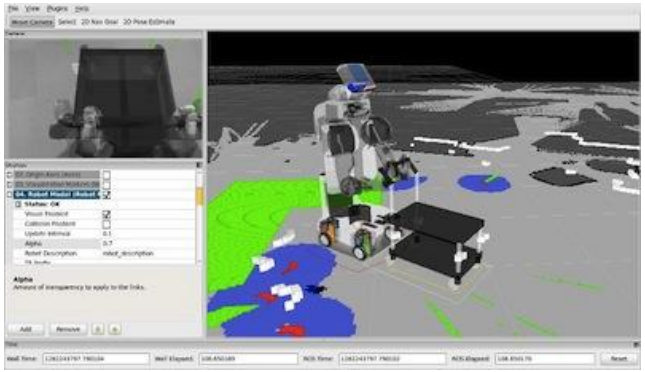
Why is robotics converging on embedded linux and where's it going next?

Tully Foote

Open Source Robotics Foundation

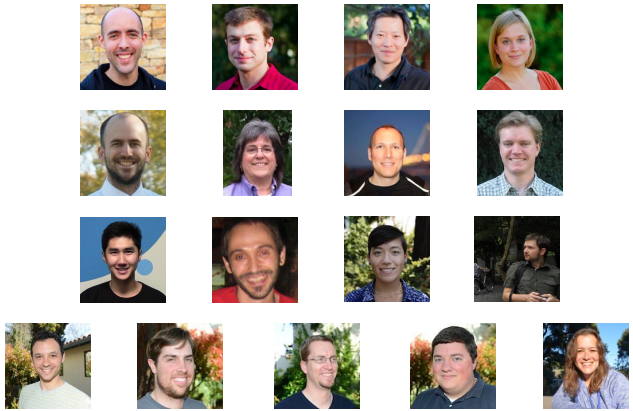
My Background



Open Source Robotics Foundation

Open Source Robotics Foundation

Mission Statement: “...to support the development, distribution, and adoption of open source software for use in robotics research, education, and product development.”



http://osrfoundation.org

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Origins of Robots

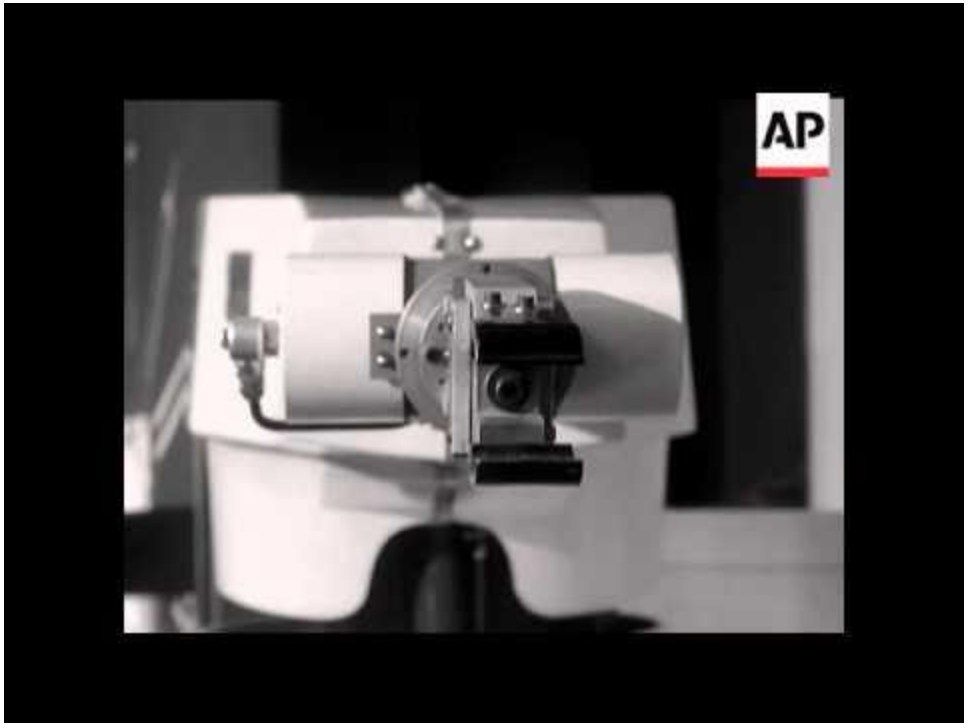
1920

- **robot**: a machine capable of carrying out a complex series of actions automatically, especially one programmable by a computer.
- From Czech word robota meaning ‘forced labor’

