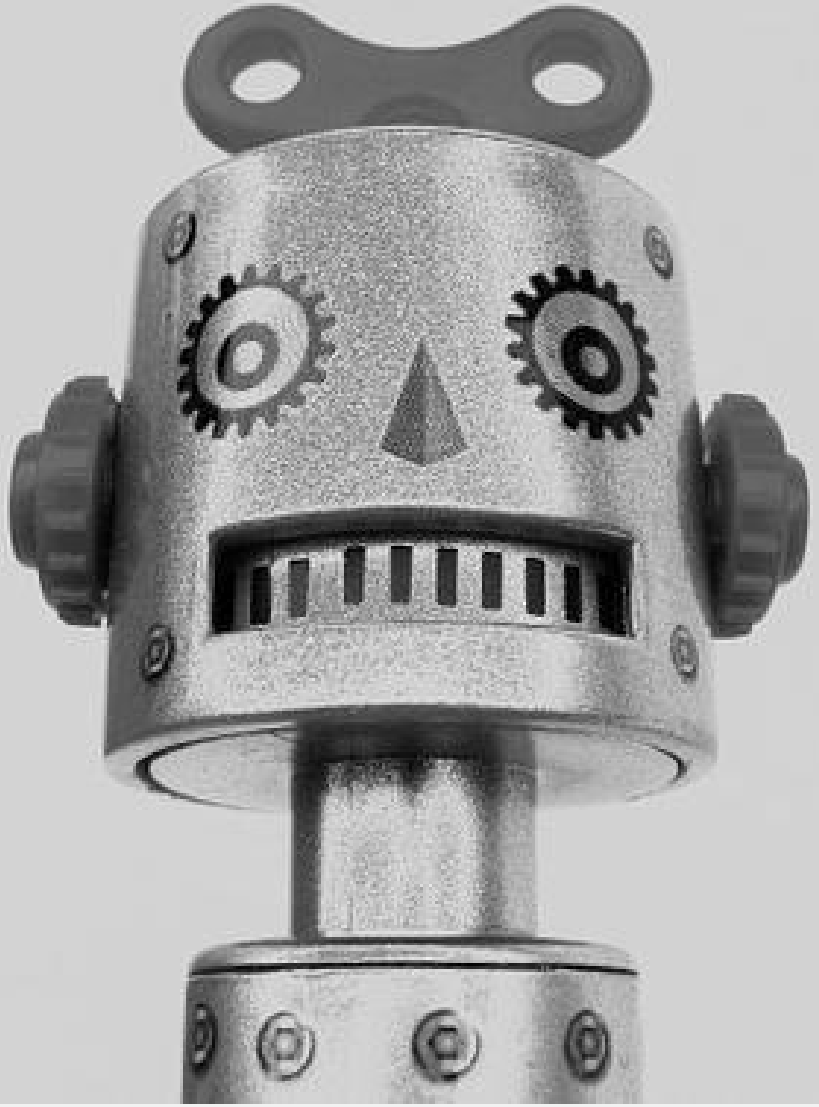
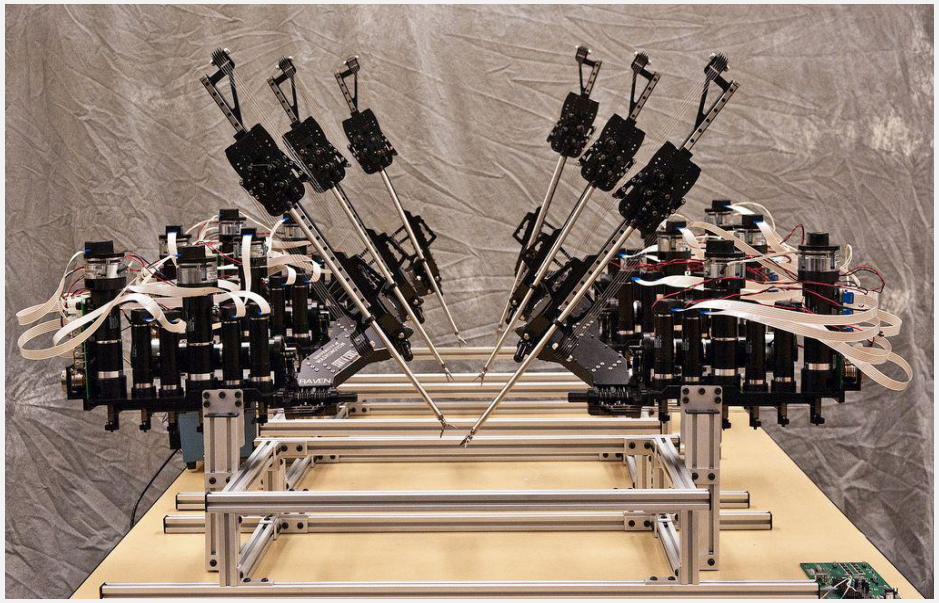
