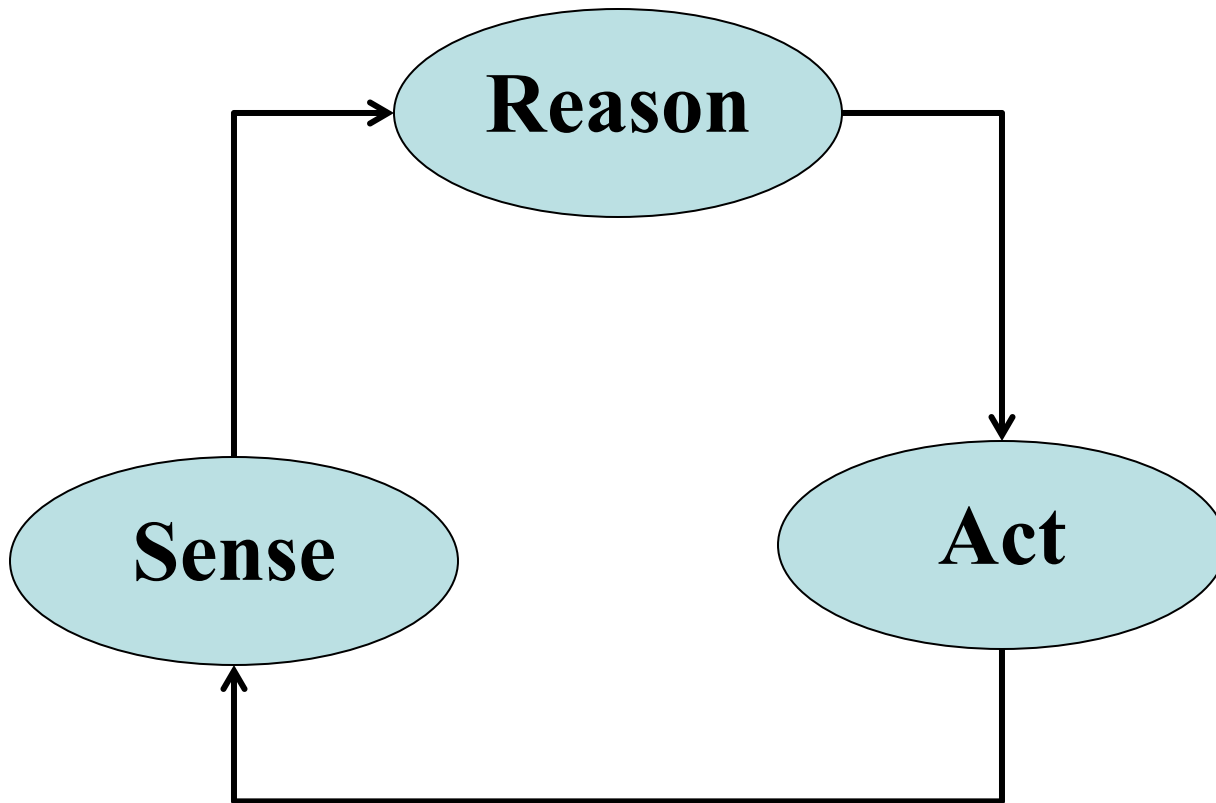


COMP417- Introduction to Mobile Robotics

A Quick History

Robot

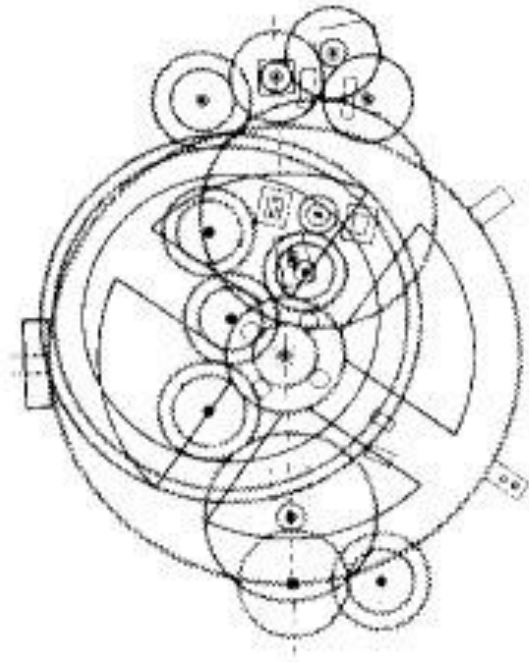


Talos (Τάλως/Τάλων) 400 BC

- 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

