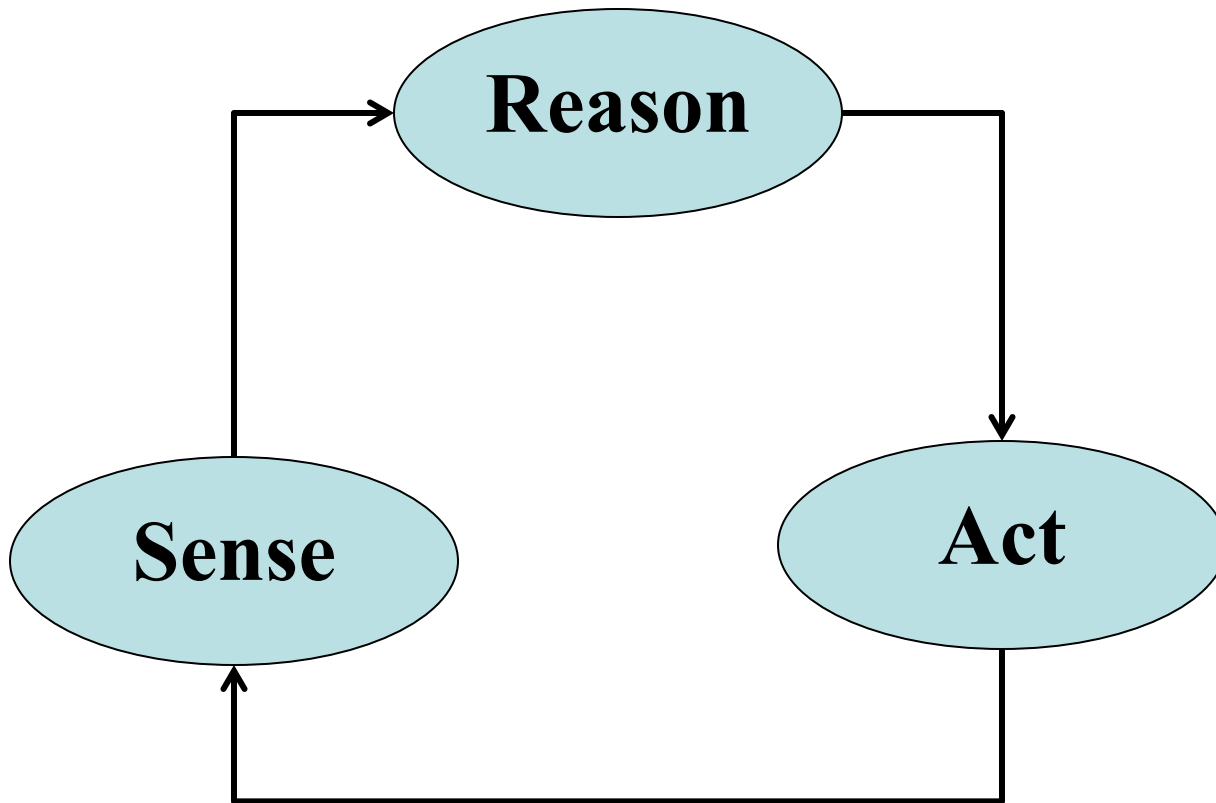


COMP417- Introduction to Mobile Robotics

A Quick History

Robot

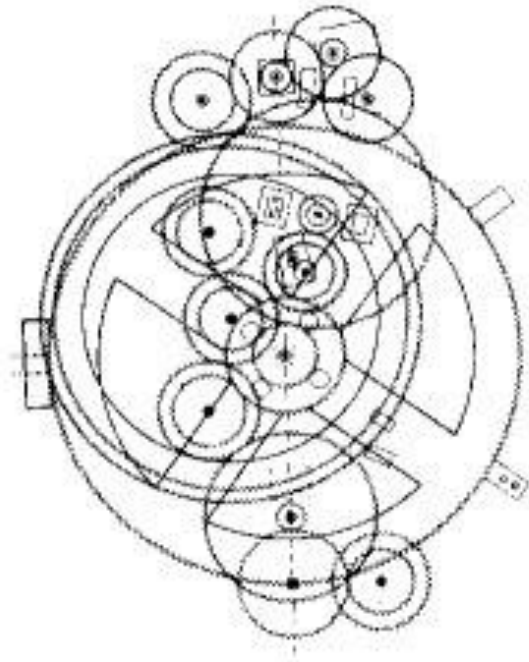


Talos (Τάλως/Τάλων) 400 BC

- 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

