2018 Chapter Report:

OR IEEE RAS

Robotics and Automation Society

June 12, 2018
Dr. Edward C. Epp
Oregon IEEE RAS Chair

Outline

- Oregon IEEE RAS Goals
- Targeted Technology Drivers
- Oregon IEEE RAS Activities

IEEE RAS Mission Statement

Our Mission is to foster the development and facilitate the exchange of scientific and technical knowledge in Robotics and Automation that benefits members, the profession and humanity.

http://www.ieee-ras.org/about-ras

ROS as a Narrowly Focused Oregon Goal for 2016 - 2018

Support robot developers, researchers and educators who want to leverage ROS (Robot Operating System) in their projects.

- Edward C. Epp (Oregon RAS Chair)
  - Build to understand
- Robert Toppel (Axiom Electronics)
  - Using robot arms in high quality low volume aerospace.
- Dave Shinsel (Shinsel Robots)
 - Robot / human interaction
- Others
  - Armchair observers

ROS (Robot Operating System)

- Industrial and research grade distributed robot development system
- Requires good computing skills
  - Programming in a high level language in an
  - Understanding how large modular distributed software systems fit together.
  - Leveraging Custom and Ubuntu development tools

Turtlebot 3 – Sold by Robotis

IEEE SPECTRUM

May 2017
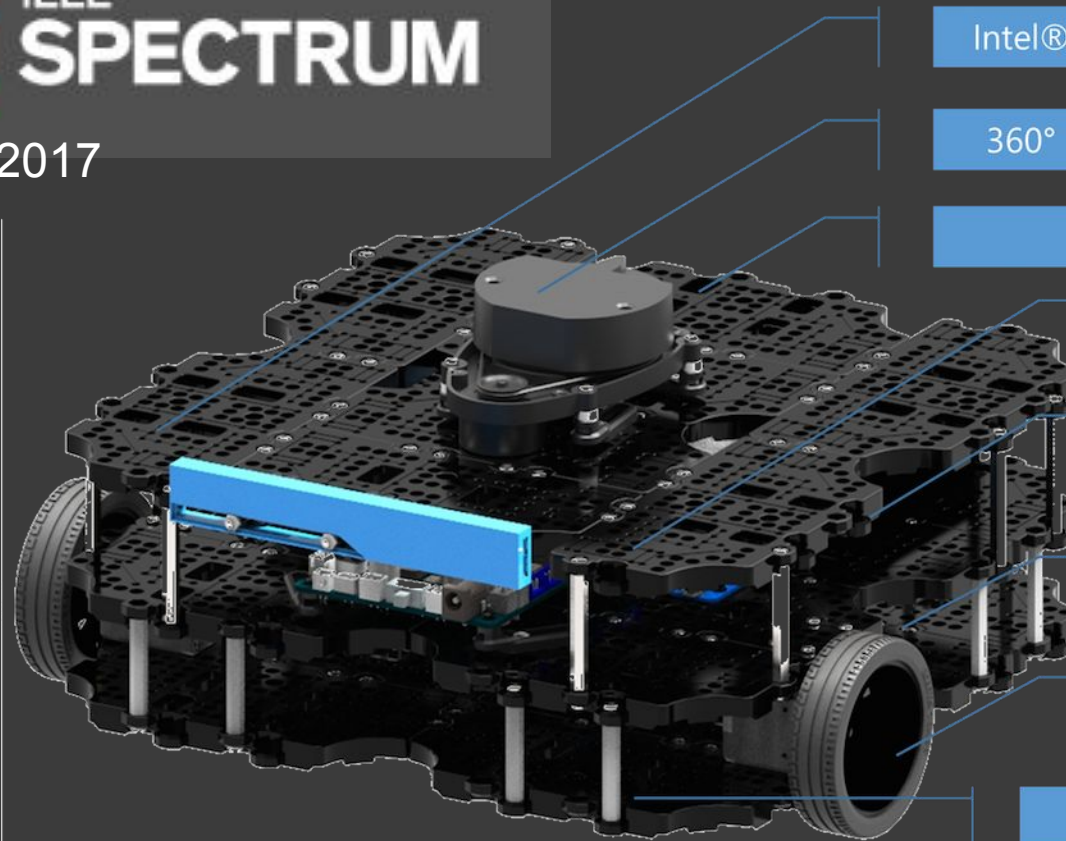
- Intel® RealSense™ for 3D Perception
- 360° LiDAR for SLAM & Navigation
- Scalable Structure
- OpenCR (ARM Cortex-M7)
- Single Board Computer (Intel® Joule™)
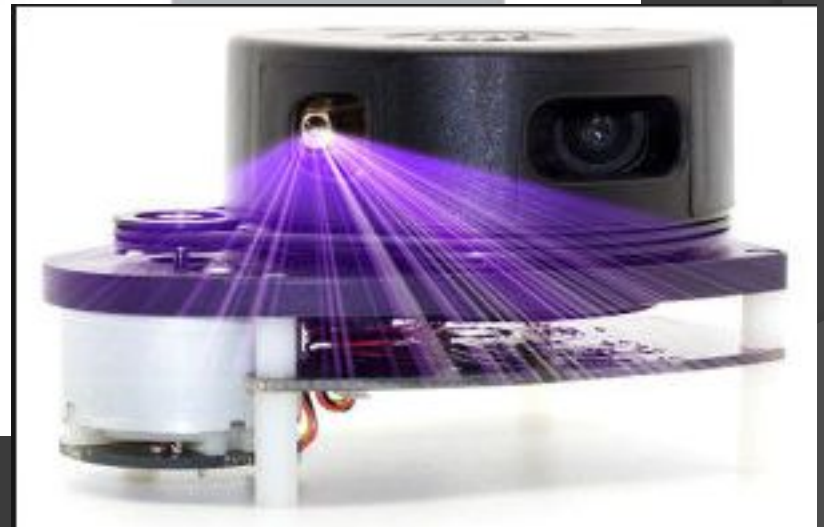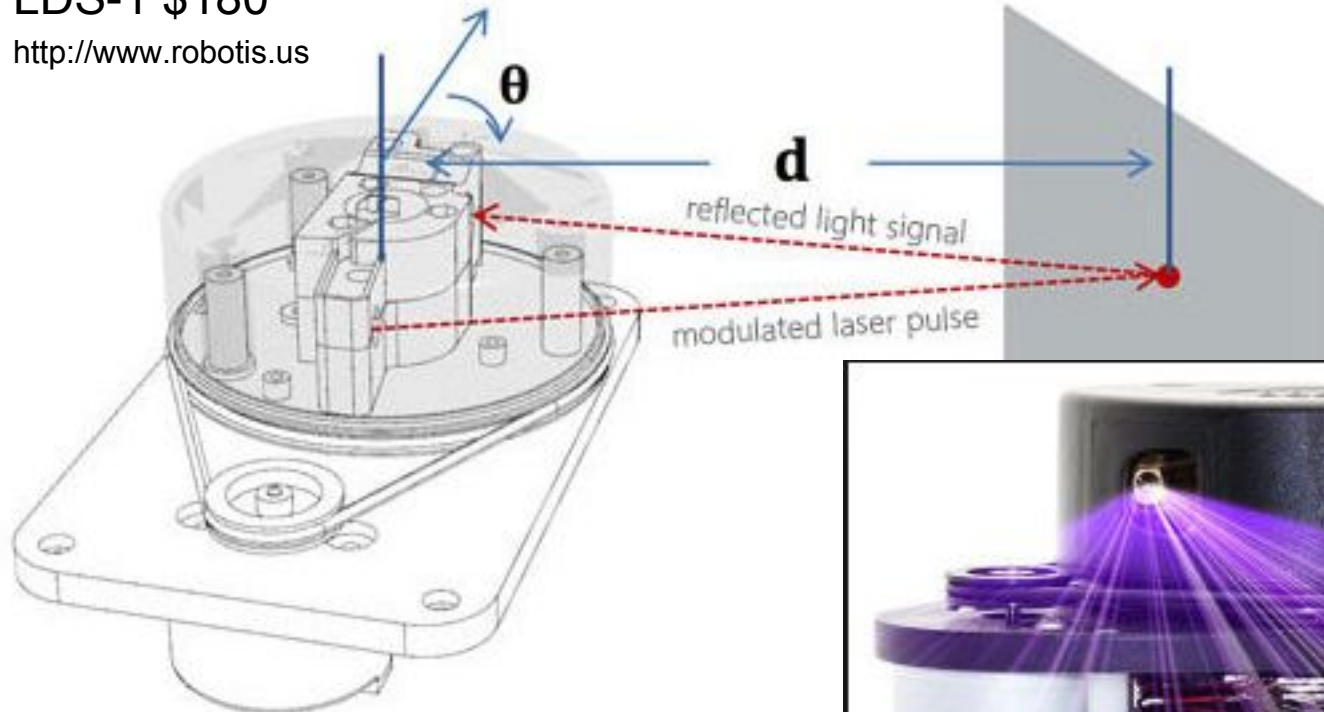- DYNAMIXEL x 2 for Wheels
- Sprocket Wheels for Tire and Caterpillar
- Li-Po Battery 11.1V 1,800mAh