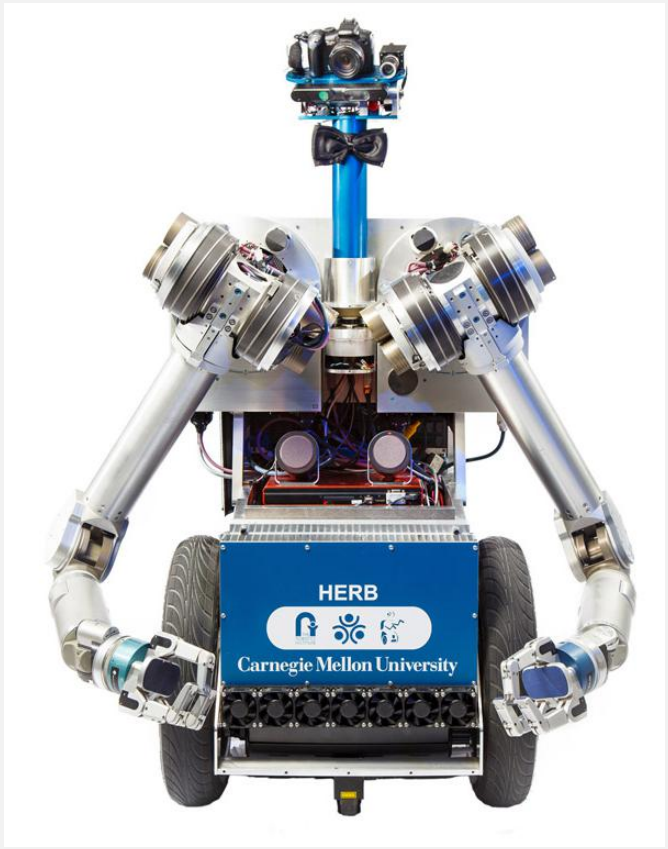
ROBOTICS