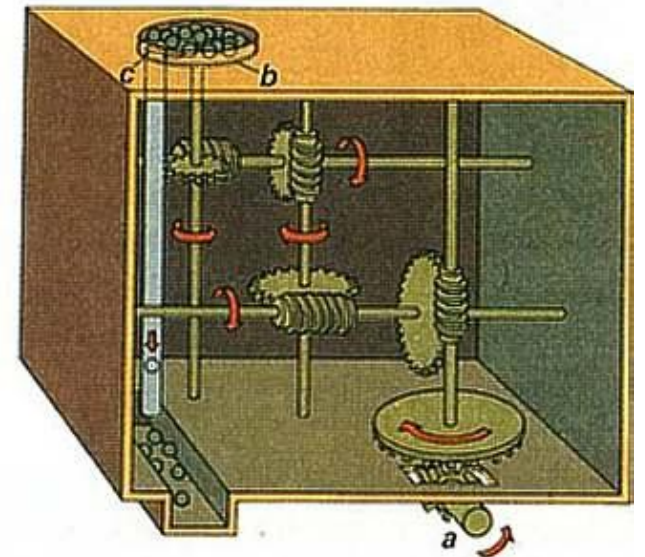


Antikythera, 150–100 BC

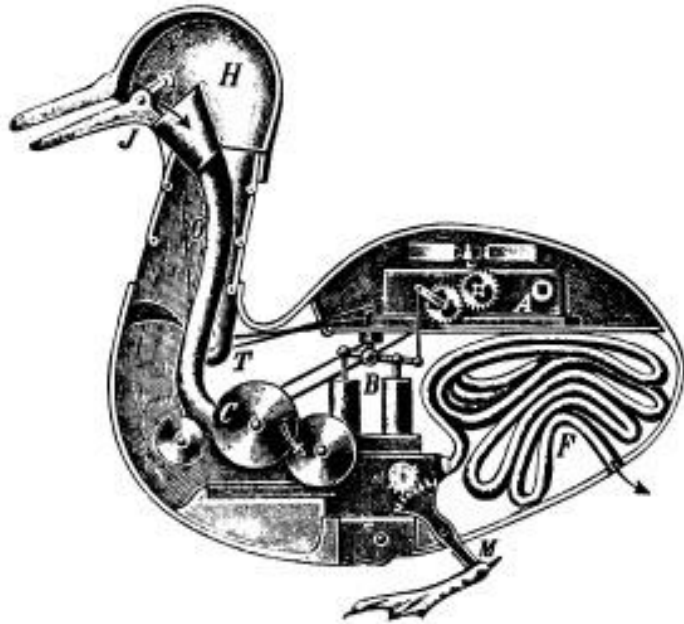


Heron of Alexandria (Ἡρων ὁ Ἀλεξανδρεὺς) 10-70AD

One of the first sensors:
Odometer.

