ROS SEMINAR UNIT 1.3 ROS & People & Rethink

Give a short description of the following organizations and include their contributions to Robotics and ROS. Give References.
a. Willow Garage
b. iRobot
c. Rethink Robotics


a.


https://en.wikipedia.org/wiki/Willow_Garage



Willow Garage hired its first employees in January 2007, Jonathan Stark, Melonee Wise, Curt Meyers, and John Hsu. All four were recruited by Scott Hassan to work on Willow Garage's first projects which included an SUV entrant into the DARPA Grand Challenge and an autonomous solar powered boat for deploying scientific payloads in open oceans.[8] In the Fall of 2008, Eric Berger and Keenan Wyrobek pitched Willow Garage on creating a common hardware (PR1) and software (ROS) platforms and the idea of creating a Personal Robotics Program at Willow Garage[9]. They has previously started the Stanford Personal Robotics Program[10] to build the platform technologies that would enable the personal robotics industry. At Willow Garage they led the development of PR2[11], the common hardware platform for robotics R&D, and ROS[12], the open source robot operating system.

https://spectrum.ieee.org/automaton/robotics/robotics-software/the-origin-story-of-ros-the-linux-of-robotics  [9]



Willow Garage currently has eight spin-offs:  Here are four of importance:

- ❿ Industrial Perception Inc. - Acquired by Google in August 2013, IPI had as its broader mission "eyes and brains for industrial robots", focused on new robotic applications in logistics such as autonomous truck unloading.
- ❿ OpenCV - An open source computer vision and machine learning software library built to provide a common infrastructure for computer vision applications and to accelerate the use of machine perception in the commercial products.
- ❿ Open Perception Foundation – Their mission is to advance the development and adoption of open source software for 2D/3D processing of sensory data, for the benefit of the industrial and research communities.
- ❿ Open Source Robotics Foundation - OSRF is an independent non-profit formed to support the development, distribution, and adoption of open source software for use in robotics research, education, and product development.

Thanks to that success and his early Google stake, Hassan amassed the kind of money that eventually allowed him to buy office space in Menlo Park before he even knew exactly what he wanted to do with it. Its address — **68 Willow Road** — ultimately inspired his new company's name.

In addition to spinoffs, former employees have created several other companies:

❿ Savioke led by Steve Cousins (former CEO of Willow Garage) producing a service robot for the hotel industry.[27]

Willow Garage's first major robot is called PR2. It is of a size similar to a human. PR2 is designed as a common hardware and software platform for robot researchers. PR2 is a spinoff of PR1, a robotics platform being developed at Stanford University. *PR* stands for "personal robot".



Clearpath Robotics now supports the PR2's software and infrastructure! Visit http://www.clearpathrobotics.com/pr2/ for more info.

TurtleBot -  2011
https://spectrum.ieee.org/automaton/robotics/diy/willow-garages-turtlebot-proves-that-fancy-robots-can-also-be-cheap

TurtleBot consists of an already sensored iRobot Create base, a 3000 mAh battery pack, a gyro, a Kinect sensor, an Asus 1215N laptop with a dual core processor to run everything, and a mounting structure for you to get creative with. TurtleBot runs ROS, of course, and will come with everything preconfigured so that the robot can make maps, navigate, and follow you around straight out of the box.



**Late 2013 – Closed Shop.  Many spinoffs and PR2 and TurtleBot still doing OK.**

b. iRobot

iRobot/Company-

**iRobot Corporation** is an American advanced technology company f**ounded in 1990 by three MIT graduates** who designed robots for space exploration and military defense.[3] Incorporated in Delaware, the company designs and builds consumer robots for inside and outside of the home, including a range of autonomous home vacuum cleaners (Roomba), floor moppers (Braava), and other autonomous cleaning solutions.

iRobot was founded in 1990 by Rodney Brooks, Colin Angle and Helen Greiner after working in MIT's Artificial Intelligence Lab.

- ⑩ In 1998 the company received a DARPA research contract which led to the development of the PackBot.
- ⑩ In September 2002, iRobot unveiled its home robots flagship, the Roomba, which sold a million units by 2004.[5]

**July 2017**

SAN FRANCISCO (Reuters) - Shares in iRobot Corp jumped 23 percent to a record high on Wednesday after the Roomba robotic vacuum maker posted better-than-expected quarterly results and said it was buying its largest European distributor.

The stock surged by $21.27 to $109.03 and was on track for its biggest one-day percentage gain since 2010.

The market for smart home devices was worth $9.8 billion in 2016 and is projected to grow 60 percent this year, according to market research firm IHS Markit.

c. Rethink Robotics

http://www.rethinkrobotics.com/about/

When Rethink Robotics founder Rodney Brooks was producing the Roomba vacuum at iRobot in the 2000s, he saw first-hand how challenging and inefficient the manufacturing process could be, with so many manual processes.  By the end of that decade, he founded Rethink Robotics, with the intent of providing an entirely new type of automation to manufacturers.  One that was safe to work next to without cages, easily trained by non-engineers, flexible enough to move quickly from job to job, and affordable for companies of all sizes.

That vision was realized with the introduction of Baxter® in 2012.  For the first time, manufacturers had a cost-effective and easily deployed solution.  And the market had a new category of automation: collaborative robots.