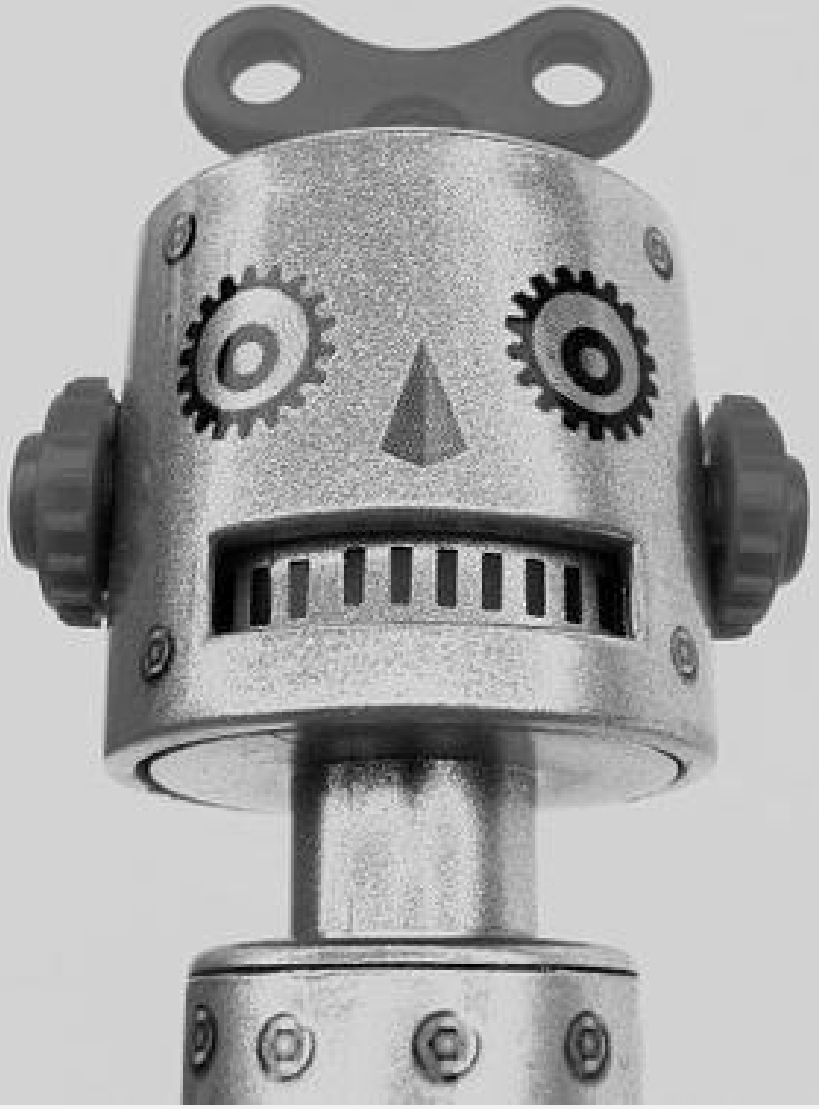

HERB
Carnegie Mellon University

ROBOTICS

But Robotics is hard to learn, & it takes time as well as money to develop a fully functional robot.

ROBOTICS

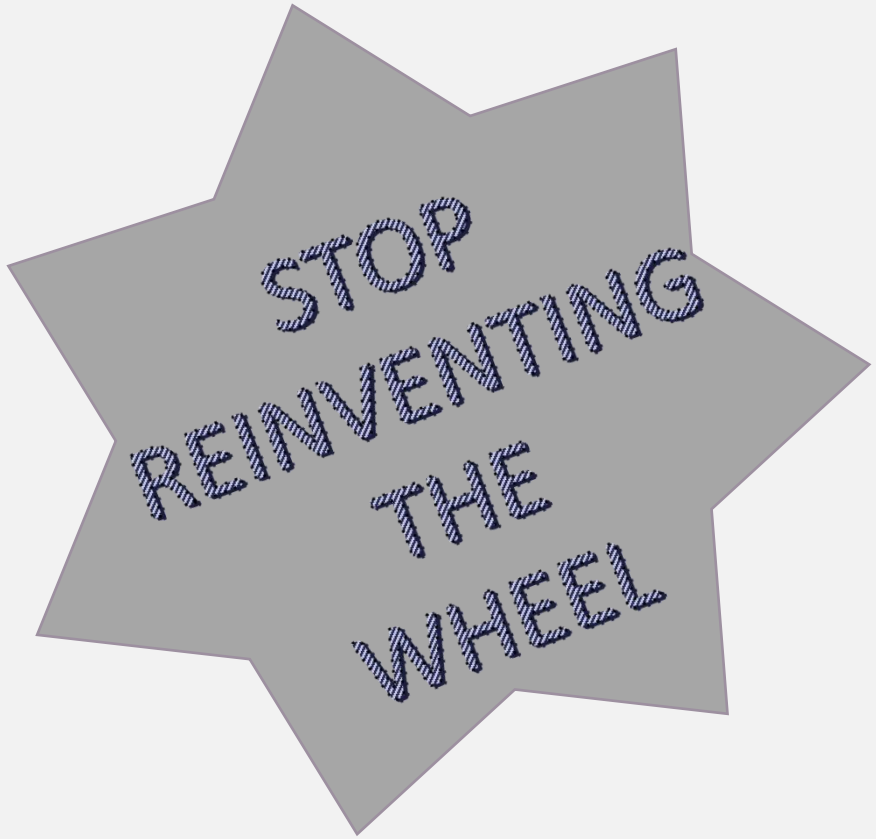
So what's the way out?