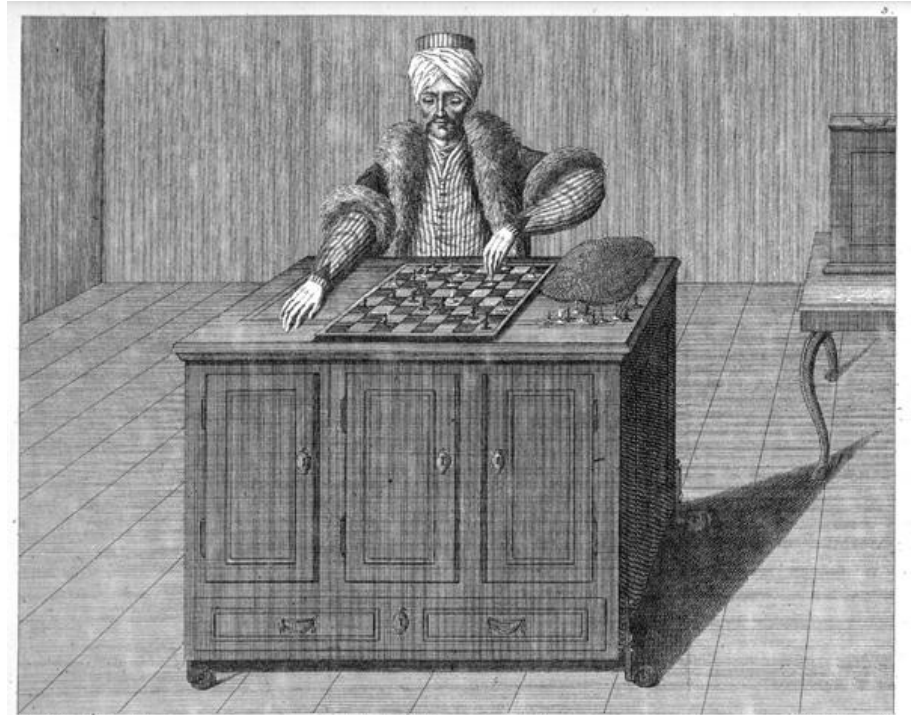


Automatons



“Canard Digérateur“,

1793



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

“The Turk“

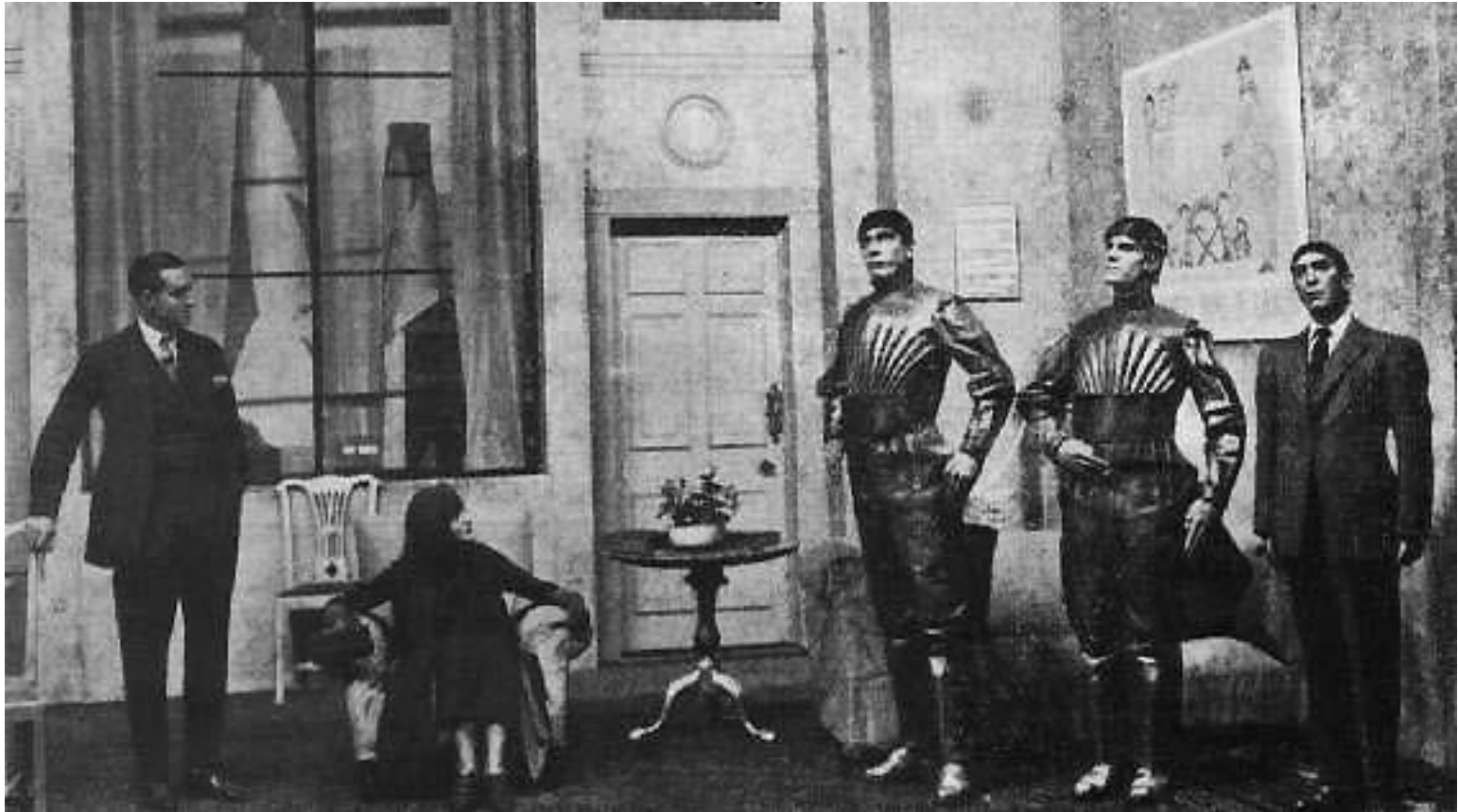