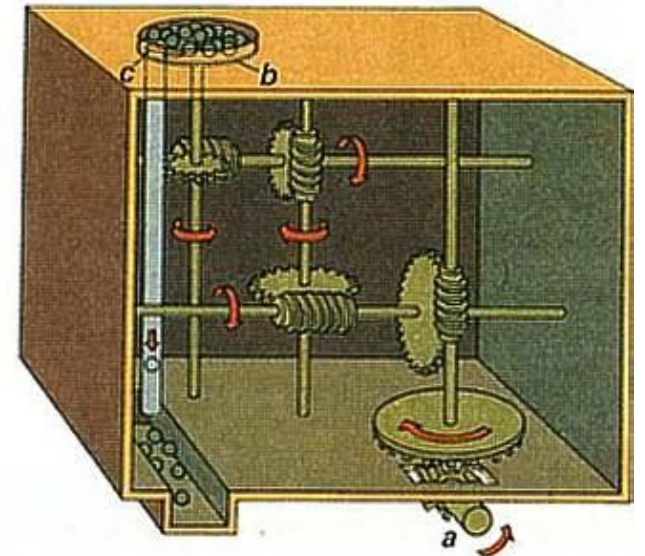


Antikythera, 150–100 BC

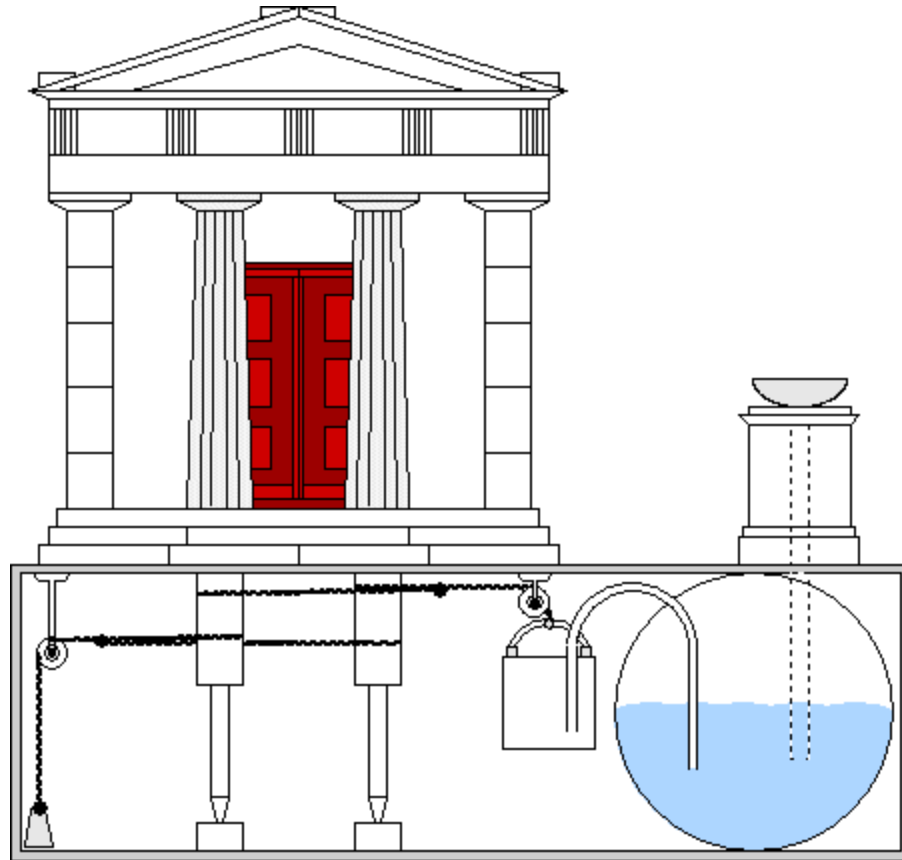


Heron of Alexandria (Ἡρων ὁ Ἀλεξανδρεὺς) 10-70AD

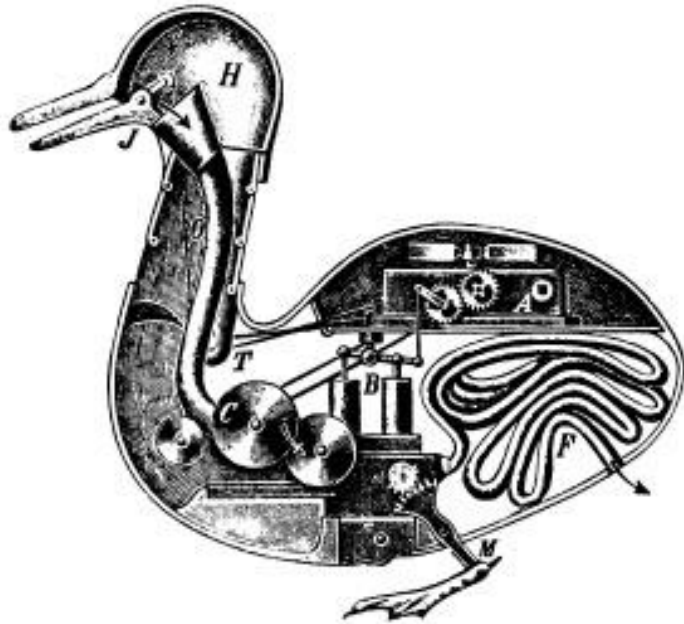
One of the first sensors:
Odometer.



