
Getting started with veggie
Lecturer
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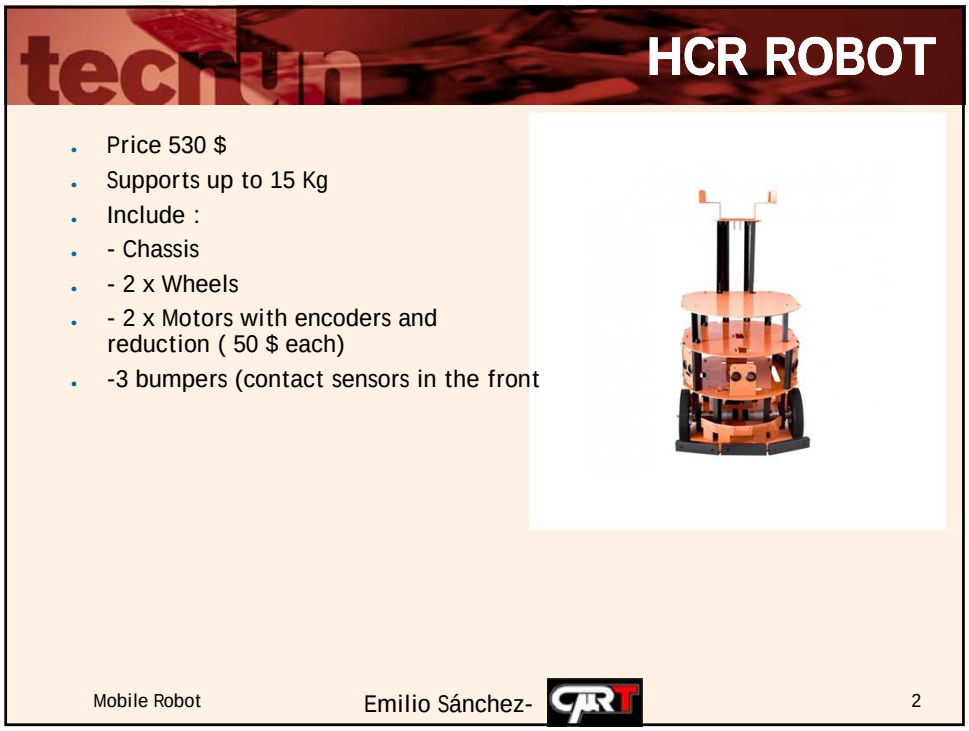
tecnun


tecnun
HCR ROBOT
Price 530 $
Supports up to 15 Kg
Include :
- Chassis
- 2 x Wheels
- 2 x Motors with encoders and reduction (50 $ each)
-3 bumpers (contact sensors in the front
Mobile Robot
Emilio Sánchez-
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Electric Motors

- Working voltage:12v
- Gear ratio 51:1
- Stall current 3.6 A
- No load (after gearbox): 146 rpm
- Encoder resolution 13 PPR
- -Quadrature (multiply by 4)
- -Gearbox ratio (multiply by 51)
- Total pulses per rotation = 13 * 51 * 4 = 2652 pulses

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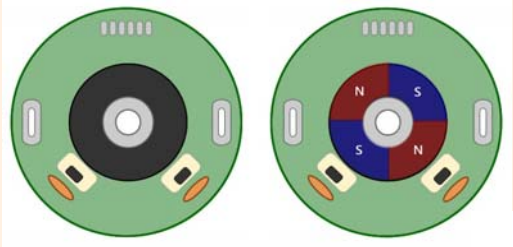
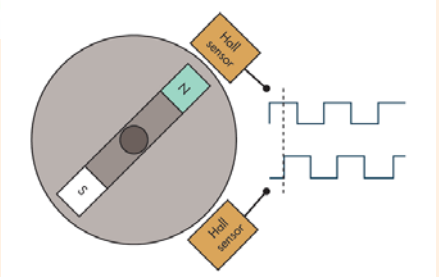
Encoders