ROBOTICS

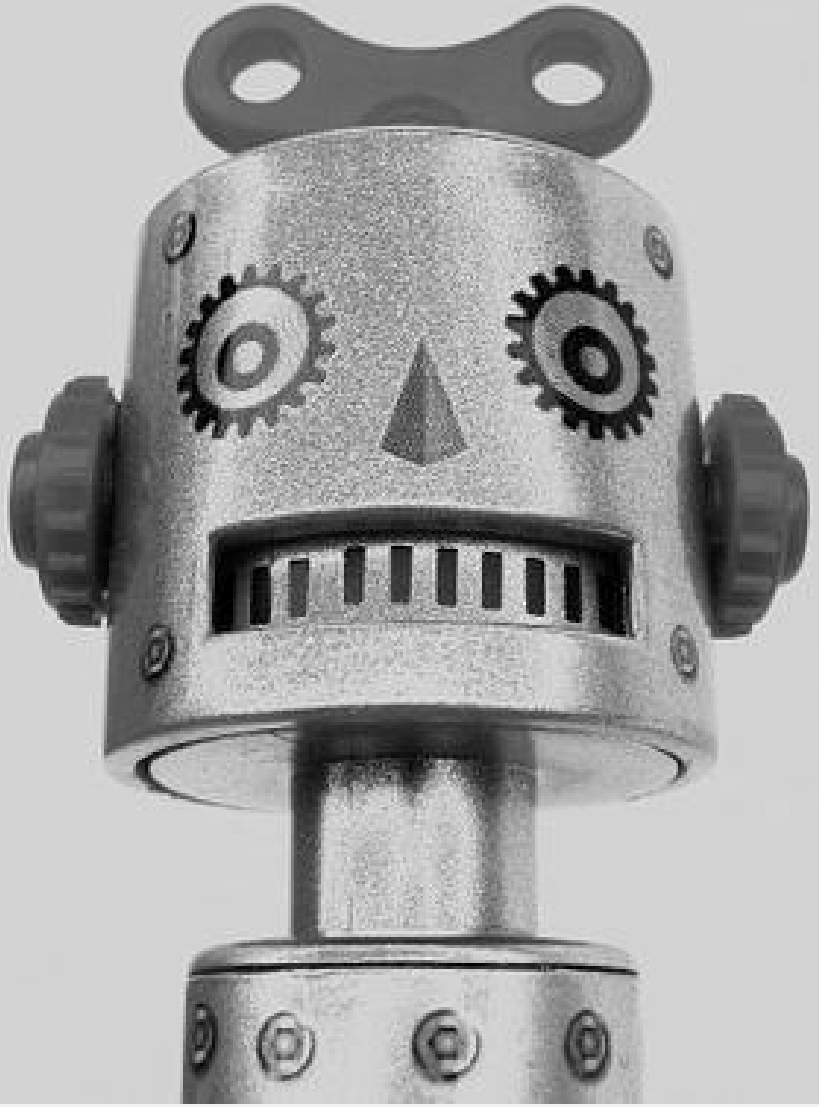
So what's the way out?

- Collaborative apporach towards work
- Reusability of resources
- Cost effectiveness
- Existing robotics software framework support



ROS

Robot Operating System



ROS

Robot Operating System

- Robot Operating System, despite its name, is not an operating system. Nor it is really a framework, but rather a **meta operating system**.
- A meta operating system is **built on top of an existing operating system and allows different processes (nodes) to communicate with each other at runtime.**
- ROS is more of a middleware, something like a low-level “framework” based on an existing operating system.

Chosing between languages for robotics programming.

+

Trade off between performance and development time.

ROS

Rospy vs Roscpp

- In academia, speed in testing hypothesis is more important than speed of execution.
- While in implementation, performance plays a bigger role.

