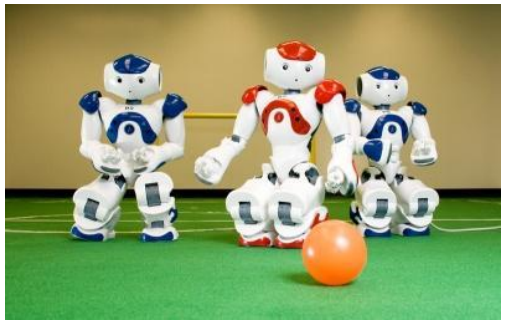
Introduction to Mobile Robotics
Course Overview

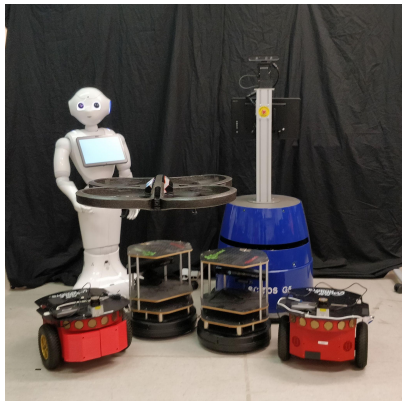
Prof. Mohan Sridharan
Chair in Robot Systems
University of Edinburgh, UK
https://homepages.inf.ed.ac.uk/msridhar/
m.sridharan@ed.ac.uk

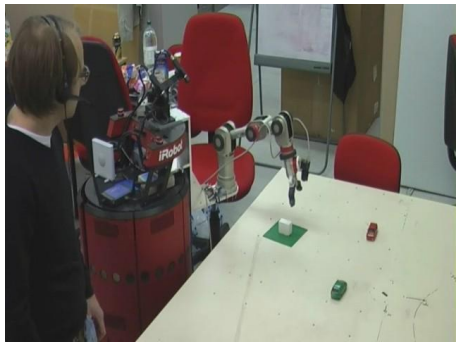
Motivation

- Increasing demand for autonomous systems:
  - Healthcare, navigation, assistive technology.
- Main challenge:
  - Systems that *learn* and *adapt* in response to uncertain sensing and actuation.
- Probabilistic methods provide a strong mathematical basis.

The Stars…







Instructor Overview

- Chair (Professor) in Robot Systems.
- Studied in India (BE) and the US (MS, PhD).
- Academic positions in the US, NZ, UK. Robotics research and teaching for more than 20 years.
- Coordinated multiple collaborative research projects funded by competitive grants from funding agencies in the US, NZ, EU, UK.
- Research interests: cognition and control in robots and humans.
- Human-robot collaboration, knowledge representation, cognitive systems, interactive learning, control systems.

Module Overview

- Model *uncertainty* in integrated systems that sense and interact with the world
- Understand *mathematical basis* of probabilistic state estimation algorithms.
- Apply algorithms to challenging problems:
  - Perception and actuation.
  - Localization and mapping.
  - Learning and representation.
  - Control and coordination.

What it is… (and is not?)

- Collective learning and investigation.
- Individual initiative and teamwork: need to be able to work alone and with others.
- Analyze and criticize existing/prior work.
- Ask questions, discuss and help each other learn.

Content – Subject to change!

- Probabilistic state estimation.
- Gaussian and non-parametric filters.
- Robot motion and perception.
- Localization, mapping and SLAM.
- Probabilistic sequential decision making.
- Logics and other representations.

Assessment

- **MOB-CA:**
  - 40%.
  - Based on a programming assignment, writing tasks.

- **Programming assignment:**
  - Software (demo?), report.

- **MOB-Exam:**
  - 60%.
  - Based on questions that require application of algorithms and concepts learned during the semester.
  - Different from previous years!

Timetable, Schedule, Announcements

- Class size: large and changing.
- Topics and schedule likely to undergo minor changes.
- Check online for teaching team, TAs/tutors, office hours.
- Keep track of announcements made in lectures and posted online.

How to do well in the course?

- Keep up with lectures and tutorials.
- Complete assignments (programming, reading, writing) on time.
- Read chapters and other material.
- Participate in discussions.

Action Items

- Review programming concepts and Linux environment; **proficiency is expected!**
- Review probability, calculus, linear algebra, statistics:
  - Level of first/second-year mathematics module.
  - Textbooks; Gilbert Strang's lectures on linear algebra.
  - **Proficiency expected!**
- Make sure you have access to resources!
- Look at the website of book:
  - Probabilistic Robotics: Thrun, Burgard and Fox (2005) http://www.probabilistic-robotics.org/
  - Other resources made available as needed.
  - Problem solutions, errata, additional resources.

Example Videos!