1770

Tea serving automaton 19th Century, Japan



Word “*Robot*”

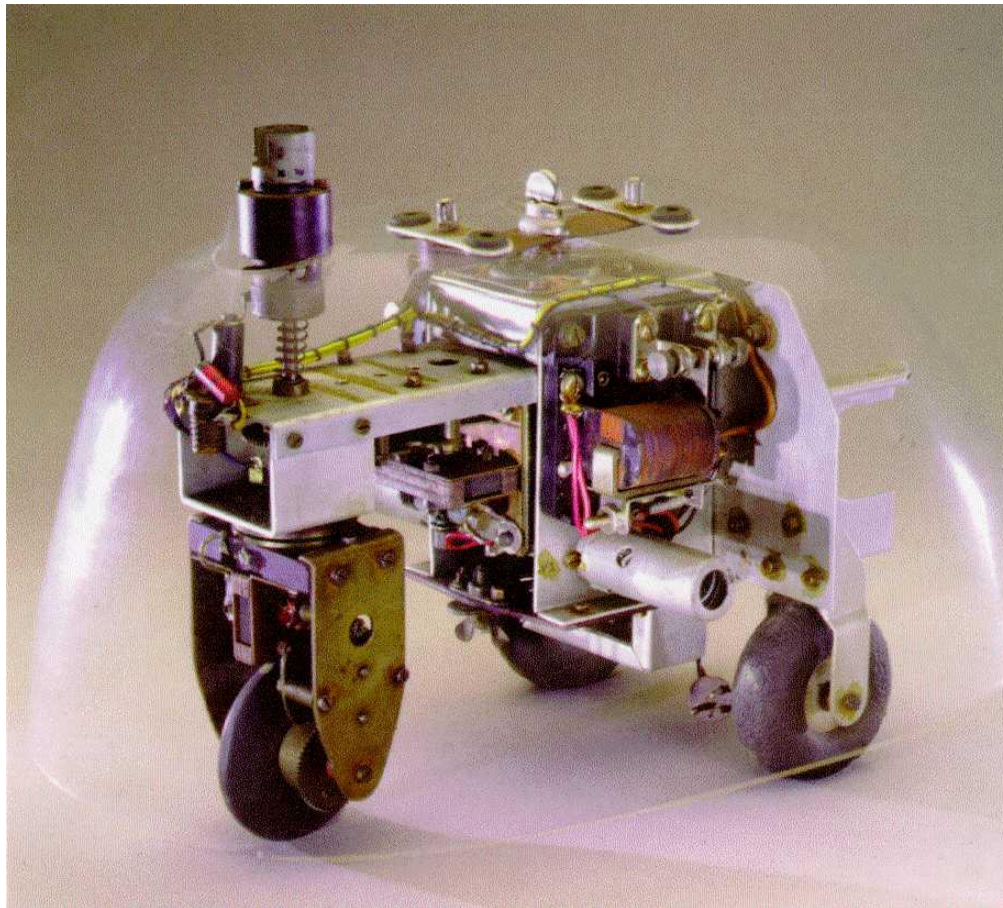
- “*Rossum's Universal Robots*” a novel by Karel Čapek, 1920.