1941

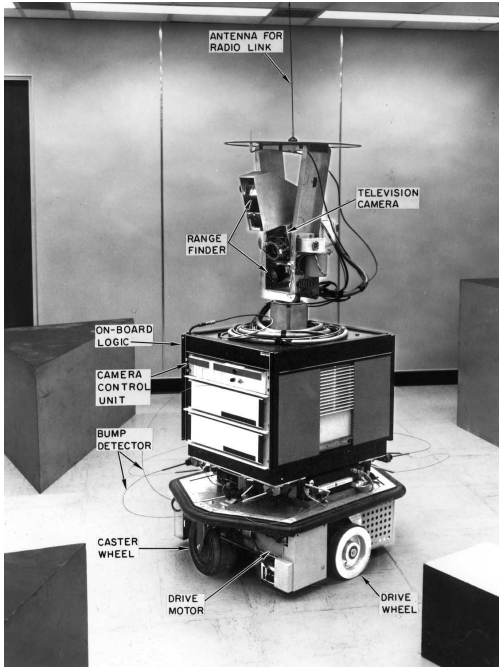
- **robotics:** term coined by Isaac Asimov

UniMate 1961



Cost Reduction

Shakey 1966-1972 at SRI



Computing: SDS-940

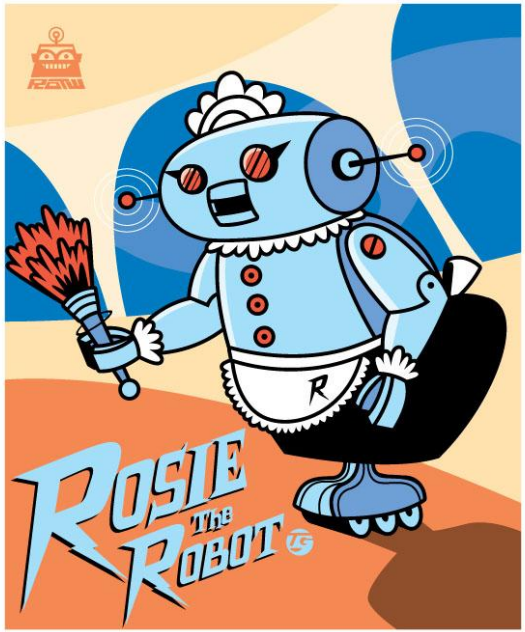
More info see: http://www.ai.sri.com/shakey/

2015 Shakey redux

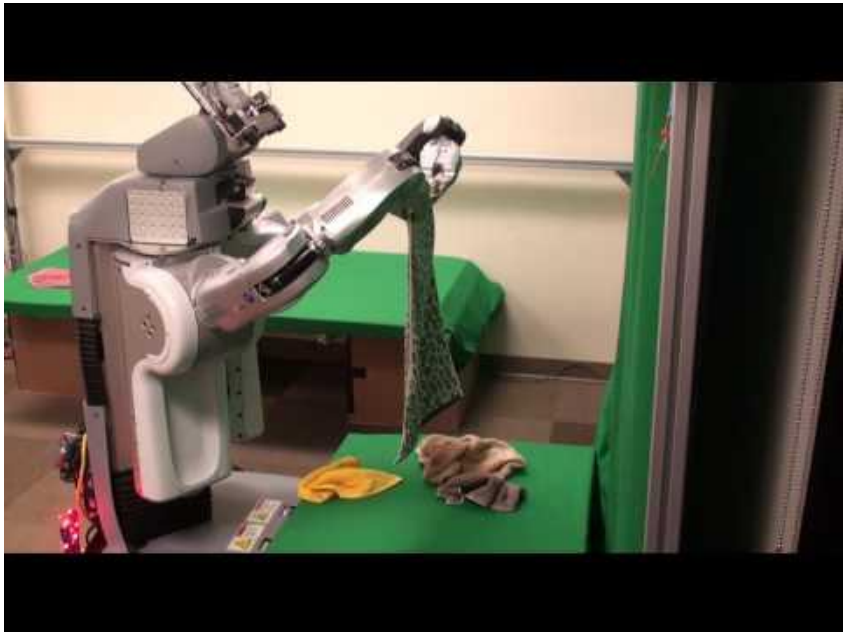
Individuals can reproduce Shakey using off the shelf parts.