Main languages in ROS repos by popularity

rank	Language	repos	percent
1.	C++	350	55.0%
2.	Python	158	24.8%
3.	CMake	82	12.7%
4.	C	15	2.4%
5.	Common Lisp	8	1.3%
6.	None	7	1.1%
7.	Java	4	0.6%
8.	EmberScript	3	0.5%
9.	Shell	2	0.3%
10.	HTML	2	0.3%
11.	Arduino	1	0.2%
12.	Emacs Lisp	1	0.2%
13.	Lua	1	0.2%
14.	Protocol Buffer	1	0.2%
15.	C#	1	0.2%

RosPy

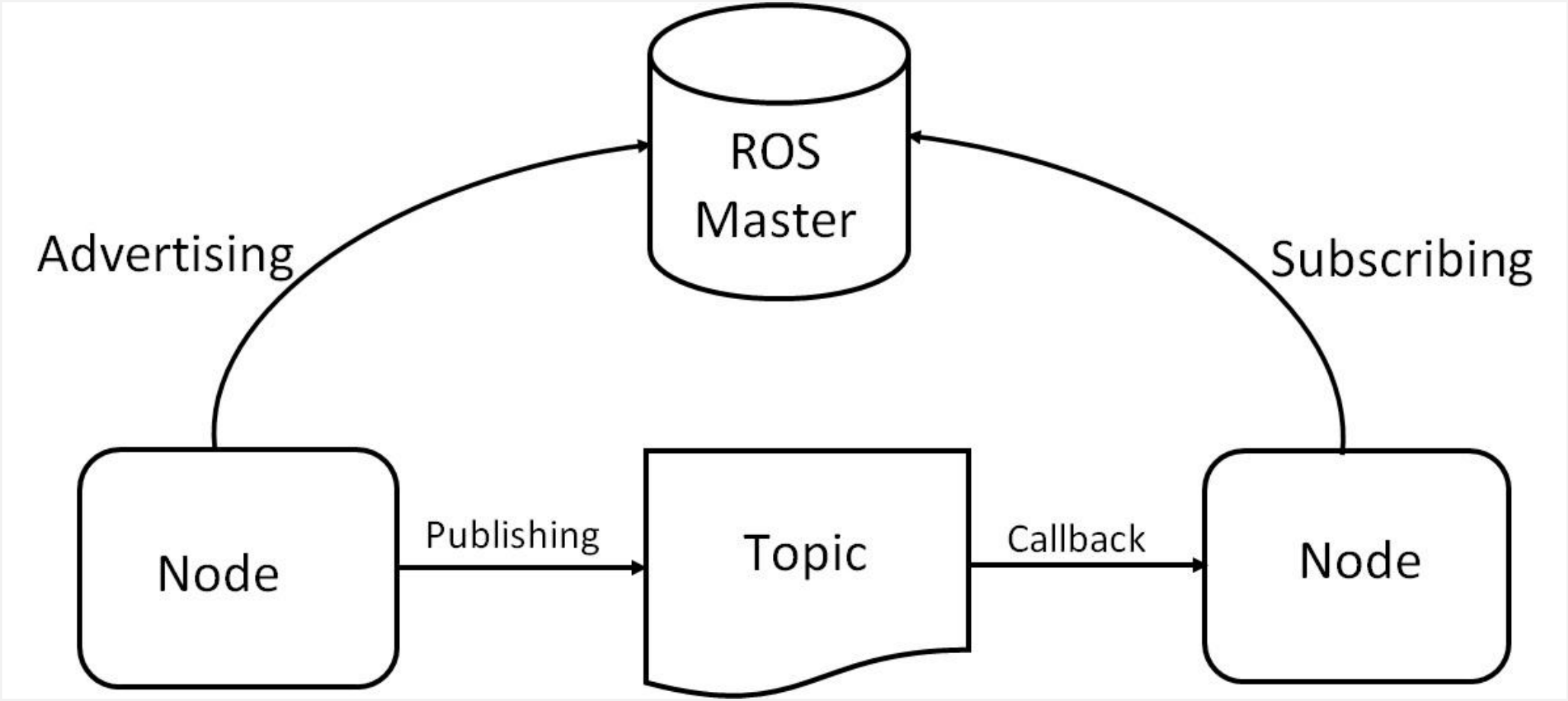
It can also be used with various other tools such as:

- OpenCV(computer vision library),
- Gazebo(simulator with dynamic and kinematic physics),
- Fetch (ROS Compatible robot),
- Rviz(sensor data visualisation tool),
- Roslink (protocol to integrate robot with IoT)
- MoveIt(motion planning library)