Mobile Robots: 1950

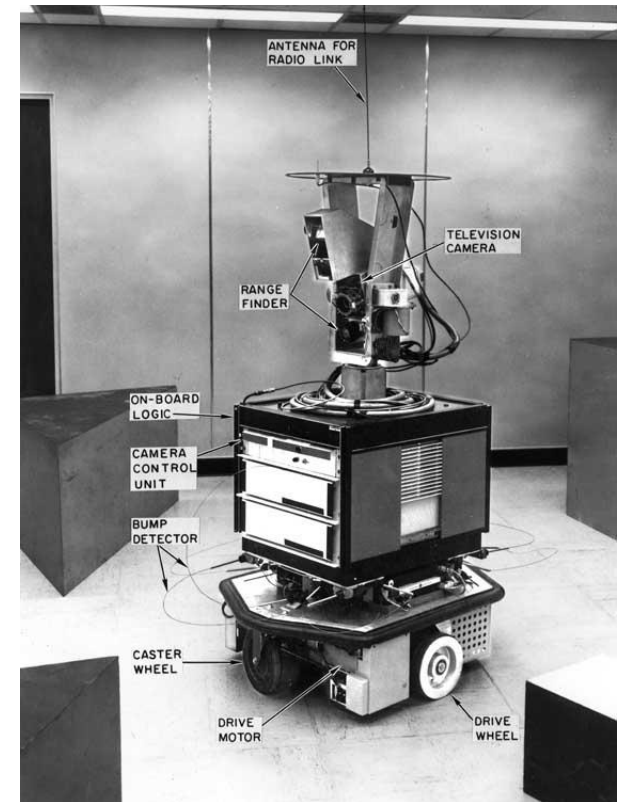
- Walter's *Tortoise*

<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

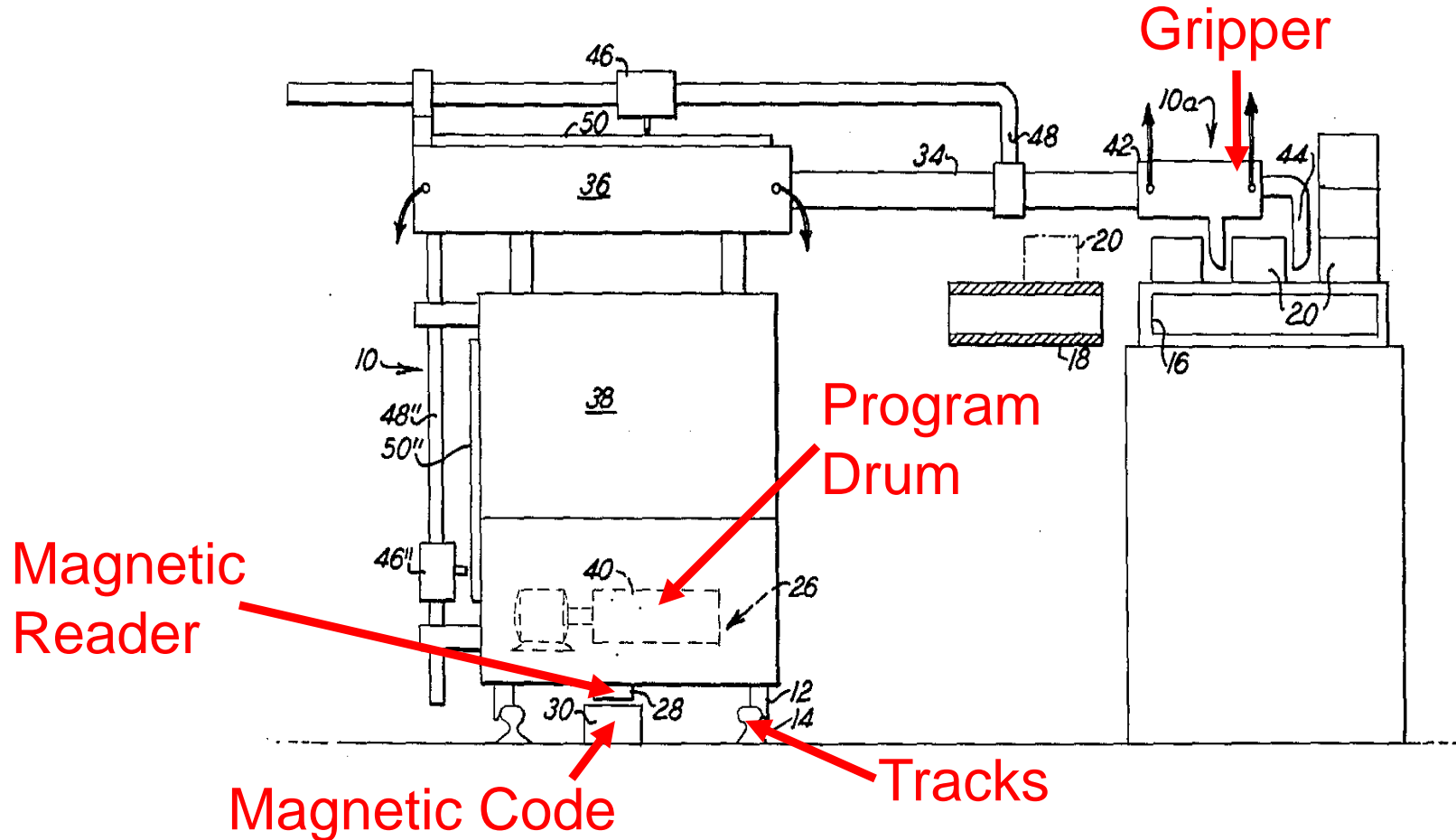
G. C. DEVOL, JR

2,988,237

