





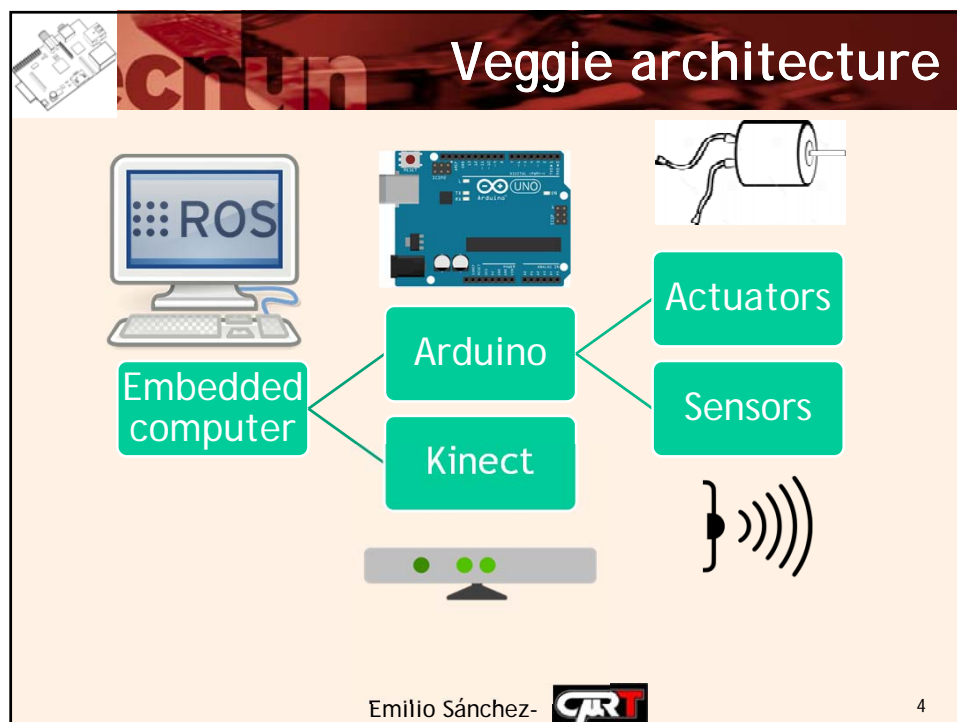
Veggie chassis: HCR ROBOT

- Price 530 \$ (only chassis)
- Supports up to 15 Kg
- Include :
 - - Chassis
 - - 2 x Wheels
 - - 2 x Motors with encoders and reduction (50 \$ each)
 - -3 bumpers (contact sensors on the front)




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Electric Motors

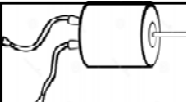


- Working voltage: 12v
- Gear ratio 51:1
- Stall current 3.6 A
- No load (after gearbox): 146 rpm
- Encoder resolution 13 PPR
 - Quadrature (multiply by 4)
- Gearbox ratio (multiply by 51)
- Total pulses per rotation = $13 * 51 * 4 = 2652$ pulses


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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