The ROS Equation

Plumbing + Tools + Capabilities + Ecosystem

= ROS


ROS
Master
Advertising
Subscribing
Node
Publishing
Topic
Callback
Node

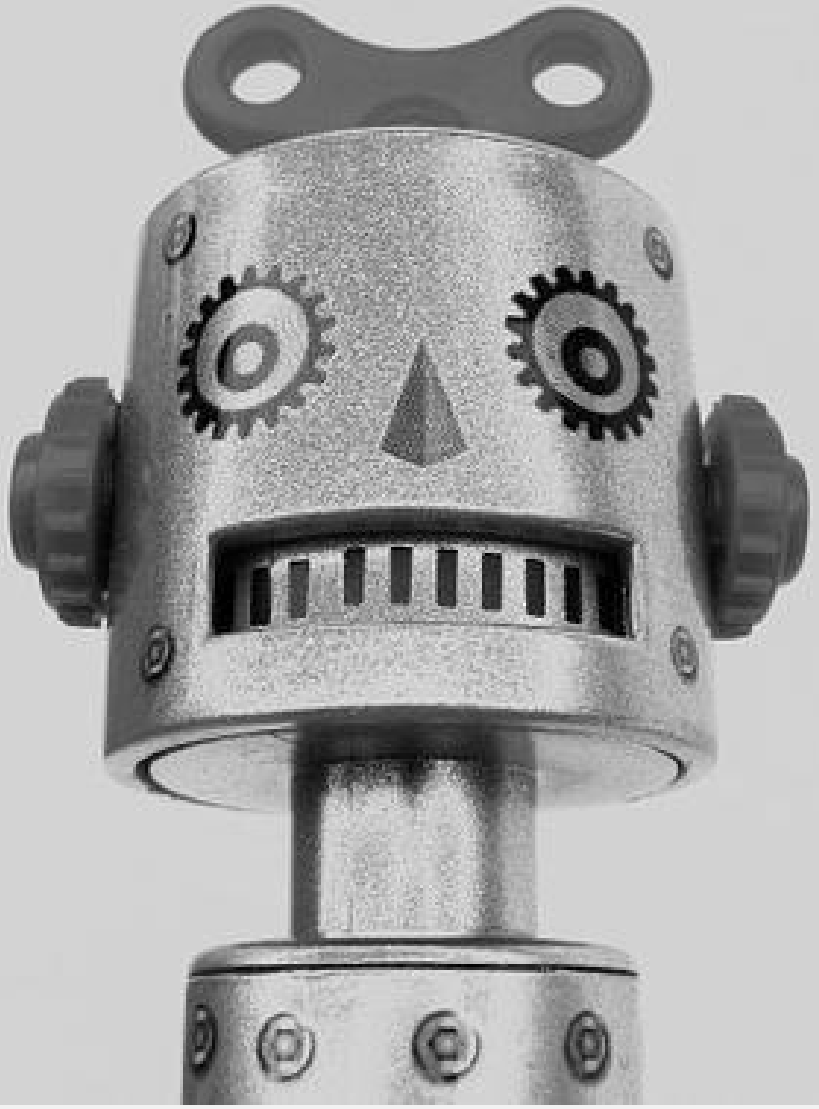
RosPy

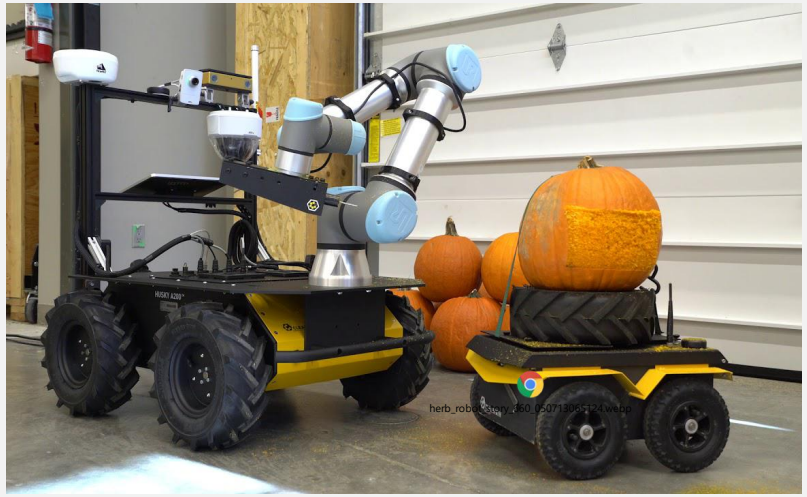
Why RosPy is better for academia and research