- Magnetic Encoder: Hall effect sensor





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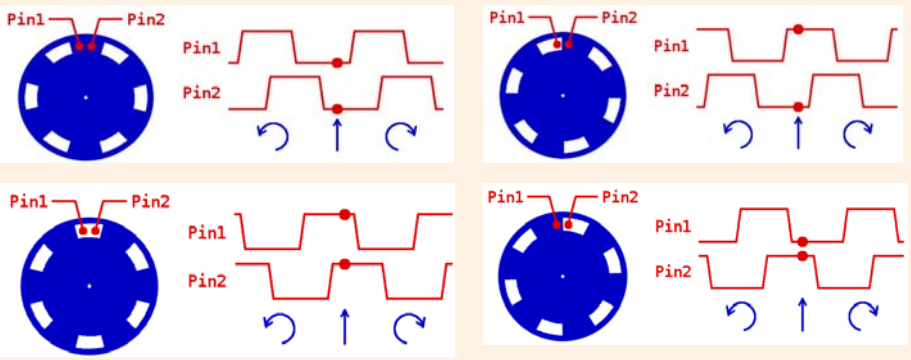
Encoders Quadrature



Encoder: 13 pulses per motor rotation (multiply this by 4 for Quadrature)
Gearbox ratio 51/1
Total amount of pulses per wheel rotation: 13 * 51 * 4 = 2652 pulses

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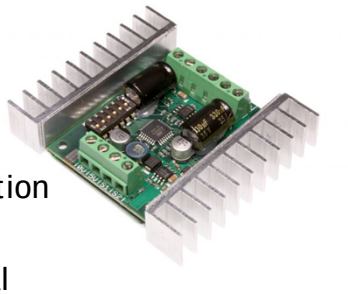
Motor Driver

- Specification required
- - Analog voltage control
- - Input voltage (12 volts)
- - Two motors, two motor drivers or one dual motor driver
- - Able to handle at least 3.6 A x 2

Mobile Robot Emilio Sánchez- 6

Sabertooth Dual 12 A

- Features
- -Price 80 $
- -Dual 12 A, 6v-24V
- -Thermal and overcurrent protection
- -Lithium protection
- - Input modes: Analog, R/C, serial



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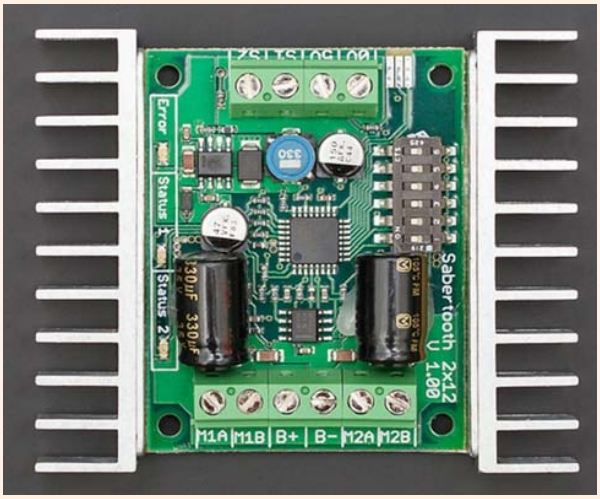
Sabertooth Dual 12 A



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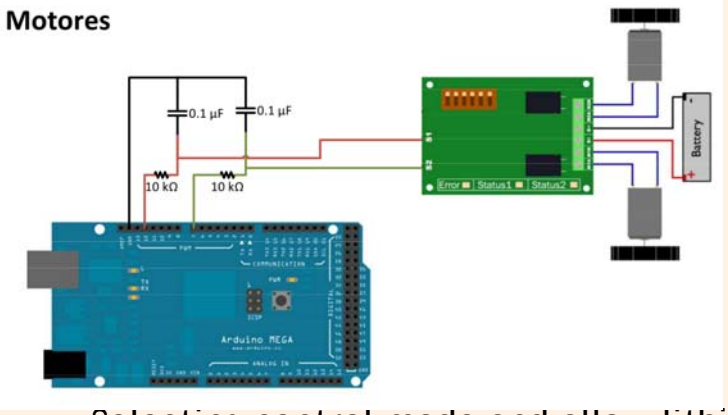
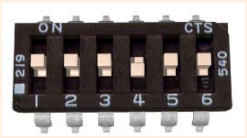
Motor Driver Connection