Heron of Alexandria

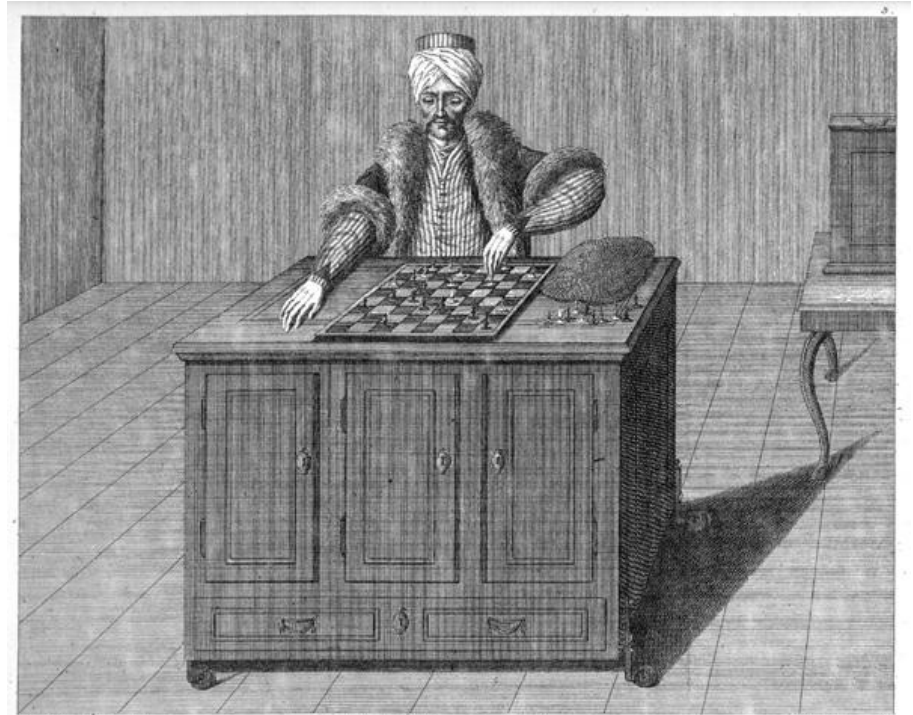


Automatons



“Canard Digérateur“,

1793



W. de Kempelen del. Chp. à Meckel, excud. Basilea. P. G. Pütz sc.
Der Schachspieler im Spiele begriffen. Le Joueur d'Échecs tel qu'on le voit pendant le jeu.