We expanded that vision with the introduction of Sawyer™ in 2015, a smaller, faster robot designed for high precision tasks. Best of all, we continue to deliver on that vision with frequent upgrades to our one-of-a-kind Intera® software.  Our unique combination of hardware and software enables the

easiest train-by-demonstration functionality in the industry, and reduces the time it takes to deploy the robots.

Our mission is to make robotics more accessible, usable and practical than they've ever been before.  We're here to *Rethink Robotics*.  We're redefining automation. And we want to help you rethink what's possible on your factory floor.



Sawyer is outselling Baxter ten to one, and we tripled our revenue in 2016. In China, the appetite for Sawyer has been quite high. We've sold a large quantity of Sawyer robots. In addition, we are looking to 2017 to be a big year for our deployments in Europe, as we expect to have additional distribution agreements in place in that region soon, as well.

People

Give a short biographical sketch of the following persons – brief history and present positions. Include their contribution to robotics and ROS. Give the references.

a. Rodney A. Brooks and look at his important papers:
"New Approaches to Robotics"
" A Robust Layered Control System For A Mobile Robot"
b. Brian Gerkey
b. Morgan Quigley
c. Tully Foote

1. http://www.businessinsider.com/important-robotics-people-2014-6#

# Rodney Brooks, founder of Rethink Robotics and Panasonic Professor of Robotics at MIT



Screenshot

Brooks is a co-founder of iRobot alongside Colin Angle and Helen Greiner, and is also a former director of MIT's Computer Science and Artificial Intelligence Laboratory. He founded Rethink Robotics, the company that makes the noted Baxter manufacturing robot.

Baxter is hardly your conventional manufacturing robot. It can be trained manually by moving its arms without the need to program a line of code. And considering its $25,000 price tag, Baxter is mighty affordable as far as heavy-duty robots go.

Brooks also popularized the idea of behavior-based robotics, in which a robot uses information obtained by its sensors to "gradually correct its actions according to the changes in immediate environment."

https://en.wikipedia.org/wiki/Rodney_Brooks

Instead of computation as the ultimate conceptual metaphor that helped artificial intelligence become a separate discipline in the scientific community, he proposed that *action* or *behavior* are more appropriate to be used in robotics. Critical of applying the computational metaphor, even to the fields where the action metaphor is more appropriate, he wrote that:

> Some of my colleagues have managed to recast Pluto's orbital behavior as the body itself carrying out computations on forces that apply to it. I think we are perhaps better off using Newtonian mechanics (with a little Einstein thrown in) to understand and predict the orbits of planets and others. It is so much simpler.

**Baxter Main article**: Baxter (robot)
Introduced in 2012 by Rethink Robotics, an industrial robot named Baxter was intended as the robotic analogue of the early personal computer designed to safely interact with neighboring human workers and be programmable for the performance of simple tasks. The robot stopped if it encountered a human in the way of its robotic arm and has a prominent off switch which its human partner can push if necessary. Costs were projected to be the equivalent of a worker making $4 an hour.

Subsumption

http://people.csail.mit.edu/brooks/papers/new-approaches.pdf

# Brian Gerkey, CEO of the Open Source Robotics Foundation



Screenshot

The Open Source Robotics Foundation, or OSRF,  exists to "support the development, distribution, and adoption of open source software for use in robotics research, education, and product development."

Brian Gerkey is founder and CEO of the nonprofit organization, and under his leadership, it has continually developed two big robotics projects: the previously mentioned ROS (Robot Operating System), and Gazebo, a piece of software that can simulate robots' moving around in a 3-D environment as they receive feedback from their sensors and various objects.

Both pieces of software have saved roboticists countless hours by providing a common, open foundation for people to build on.

c. Morgan Quigley



2014 At MIT
https://www.technologyreview.com/lists/innovators-under-35/2013/inventor/morgan-quigley/

Chief Architect, Founder
**Morgan Quigley is one of the founders of OSRF.** He received a PhD in Computer Science in the AI Lab at Stanford University in 2012. His previous work includes contributions to the initial design and implementation of ROS and its ancestors back in ye olden days, and electronics and firmware for sensor-rich, high-performance robot legs and hands. His research interests include creating systems tools to simplify collaboration and enable greater use of open-source software and firmware in modern robotic systems. For more information: http://people.osrfoundation.org/morgan

d. Tulle Foote



ROS Platform Manager

Tully Foote is the ROS Platform Manager at the Open Source Robotics Foundation. His work at the Open Source Robotics Foundation is a continuation of his work at Willow Garage where he focused on ROS development, building core tools and libraries to support the ROS community. Prior to Willow Garage he worked on all three DARPA Grand Challenges, twice on the Caltech team and in the Urban Challenge on the University of Pennsylvania team. **He is also the co-creator of the TurtleBot, a platform designed to expand the availability of robotics to new communities.**

# ROS: an open-source Robot Operating System

Morgan Quigley , Brian Gerkey, Ken Conley, Josh Faust, Tully Foote,
Jeremy Leibs, Eric Berger, Rob Wheeler, Andrew Ng

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Computer Science Department, Stanford University, Stanford, CA;
Willow Garage, Menlo Park, CA; Computer Science Department, University of Southern
California

http://www.willowgarage.com/sites/default/files/icraoss09-ROS.pdf