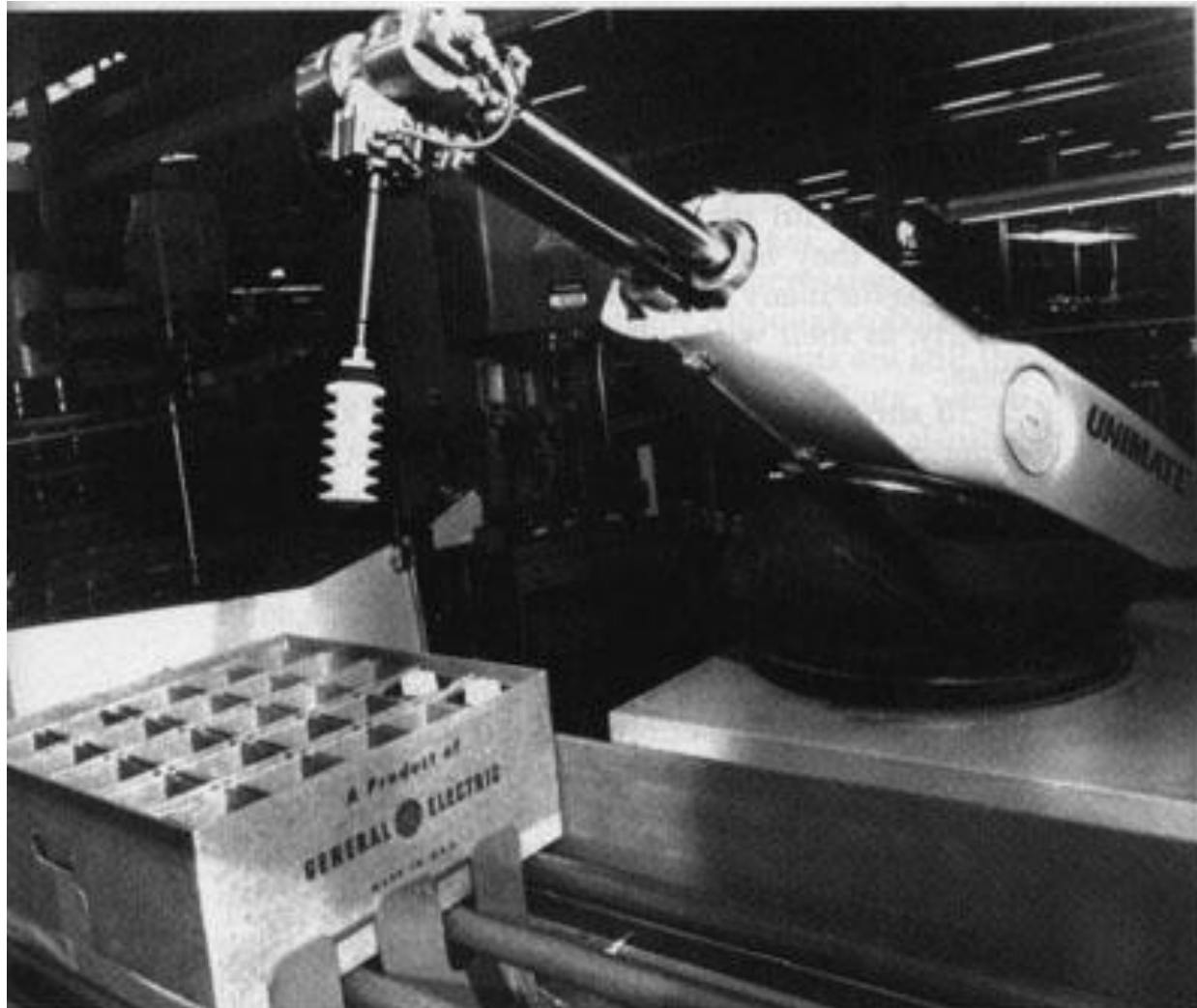
PROGRAMMED ARTICLE TRANSFER

Filed Dec. 10, 1954

3 Sheets-Sheet 1

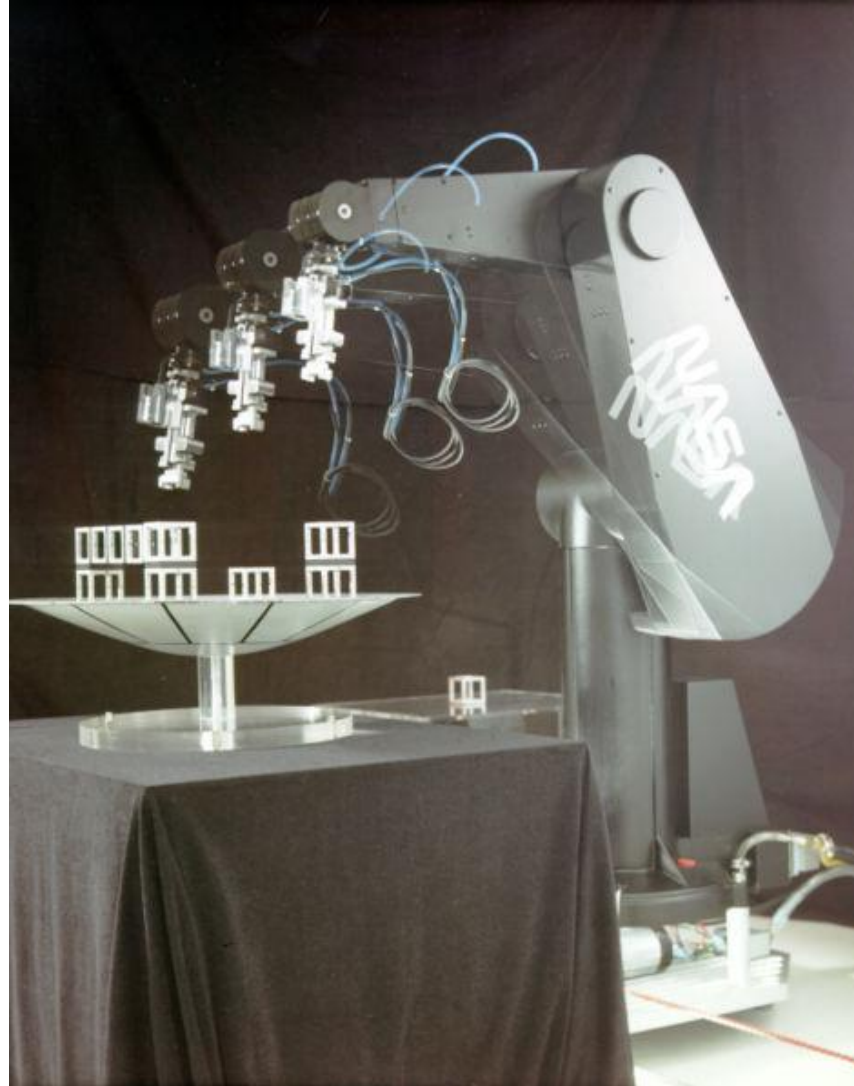


Industrial history: Unimate



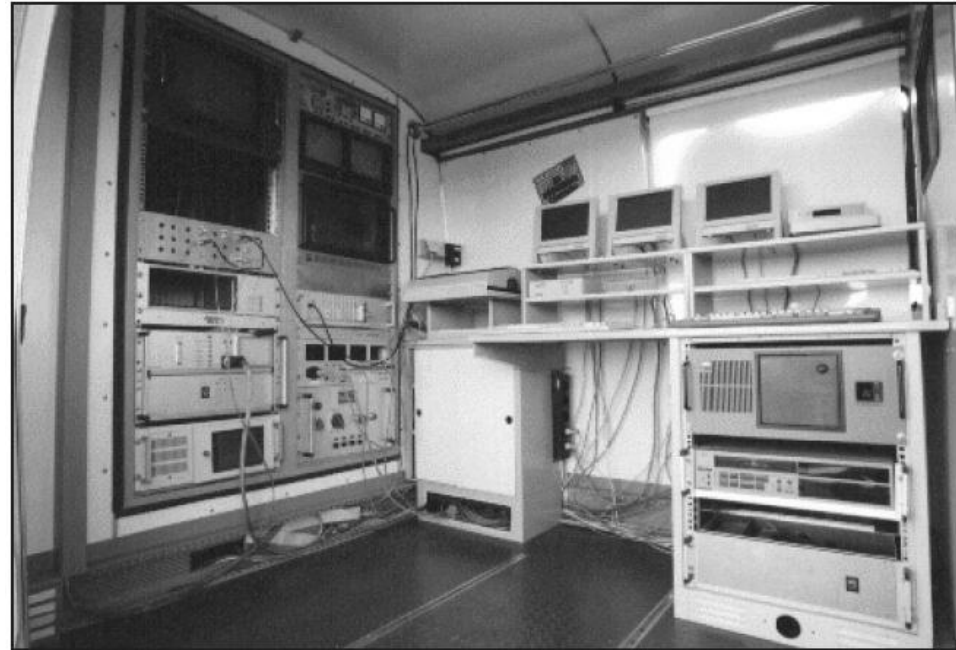