“The Turk“

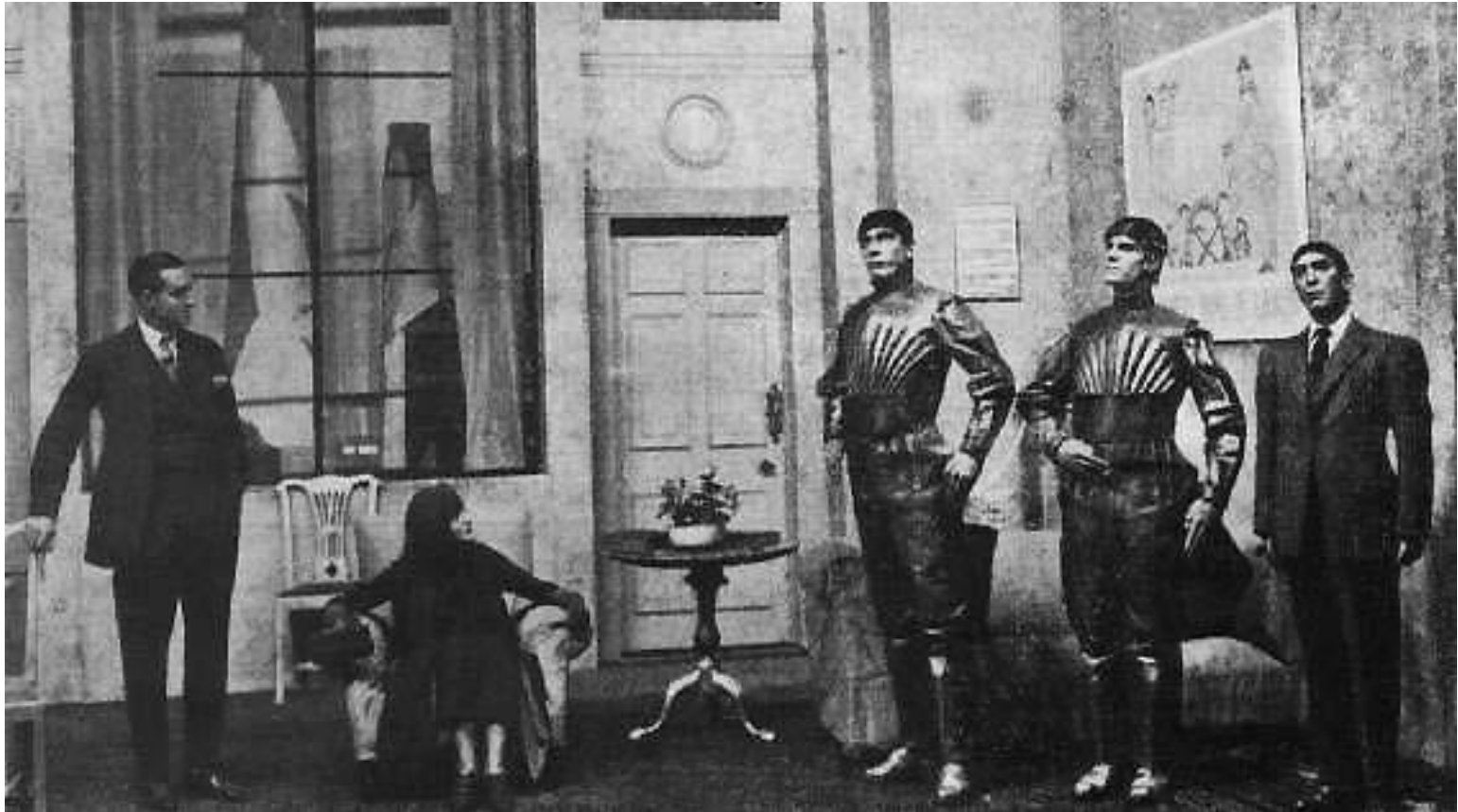
1770

Tea serving automaton 19th Century, Japan



Word “*Robot*”

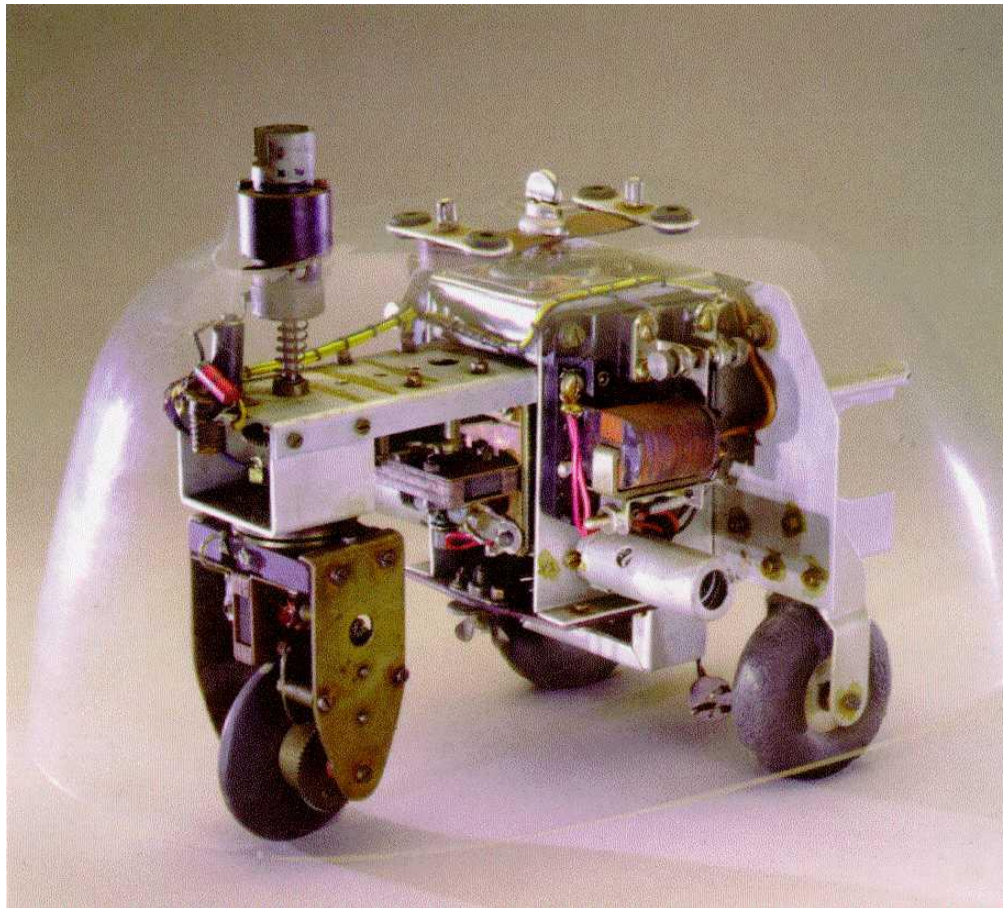
- “*Rossum's Universal Robots*” a novel by Karel Čapek, 1920.