- Selecting control mode and allow lithium type power source



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Battery

- Price 25 $
- Lead-acid battery
- 12 volts
- Weight 2 kg
- Capacity 8Ah
- Smartphones 3000 mAh

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Sensors

- 3 BUMPERS
- 2 Encoders
- 6 ultrasonic distance sensors
- 8 optical distance sensors
- 1 IMU (Inertial Measurement Unit 3 axis accelerometer and 3 axis gyroscope (I2C communication)
- 1 Microsoft Kinect (RGB sensor and RGBD or depth sensor)

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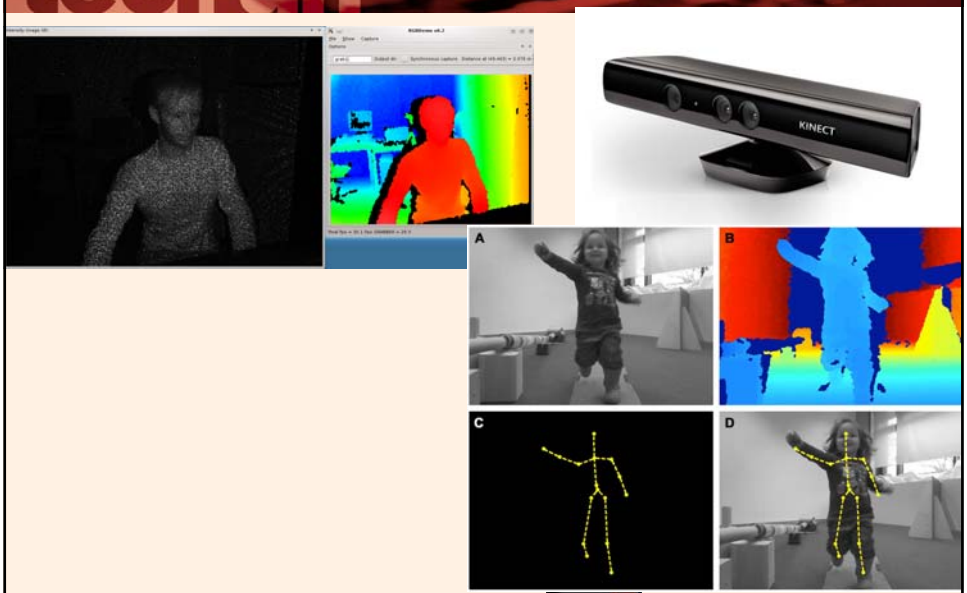
Kinect



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Kinect in Robotics





Mobile Robot

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ARQUITECTURE TOPICS

/odom – odometry sensor fusión (IMU + encoders)