Armed for duty. A Unimate robot—really, just an arm—picks up and puts down parts in a General Electric factory.

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

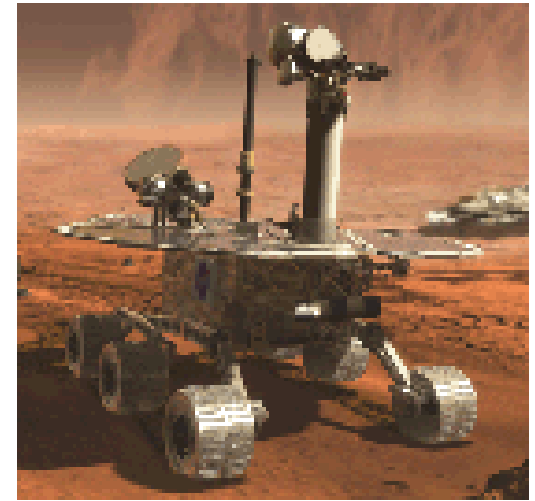
- Drove 2797/2849 miles (98.2%) on highways
- Throttle/Brake manually handled.



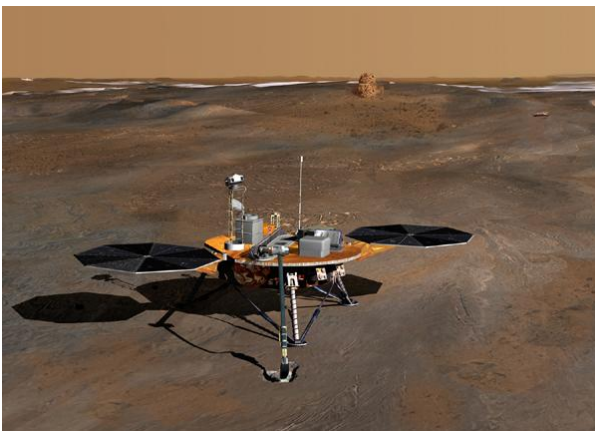
Exploring Mars



Spirit and
Opportunity
2003



Sojourner
1997



Phoenix-2008



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.

