Robotics, ethics and the future

- Robotics – what is it?
- DARPA challenge and STANLEY
- Robot ethics
- Concerns – Bill Joy
- Where is the future heading (incl. BJ again)

Robotics

- Science and technology at the intersection of

  AI and engineering
- with the goal of building machines replacing humans

  in dangerous and/or repetitive actions

- ASIMO is a humanoid robot created by Honda. Standing at 130 centimeters and weighing 54 kilograms, the robot resembles a small astronaut wearing a backpack and can walk on two feet in a manner resembling human locomotion at up to 6 km/h.

DARPA grand challenge

- Each team given a map with the “road” (geo. coordinates, etc.) 2 hrs before start
- Primarily test of high-speed road finding, obstacle detection and avoidance
- No passing
- Stanley – SU team; a VW Touareg, outfitted with custom interfaces for throttle, brakes, steering and gear shift
- 2004 video
- http://video.google.com/videoplay?docid=8594517128412883394
- 2007 video:
- http://www.youtube.com/watch?v=-xibwwNVLgg

- Sensors for navigation and GPS (to position)
  - Lasers
  - TV camera
  - Radar
- Computers (6 Pentium M), 1G ethernet – all in the trunk
- Designed for driver overtaking control at any time

Software - overview

- All on Linux
- Uses Machine Learning and probabilistic reasoning
- Lasers used for short and medium range obstacle avoidance at 22 m
- Camera input/ vision processing for 70m range (35mph+)
- See **robot**s.stanford.edu/papers/thrun.**stanley**05.pdf for details

Robotics

- … all kinds of useful functions:
  - Industrial robots
  - Underwater robots
  - Security applications
  - Medical applications
  - …
- But what if robots will “have their own mind”?

Artificial intelligence

- Original idea – cognitive architectures
- Current thinking – limited goal, embedded appls
- Includes:
  - Machine vision
  - Machine learning
  - Natural language processing
  - Planning
  - Knowledge representation and reasoning

Robot ethics- Asimov laws

- A robot may not injure a human being or, through inaction, allow a human being to come to harm.
- A robot must obey orders given it by human beings except where such orders would conflict with the First Law.
- A robot must protect its own existence as long as such protection does not conflict with the First or Second Law
- Discussion – variants on the 1st Law

Singularity

- According to Kurzweil, progress in parallel computing and AI will bring about singularity, and super-intelligent machines
- singularity is a hypothetical event occurring when technological progress becomes so rapid that it makes the future after the singularity qualitatively different and harder to predict.

Bill Joy's paper

http://www.wired.com/wired/archive/8.04/joy.html

- Motivated by a meeting with Kurzweil and Searle – can robots be conscious? quotes a vision of a robot-driven society (by Kaczynski – the Unabomber!)
- Is disturbed by that vision, and by Moravec's book, seeks opinions
- Concerned by 3 21st century GNR technologies:
  - Genetic engineering
  - Nanotechnology
  - Robotics
- Robots, genetically-engineered organisms, nanobots replicate

- Qualitative changes (technologies able to replace our species) possible due to quantitative progress in the foundations of computers (Moore's law to continue beyond 2010, machine 10**6 more powerful than those of today)
- We will "download our consciousness into robotic technology"

Where is Internet going – BJ and others

- Internet of things

Where is AI going – see video from Charlie Rose

- Watson
- http://www.charlierose.com/view/interview/11488
- Future of intelligent machines
- http://www.charlierose.com/shows/2004/12/21/2/a-panel-discussion-about-artificial-intelligence