- Simulation + real world application
- Community support
- Prebuild library
- Cost effective (for simulation)
- Popularity
- Tools
- Customization

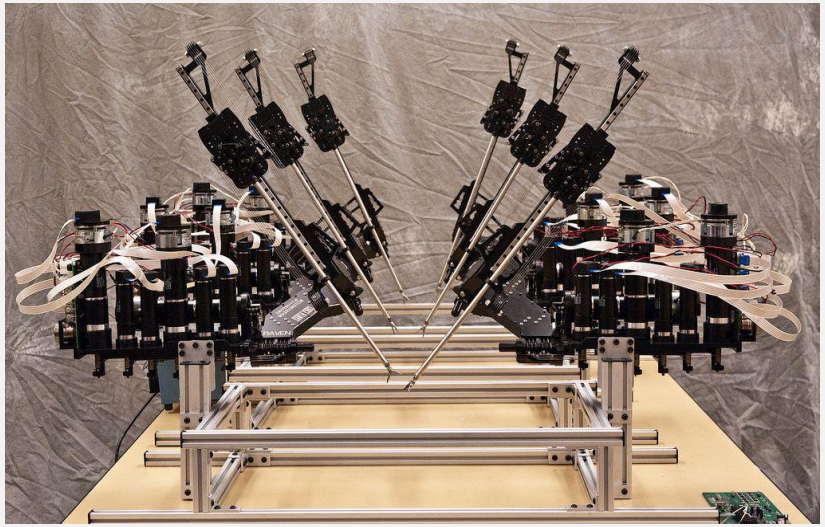
ROS

Where's the world with ROS at?