Mobile Robots: 1950

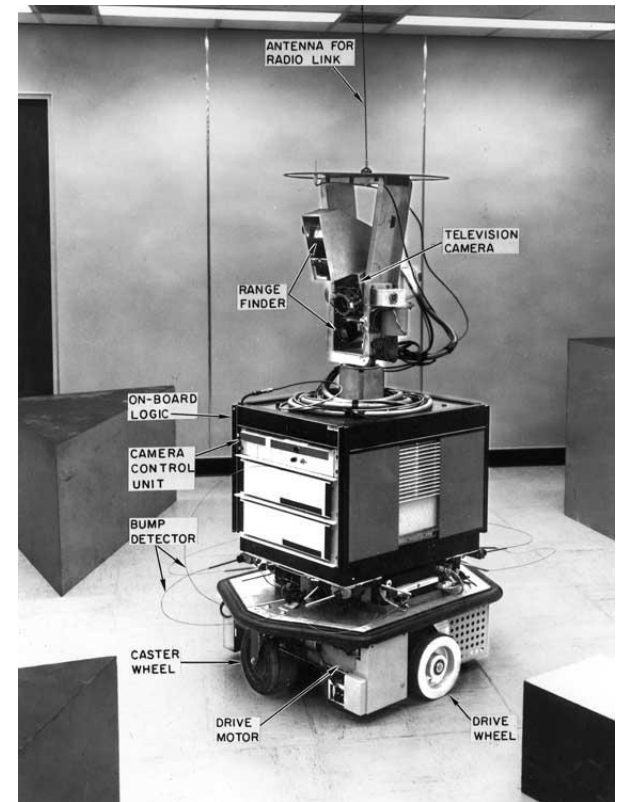
- Walter's *Tortoise*

<http://www.youtube.com/watch?v=ILULRImXkKo>



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: 1961

June 13, 1961

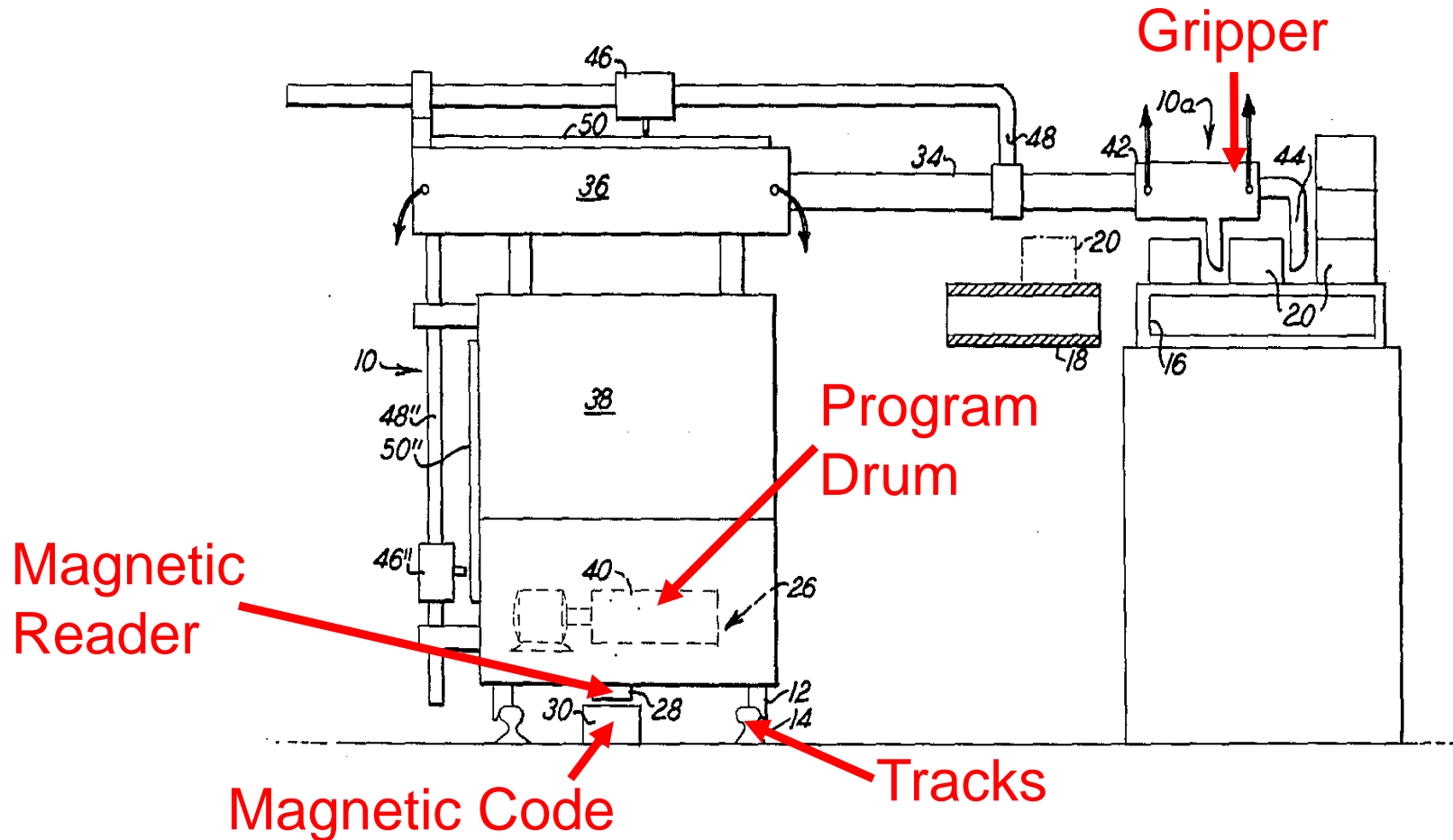
G. C. DEVOL, JR

