ROBOTICS
Current State and Trends

CSUC Intelligent Systems Lab

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Can you name this robot (and the show it was in)?
Can you name this robot (and the show it was in)?

Astro Boy (a.k.a. Tetsuwan Atomu)

Astro Boy (1963)
What is a robot?
Three Laws of Robotics

1. A robot may not injure a human being or, through inaction, allow a human being to come to harm.

2. A robot must obey orders given to it by human beings, except where such orders would conflict with the First Law.

3. A robot must protect its own existence as long as such protection does not conflict with the First or Second Law.

Zeroth Law: A robot may not harm a human being, unless it finds a way to prove that in the final analysis, the harm done would benefit humanity in general.
Can you name these robots (and the movie they were in)?
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David and Teddy
A.I. (2001)
DARPA Grand Challenge

- first long distance competition for fully autonomous robot cars in the world
- ultimate goal of making one-third of ground military forces autonomous by 2015 (see U.S. Army's Future Combat Systems, FCS)
- open to teams and organizations around the world (must have at least one U.S. citizen in the roster)
DARPA Grand Challenge

- 2003-2004:
  - 150-mile route through Mojave Desert just before Barstow, California to Primm, Nevada
  - 15 finalists emerged from the qualifying round at the California Speedway
  - $1M prize went unclaimed
  - best performance (distance) by CMU Red Team's Sandstorm (AM General Hummer H1): 7.36 miles
DARPA Grand Challenge

- **2004-2005:**
  - desert Southwest
  - *five teams* completed the 132-mile course
  - $2M prize went to Stanford Racing Team's *Stanley* (Volkswagen *Tuareg*) with the winning time of 6 hours, 53 minutes
DARPA Grand Challenge

- **2006-2007: Urban Challenge**
  - George Air Force Base, Victorville, California
  - 60-mile urban area course in less than 6 hours
  - obey all traffic regulations while negotiating with other traffic and obstacles and merging into traffic
  - $2M prize went to Tartan Racing's (CMU and GM) Boss (Chevy Tahoe), 4:10:20 at 14 mph average
UGVs: Unmanned Ground Vehicles

- iRobot PackBot
- iRobot ATRV-2
- Gecko Tactical UGV
- Armed Robotic Vehicle (ARV)

https://www.fcs.army.mil/
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Rosie
The Jetsons (1962)
UAVs: Unmanned Aerial Vehicles

MQ-1 Predator

Casper 250

MQ-8B Fire Scout

MDARS-E with iSTAR

Lockheed Martin Polecat
AUVs: Autonomous Underwater Vehicles

Bluefin-12

USVs: Unmanned Surface Vehicles

Naval Postgraduate School
NPS Research AUV

Protector
Commercial Products

Friendly Robotic's *RoboMow*
http://www.friendlyrobotics.com/

iRobot's *Roomba*
http://www.irobot.com/
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Robbie
The Forbidden Planet (1956)
Commercial Products

Hasbro's FurReal Friends
http://www.hasbro.com/furreal/

Ugobe's Pleo
http://www.pleoworld.com/
Other Cool Products

Hanson Robotics' Zeno
http://www.hansonrobotics.com/
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Sonny (an NS-5 robot)
Sony AIBO

Robocup 2007
• Atlanta, GA (July 1-10)
• Winners:
  • Northern Bites (Bowdoin College, USA)
  • NUbots (University of Newcastle, Australia)
  • CMDash`07 (CMU, USA)

Chico State SoccerBots

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Other Cool Products

Boston Dynamics' *BigDog*
http://www.bostondynamics.com/
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R2D2 and C3PO
Star Wars (1977)
NASA Mars Pathfinder Rover
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Twiki
Buck Rogers in the 25th Century (1977)
Honda ASIMO

Commercial
CES 07 demo
Climbing (and falling)

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Bender

Futurama (1999)
Sony QRIIO

Quest for cuRIOsity

Commercial (in Japanese)

Fan dance

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Data
Star Trek: The Next Generation (1987)
ISL Projects and Activities

- Summer Robotics Camp
- Vision
- Obstacle avoidance
- Workshops and seminars
- Decision making
- Swarm intelligence
- Localization and mapping
- Radio communication
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Maria
Metropolis (1927)
References

- Carnegie Mellon University, *Robotics Institute*, http://www.ri.cmu.edu/