https://spectrum.ieee.org/automaton/robotics/robotics-hardware/review-robotis-turtlebot-3
http://emanual.robotis.com/docs/en/platform/turtlebot3/overview/

LIDAR Example Leveraging Inexpensive HW

LDS-1 $180

http://www.robotis.us
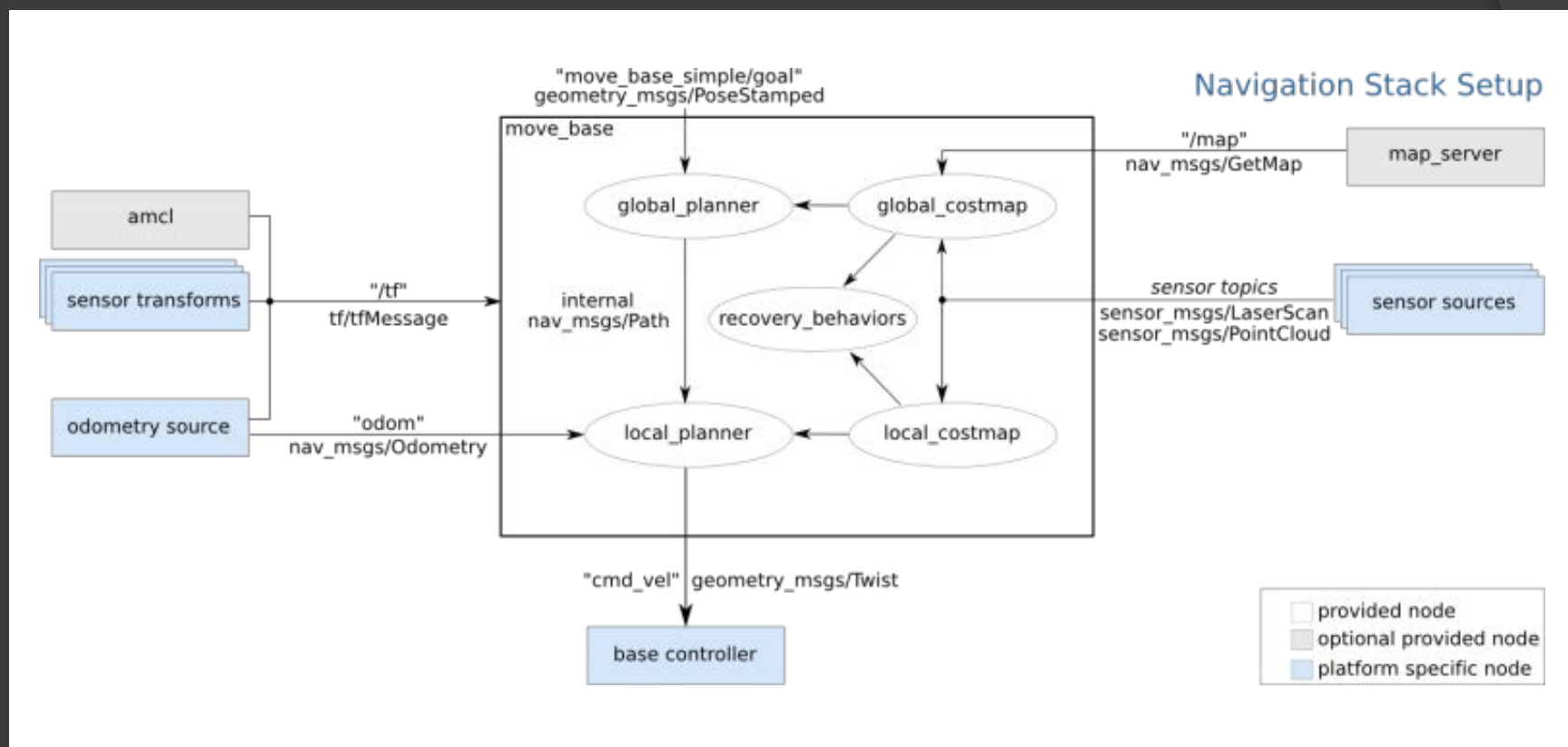

θ

d

reflected light signal

modulated laser pulse

https://www.eevblog.com/forum/microcontrollers/cheap-lidar-kit-rplidar-360-laser-scanner-what-do-you-think-about/

Navigation Example of Leveraging ROS Open Source SW Modules

http://wiki.ros.org/navigation/Tutorials/RobotSetup

ROS Example of Hiding Mathematical and Algorithmic Complexities