/cmd_vel – velocity commands

ROS

/scan - laserscan

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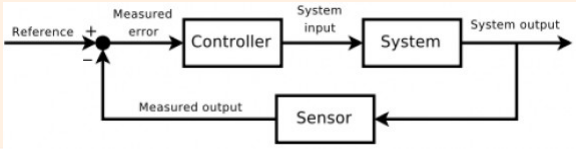
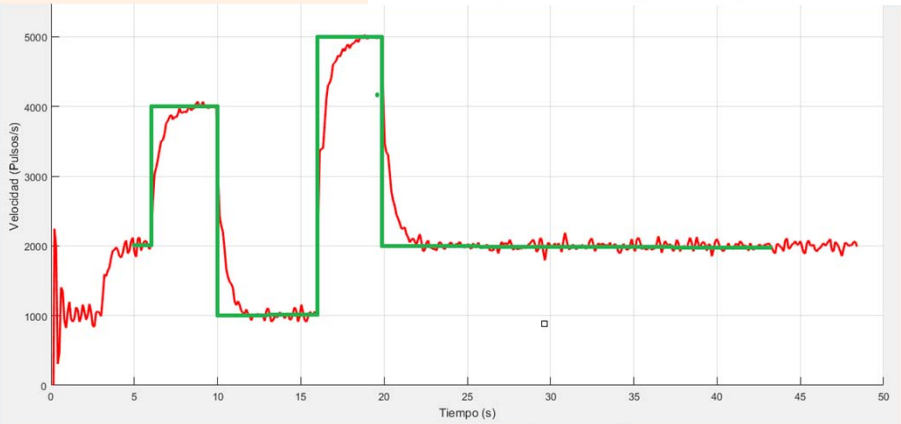
Motor Control





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Odometry Model

Coordinates in the plane; x, y , yaw

Variables:

every Δt

{

$$\Delta s = \sqrt[2]{(\Delta y)^2+(\Delta x)^2} = radiusWheel * \frac{(\Delta\theta right + \Delta\theta left)}{2}$$

$$\Delta yaw = atan2(q.x * q.y + q.w * q.z, 0.5 - q.y * q.y - q.z * q.z) - last\_yaw$$

$$v = \frac{\Delta s}{\Delta t} \quad w = \frac{\Delta yaw}{\Delta t}$$

$$Wright = \frac{\Delta\theta right}{\Delta t} \quad Wleft = \frac{\Delta\theta left}{\Delta t}$$

$$X_t = X_{t-1} + \Delta s * \cos(Yaw_{t-1} + \frac{\Delta yaw}{2}) \quad Y_t = Y_{t-1} + \Delta s * \sin(Yaw_{t-1} + \frac{\Delta yaw}{2})$$

$$Yaw_t = Yaw_{t-q} + \Delta yaw$$

Sensor&Actuators Emilio Sánchez- 16

KINECT Depth Sensor

- Cargar nodo Kinect sobre el robot real
- Cargar rviz con los siguientes plugins que se suscriben a :
  - Camera select the following topics→
    - /camera/rgb/image_color
    - /camera/rgb/image_mono
    - /camera/ir/image_raw
    - /camera/ir/image_rect_ir
    - /camera/depth/image
  - PointCloud2
    - /camera/depth/points and changing the fixframe to camera_depth_frame
  - DepthCloud use simultaneously these two topics
    - /camera/depth/image
    - /camera/rgb/image_color
    - Choose the color transformer →axiscolor
    - Choose the fixed frame→ camera_depth_optical_frame

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Interfacing Kinect

- To interface the Kinect:
- Terminal 1

  $ roslaunch freenect_launch freenect.launch
- Terminal 2

  $ rosrun rviz rviz

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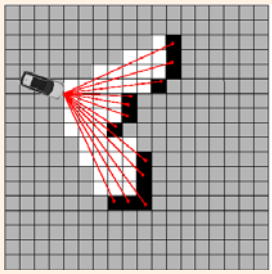
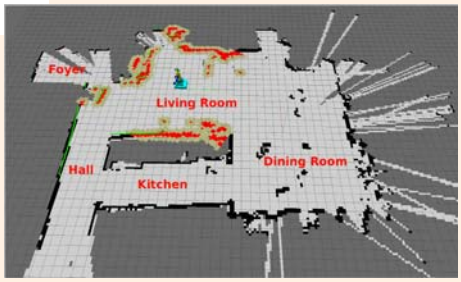
Occupancy Grid Map