Personal Robots

Fiction



Reality - Research



Reality - Products

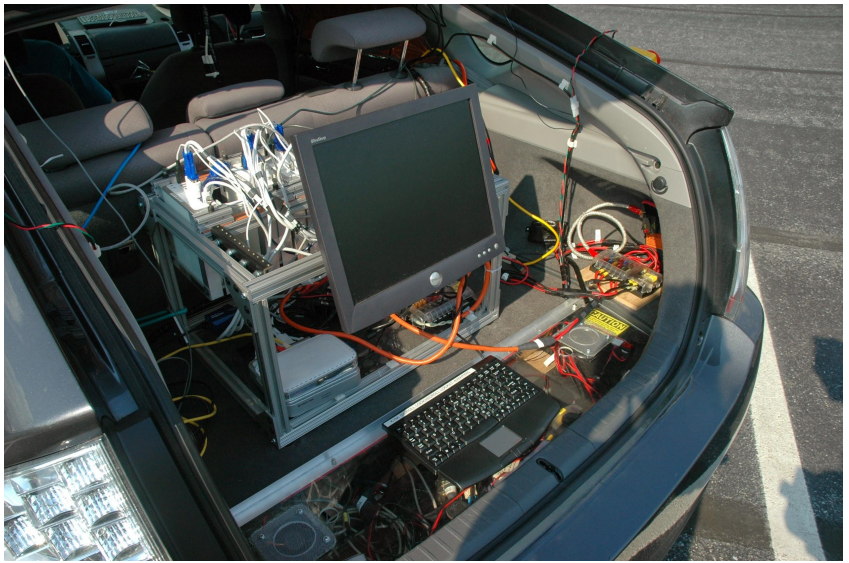
Autonomous Cars

Fiction

2004

2005

2008



Today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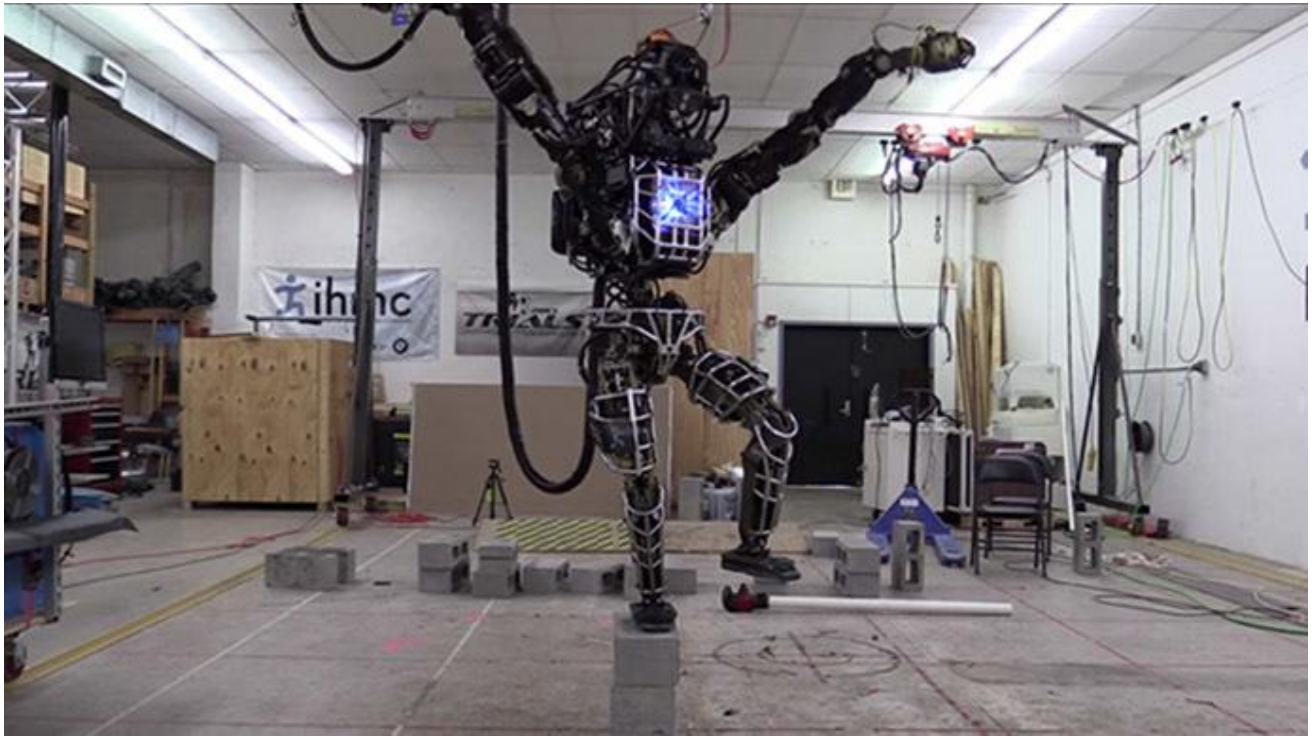
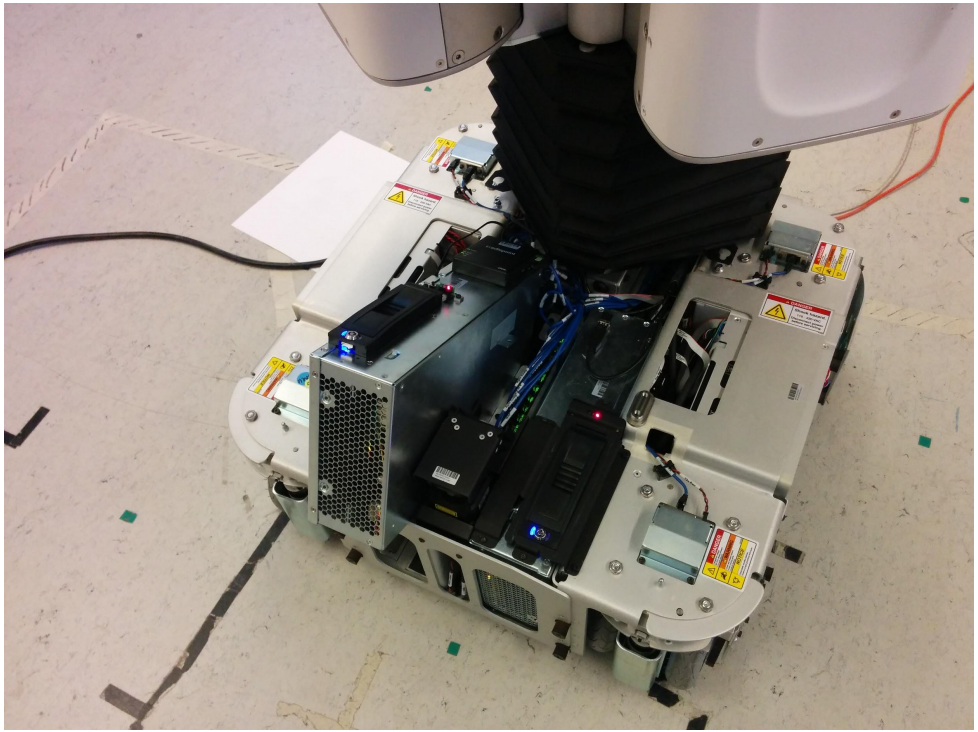
Background on Autonomous Vehicles Regulations
Testing of Autonomous Vehicles
Deployment of Autonomous Vehicles for Public Operation
Adopted Regulations for Testing of Autonomous Vehicles by Manufacturers
DMV conducted two public workshops in 2013 related to developing regulations for testing of autonomous vehicles. The proposed regulations were then published in the Office of Administrative Law's California Regulatory Notice Register on November 29, 2013. The publishing marked the start of a 45-day public comment period, which ended on January 13, 2014. After a public hearing held on January 14, 2014, DMV delivered final testing regulations to the Office of Administrative Law for approval.
The autonomous vehicles testing regulations were adopted on May 19, 2014 and became effective on September 16, 2014.
You may view the details of the adopted regulations by clicking on the documents below.
Adopted Regulatory Text (PDF)
Final Statement of Reasons (PDF)