For example, Adaptive Monte Carlo Localization (AMCL)

$$\left[\frac{p(o_t|x_t^{(i)})}{\pi(o_t)} \frac{p(x_t^{(i)}|x_{t-1}^{(i)}, a_{t-1})}{\pi(x_t^{(i)}|a_{t-1})} \right]^{-1} \eta \; p(o_t|x_t^{(i)}) \; p(x_t^{(i)}|x_{t-1}^{(i)}, a_{t-1}) \; Bel(x_{t-1}^{(i)})$$
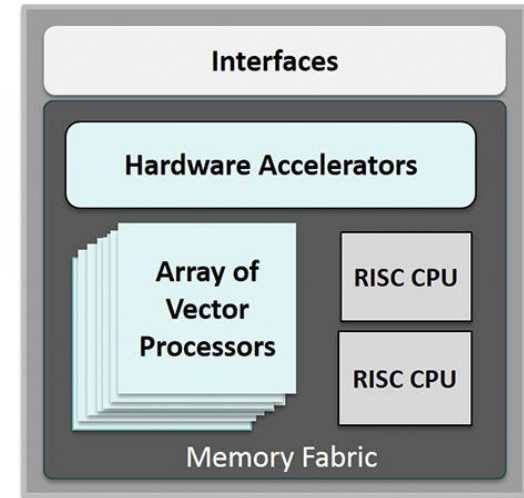
http://wiki.ros.org/amcl

Thrun, Burgard, and Fox, "Probabilistic Robotics, The MIT Press

Deep Learning

Intel Movidius NCS (Neural Compute Stick)

NCSM2450.DK1 $79
from Mouser

Tensorflow

Interfaces

Hardware Accelerators

Array of Vector Processors

RISC CPU

RISC CPU

Memory Fabric

Myriad 2 Vision Processor Unit (VPU)

