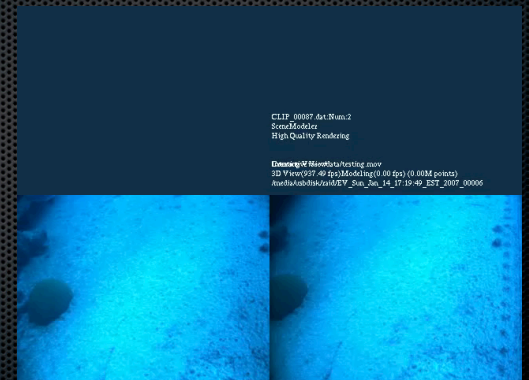
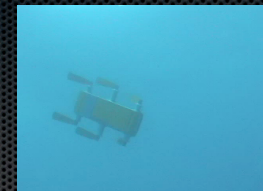
- Vision, sonar, radar, laser imaging...
- Fundamental problem is that it is very difficult to understand the data.



Collecting the data may be 'easy', but understanding it can be extremely difficult

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# Sensing

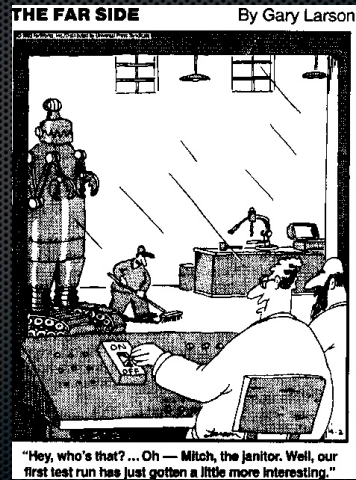


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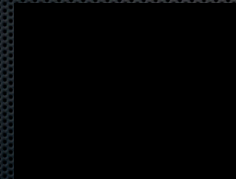
# Reasoning

- Critical issues
  - Situational reasoning
  - Reactivity
  - Reasoning about space
  - Sensor processing



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# Aquatic Applications



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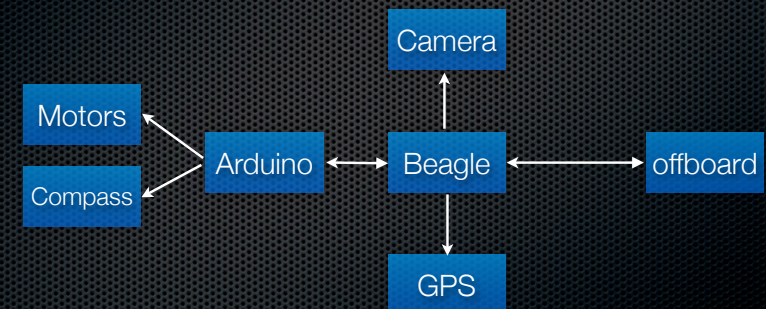
# We are going to build an aquatic vehicle

- Unmanned surface vehicle
  - Based on an RC boat platform
  - Using Beagleboard for onboard computation
  - Arduino for signal conditioning
  - Off-board communication via 802.11 networking



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# Basic design



Feel free to revise

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