2,988,237

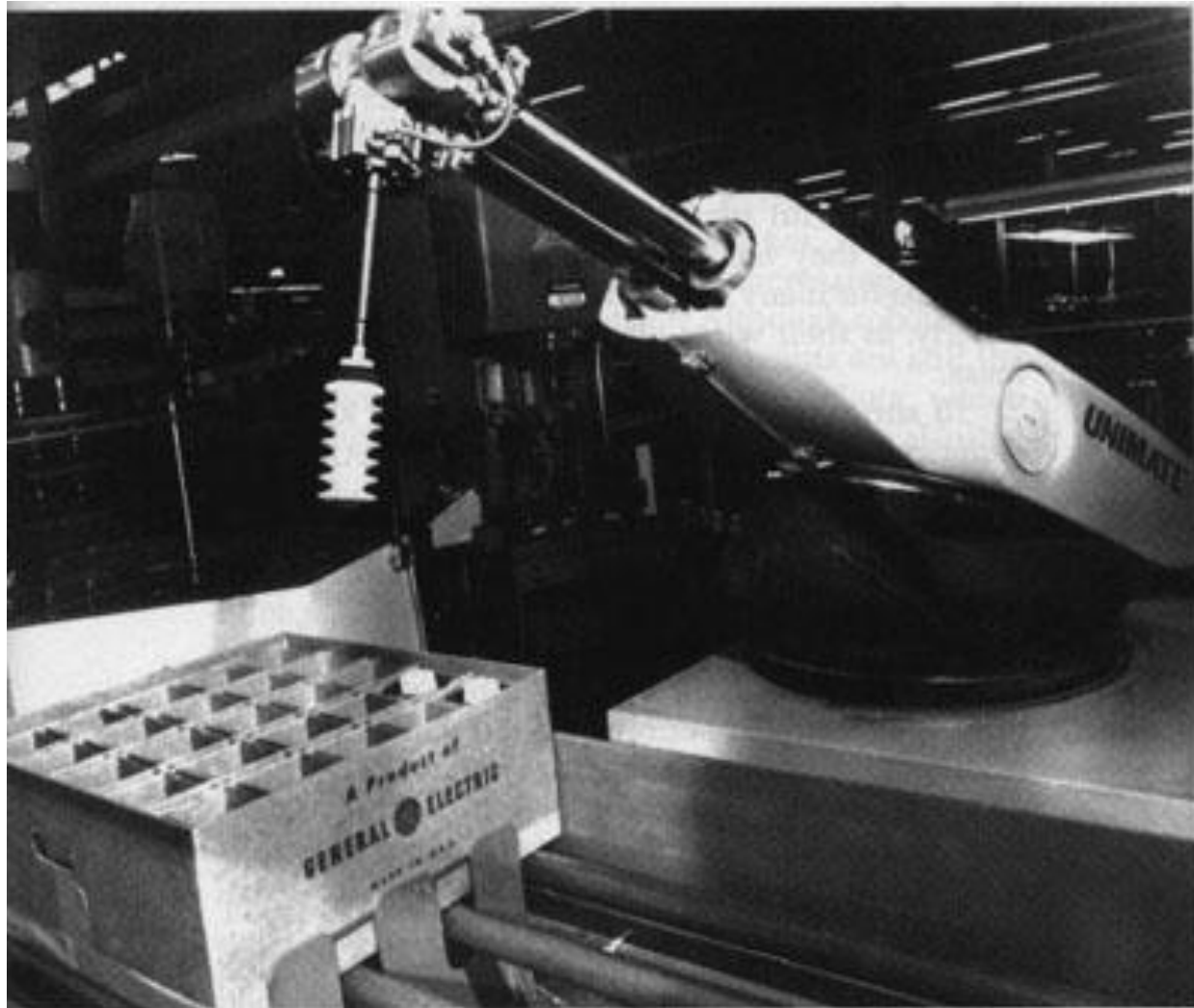
PROGRAMMED ARTICLE TRANSFER

Filed Dec. 10, 1954

3 Sheets-Sheet 1

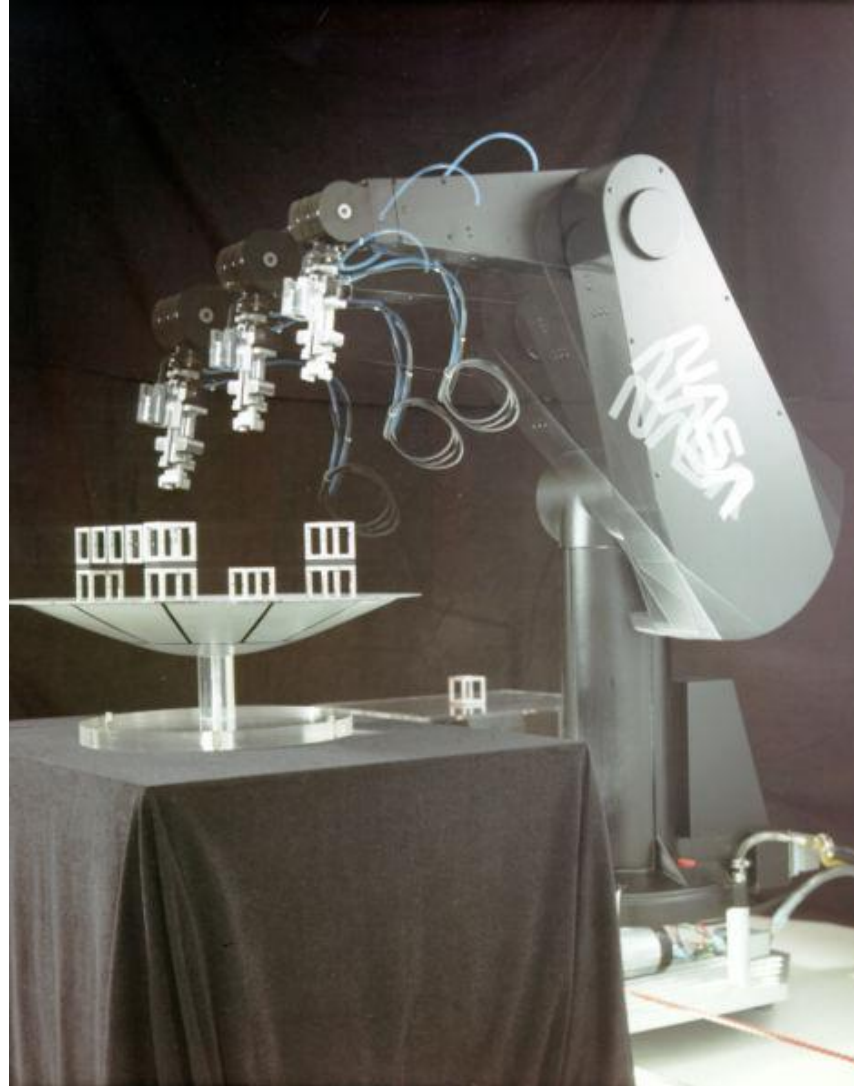


Industrial history: Unimate



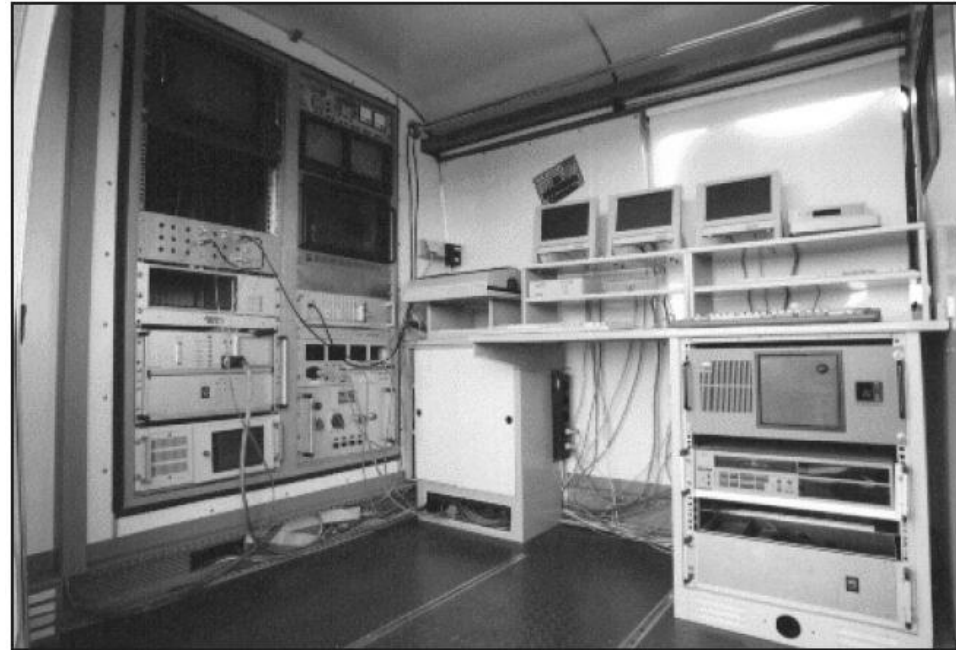
Armed for duty. A Unimate robot—really, just an arm—picks up and puts down parts in a General Electric factory.

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

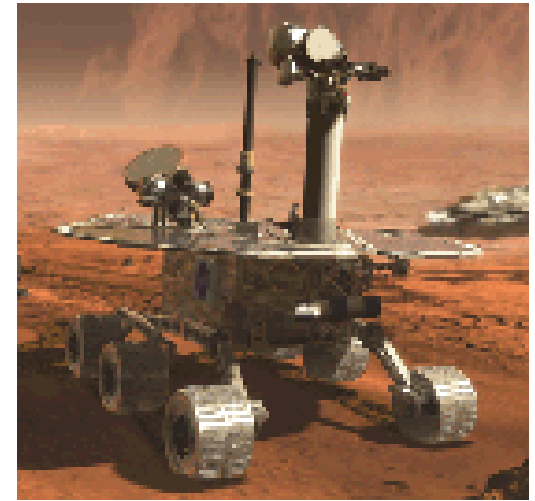
- Drove 2797/2849 miles (98.2%) on highways
- Throttle/Brake manually handled.