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Sabertooth Dual 12 A

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

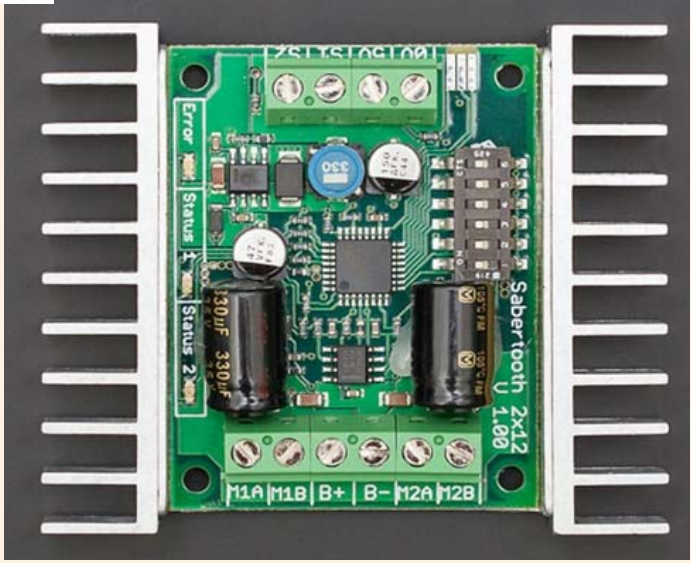



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Sabertooth Dual 12 A

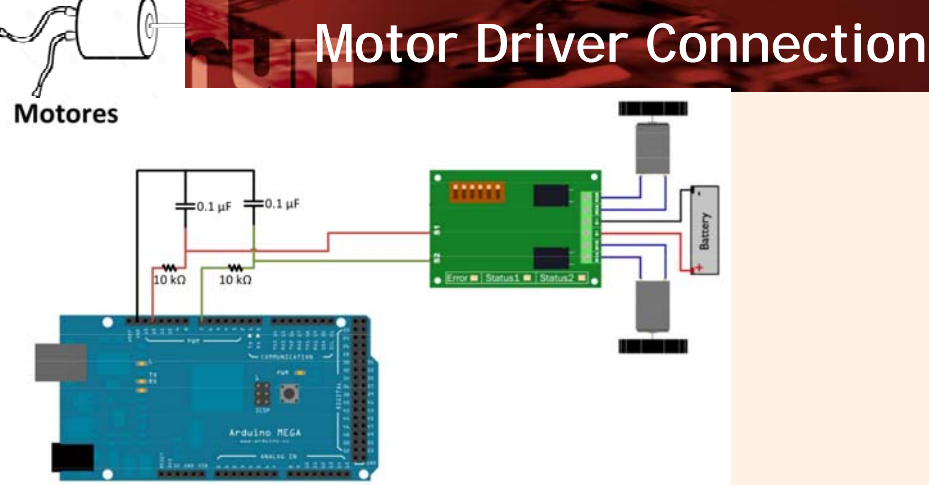


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Motor Driver Connection

Motores

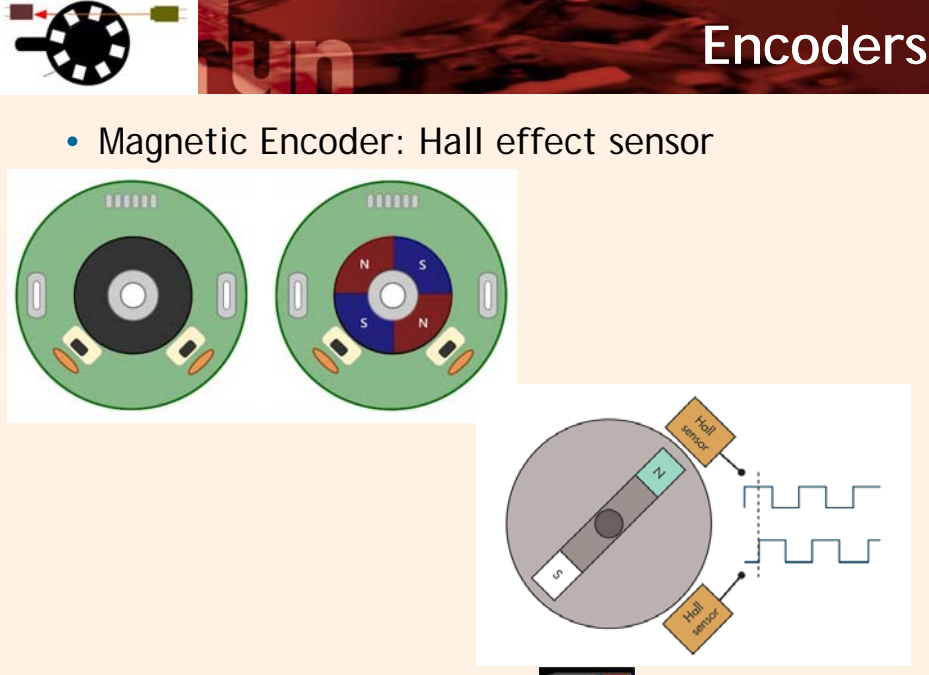



- Selecting control mode and allow lithium type power source

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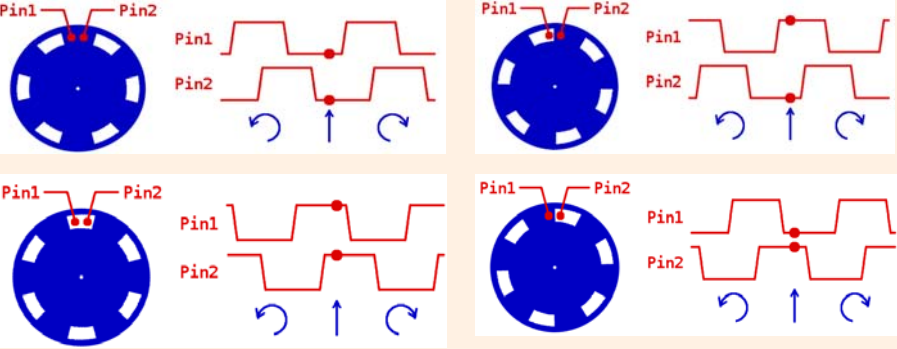
Encoders

- 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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Battery




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



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Sensors

- 3 BUMPERS (Digital input)
- 2 Encoders (Digital input interrupts)
- 6 ultrasonic sensors (I2C communication)
- 8 optical distance sensors (Analog input)
- 1 IMU -3 axis accelerometer and 3 axis gyroscope (I2C communication)
- 1 GPS (Serial communication)

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Optical distance sensor - Sharp GP2Y0A21YK

- Analog output that varies from 3.1V at 10cm to 0.4V at 80cm.