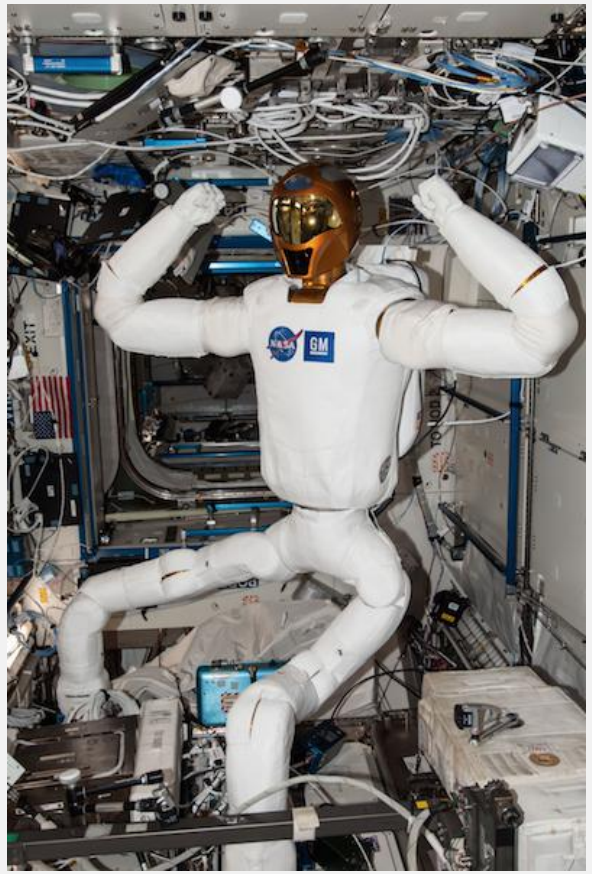




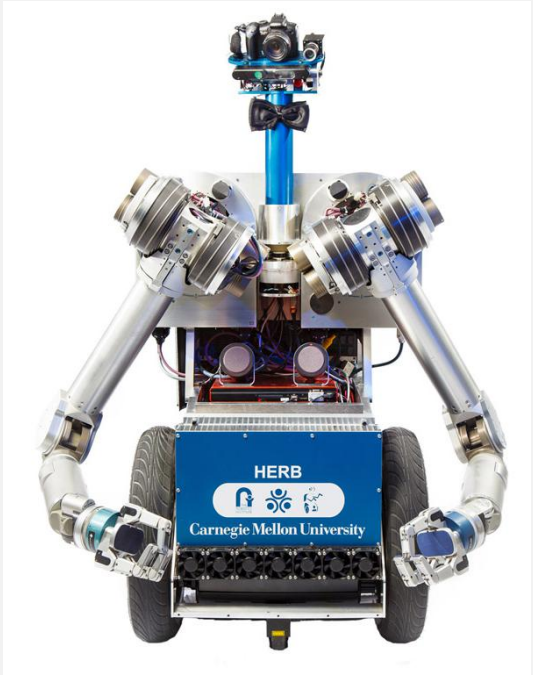
HUSKY (a medium sized robotic development platform by ClearPathRobotics)



Raven II Surgical Robotic Research Platform



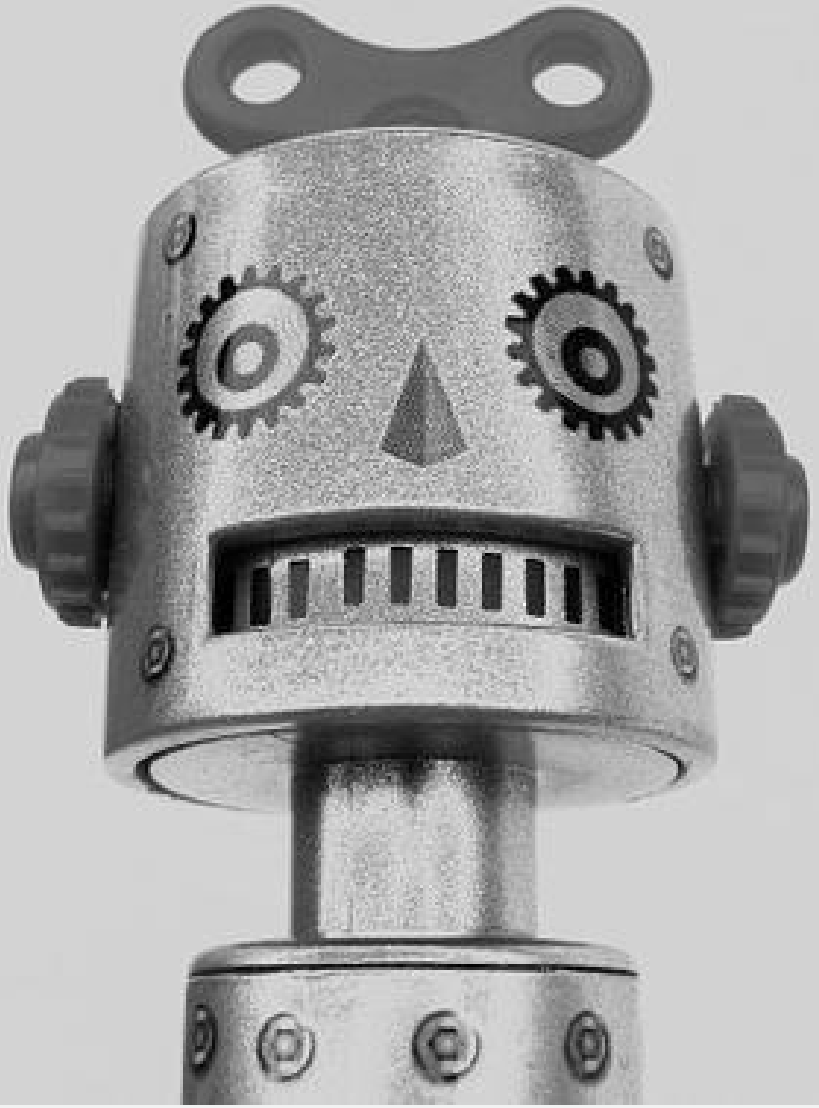
Robonaut 2: A NASA robot designed to automate various tasks on the International Space Station.



HERB, developed at Carnegie Mellon University in Intel's personal robotics program

A full-size humanoid robot that is mainly used for research purposes

Reference

https://github.com/mohitkh7/scipy-2019-talk

Thanks !