Power Requirements

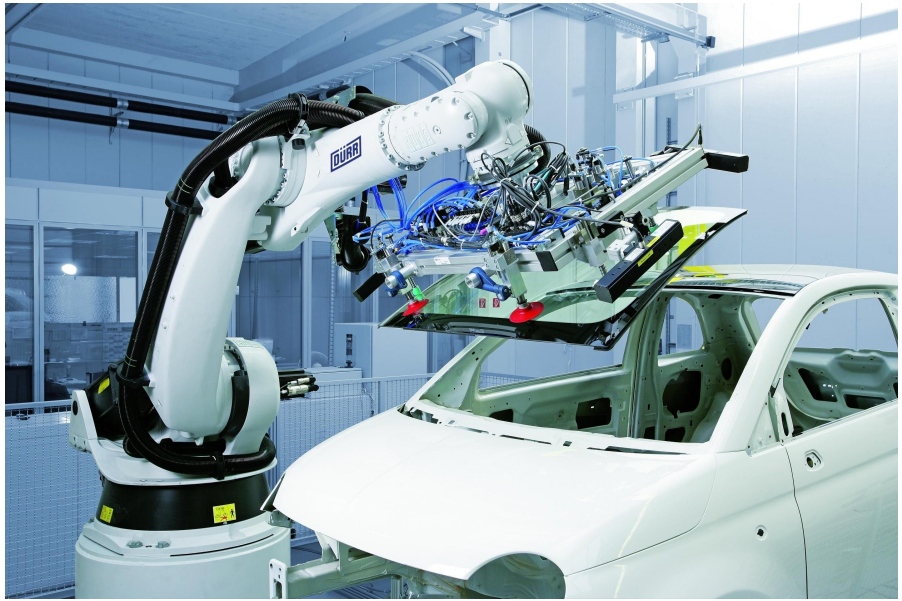
No Batteries Included



PR2: 83% power required for computers



More complex environments



Untrained Operators

Why Linux?

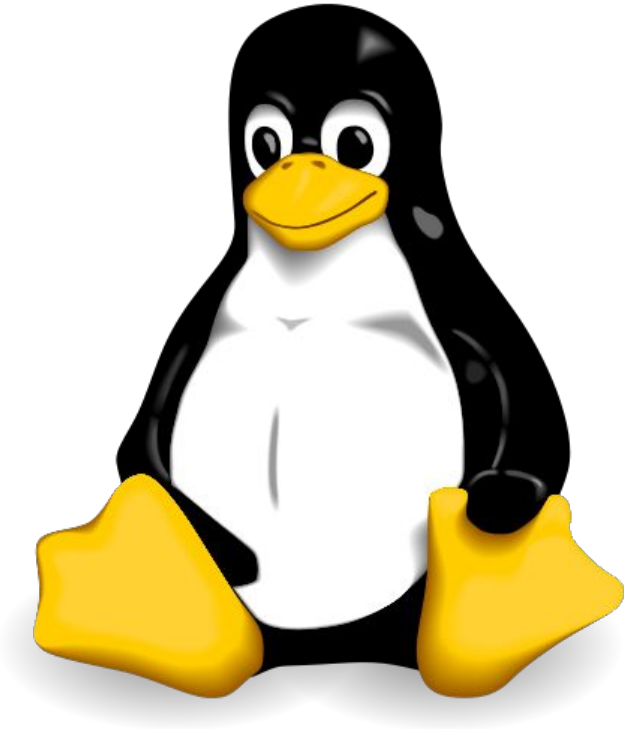
Flexibility to customize

Freedom to customize

Community collaboration

Reproducibility

Lack of restrictions (licensing) on deployment



Example: 2D Navigation

- localization
- path planning
- 3D obstacle avoidance
- mapping (SLAM)

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PAL
ROBOTICS
SINTEF

Summary

- Light weight
- Low power
- Small size
- Customizable
- Reusable across products
- Low cost

What's Next?

Standardized Embedded Platforms

96Boards

What's Next?

Internet of Things …

Robots are things?…

I think of IoT as:

A distributed robotic system

Unmet needs:

- Local communications
- Autonomy
- Security
- Robots
- Decentralized operations

Thank You