$p_{z_{k+1}}(O_{k+1}|z_{k+1}) = 0.95$
$p_{z_{k+1}}(O_{k+1}|z_{k+1}) = 0.05$
$p_{z_{k+1}}(O_{k+1}|z_{k+1}) = 0.5$



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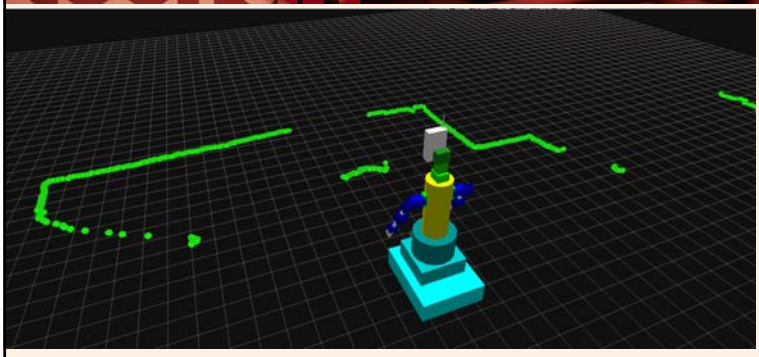
Laserscan



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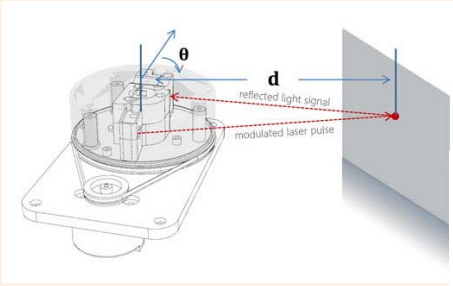
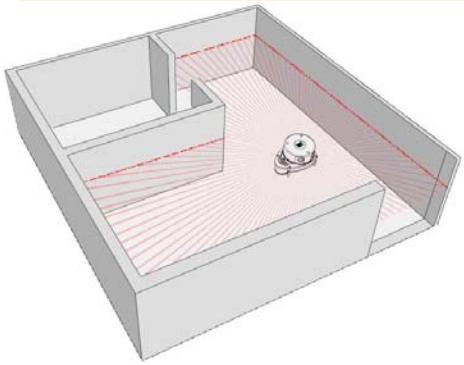
LIDAR Sensors





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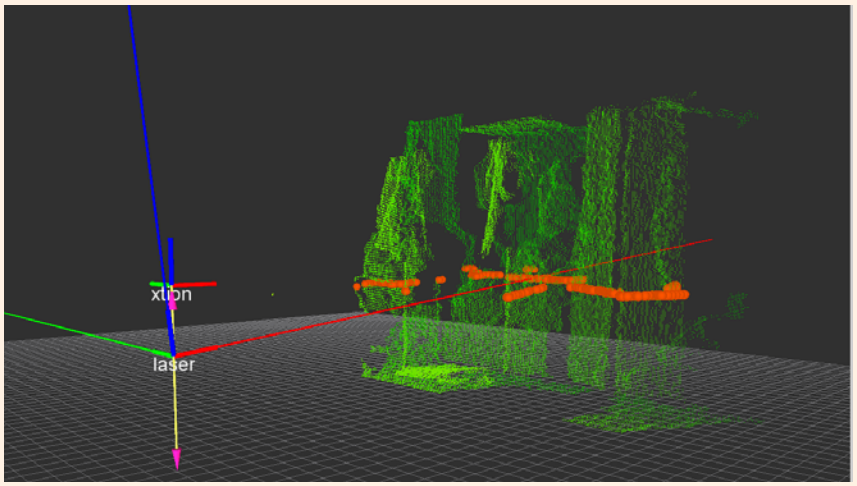
Point Cloud to Laserscan



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Point Cloud to Laserscan

- Extract laserscan

Terminal 1:

```
$ roslaunch depthimage_to_laserscan
kinect_laserscan.launch
```

Terminal 2:

```
$ rosrun rviz rviz
```

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