COMP417- Introduction to Mobile Robotics

A Quick History
Robot

Reason

Sense

Act

The diagram illustrates the cycle in a robot's operation:
1. Sense
2. Reason
3. Act
4. Sense

This cycle represents the feedback loop in a robot's decision-making process.
Talos (Τάλως/Τάλων) 400 BC

- A giant man of bronze who protected Europa in Crete, circling the island's shores three times daily while guarding it.
- Shore-length of Crete is 1.046 km.
- Average speed 130 Km/h
Automatons

Antikythera, 150–100 BC
Heron of Alexandria
(Ἡρών ὁ Ἀλεξανδρεύς)
10-70AD

One of the first sensors:
Odometer.
Heron of Alexandria
Automatons

“Canard Digérateur“, 1793

“The Turk“ 1770
Tea serving automaton
19th Century, Japan
Word “Robot”

Mobile Robots: 1950

• Walter’s *Tortoise*

http://www.youtube.com/watch?v=ILULRlmXkKo
Shakey (1966 - 1972)

- **Shakey** (Stanford Research Institute/SRI)
  - the first "autonomous" mobile robot to be operated using AI techniques
- Simple tasks to solve:
  - To recognize an object using vision, given a very restricted world
  - Find its way to the object
  - Perform some action on the object (for example, to push it over)
  - Perform compound actions and basic planning.
Stanford Cart

- 1973-1979
  - Stanford Cart developed by Hans Moravec
  - Use of stereo vision.
  - Took pictures from several different angles
  - The computer gauged the distance between the cart and obstacles in its path do to basic collision avoidance
  - About 15 min to think about each image, then drives 1 foot or so.
Industrial history: Unimate

Armed for duty. A Unimate robot—really, just an arm—picks up and puts down parts in a General Electric factory.
Industrial history: Puma 1978
Robot Vehicle (Late 80’s)

- VaMoRs: Highway driving
- Tracking white lines with Kalman filtering (Dickmanns)
Mid 90’s: CMU’s Navlab 5

- Drove 2797/2849 miles (98.2%) on highways
- Throttle/Brake manually handled.
Exploring Mars

Sojourner
1997

Spirit and Opportunity
2003

Phoenix
2008
Mars Exploratation

- As of Sol 2000 (Aug. 18, 2009), Spirit's total odometry remains at 7,729.93 meters (4.80 miles).
- As of Sol 1973 (August 12, 2009), Opportunity's total odometry was 17,228.74 meters (10.71 miles).
DARPA Grand Challenge ‘04

• Autonomous driving on 240 km
  – Best team drove only 11.8 km!
DARPA Grand Challenge ‘05

- Autonomous driving on 240 km
  - 5 teams finish the race!
DARPA Urban Challenge ‘07

- Autonomous driving for 96 km in a city.