Movidius.com

Patterns of Local Contrast

Face Features

Face

Input Layer

Hidden Layer 1

Hidden Layer 2

Output Layer

https://mesosphere.com/blog/tensorflow-gpu-support-deep-learning/
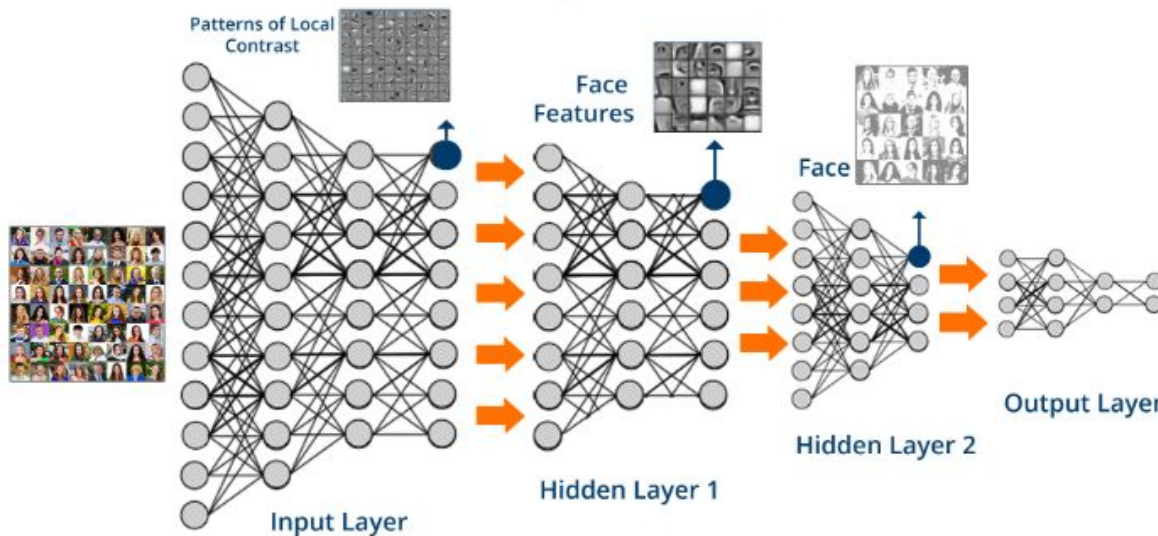
2018 Seminars and Workshops

Title of ROS and Axiom Sponsored	Speaker	Attend-ance
Creating a Robot that Stars in a Microsoft Surface Commercial	Dave Shinsel	17
Engineering the Magni Open Source ROS Robot Platform	David Crawley Ubiquity Robotics	16
Person Tracking with Depth Cameras	Dave Shinsel	29
(1) ROS Open Lab		8

Other Events
OMSI Robot Weekend (June 16 and 17) – Table and Lecture
OIT Engineering Week (February 23) - Presentation

2017 Seminars and Workshops

Title of ROS and Axiom Sponsored	Speaker	Attend-ance
ROS Basics and Building a Motor Driver	Edward Epp	11
Overview of Intel's RealSense Depth Sensors	Dave Shensil Intel Corp	55
ROS on a Custom Make Robot	Edward Epp	14
Dexter Robot Arm Tutorial	Kent Gilson Haddington Dynamics	35
Dexter Robot Arm Control Architecture	Kent Gilson Haddington Dynamics	22
Engineering Overview of a Telepresence Robot	Jesse Jenkins Hedron Technologies	14
(7) ROS Open Labs		63

2016 Seminars and Workshops

Title of ROS and Axiom Sponsored	Speaker	Attend-ance
Introductions to ROS Robot Simulation	Edward Epp	18
Using ROS and OpenCV CamShift to Create a Follow Program	Edward Epp	11
LIDAR	Sup Premvuti Hokuyo	28
Autonomous Wheelchair Project in ROS	Bill Smart OSU	20
ROS Serial	Paul Burrel (video industry)	8
(5) ROS Open Labs		54
Other Events		
PARTS: Mapping and Navigation with ROS (Robot Operating System)		

Funding

Intel matching	Edward Epp for 271 volunteer hours (2016)	$2710