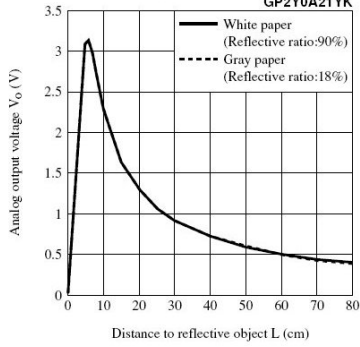



Fig.5 Analog Output Voltage vs. Distance to Reflective Object

GP2Y0A21YK

— White paper (Reflective ratio:90%)
--- Gray paper (Reflective ratio:18%)




Distance to reflective object L (cm)	Analog output voltage V_o (V) - White paper (90%)	Analog output voltage V_o (V) - Gray paper (18%)
10	3.1	1.5
20	1.5	0.8
30	1.0	0.6
40	0.8	0.5
50	0.7	0.45
60	0.6	0.4
70	0.5	0.4
80	0.4	0.4

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Distance Sensors: Ultrasound


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I2C



I²C (Inter-Integrated Circuit) - is a serial computer bus used for lower-speed peripheral integrated circuit to processors and microcontrollers in short-distance, intra-board communication.

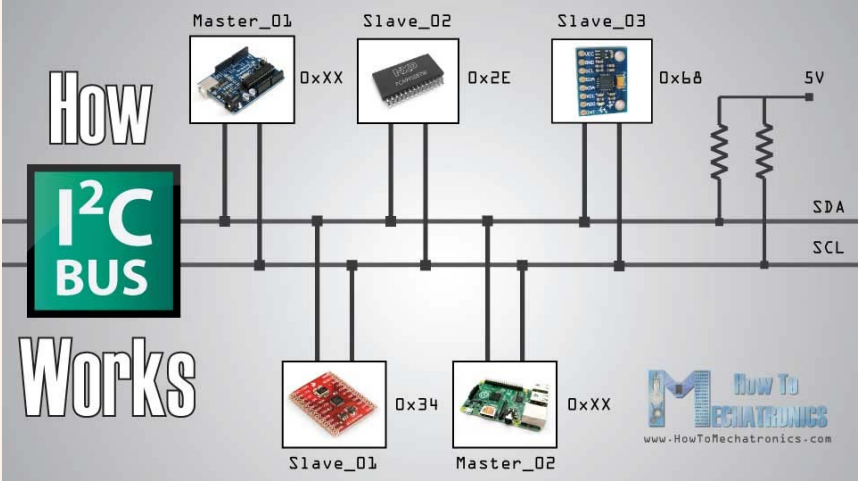
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I2C

How I²C BUS Works



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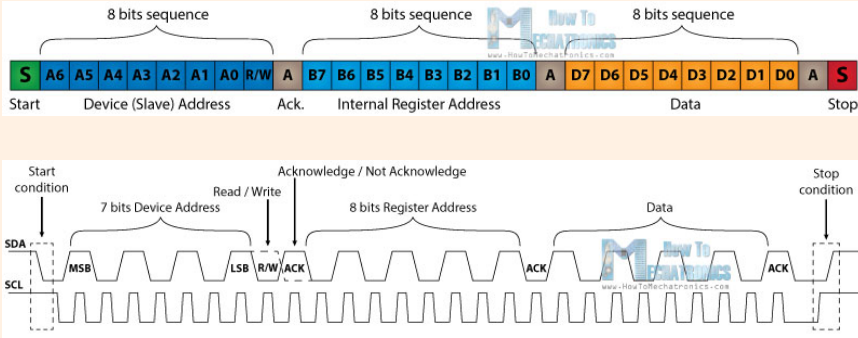
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I2C

SDA (Serial Data)
SCL (Serial Clock)

<https://www.youtube.com/watch?v=6IAkYpmA1DQ>



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I2C Connection



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CAMERAS

- Microsoft Kinect: Point Clouds, infrared and rgb video, IMU data
- Webcam: RGB video




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CAMERAS: Kinect



The image displays the Kinect v1 sensor and its various data outputs. On the left, a large window shows a grayscale depth map of a person. To its right, a smaller window shows a color-coded depth map. Above the sensor, a Kinect v1 sensor is shown. Below the sensor, four small images labeled A, B, C, and D show a person's pose being tracked by the Kinect. Image A is a grayscale video frame, B is a color-coded depth map, C is a skeletal tracking overlay, and D is a grayscale video frame with a skeletal tracking overlay.

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CAMERAS: Kinect



The image shows the Kinect v1 sensor mounted on various mobile robots. On the left, a person is holding a robot with a Kinect sensor mounted on top. In the center, a white Pioneer 3 mobile robot is shown with a Kinect sensor mounted on top. On the right, a white Pioneer 3 mobile robot is shown with a Kinect sensor mounted on top. Below the Pioneer 3 robot, a black Pioneer 3 mobile robot is shown with a Kinect sensor mounted on top. On the bottom right, a red Pioneer 3 mobile robot is shown with a Kinect sensor mounted on top.

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