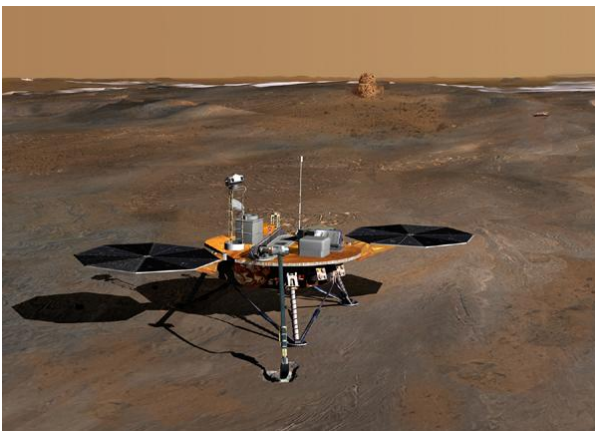
Exploring Mars



Spirit and
Opportunity
2003



Sojourner
1997

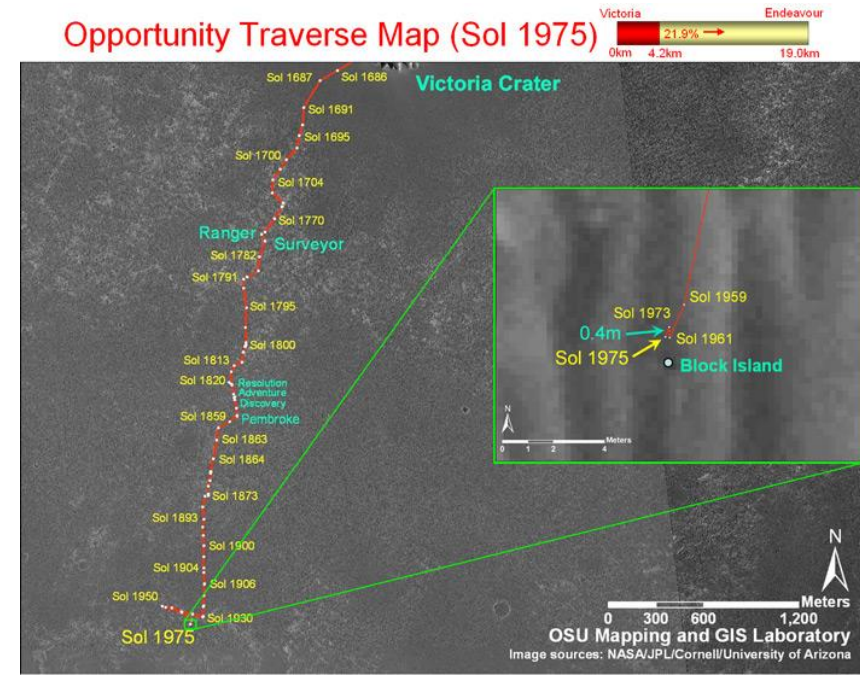
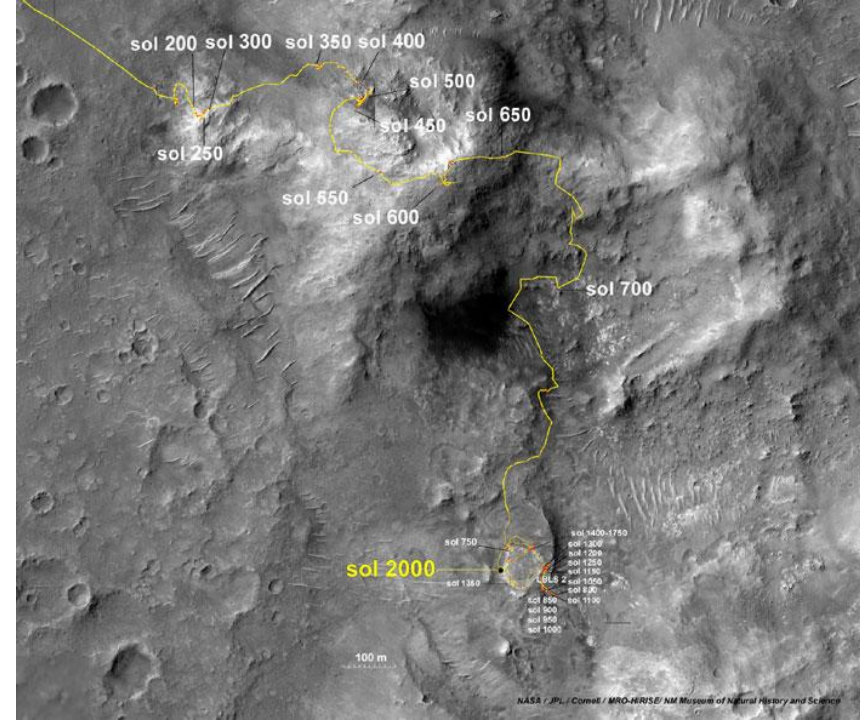


Phoenix-2008



Mars Exploraton

- 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.

