

# Intelligent Turtlebot Gripper v2.0

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Robótica Móvel Inteligente - 2017.2

# Agenda

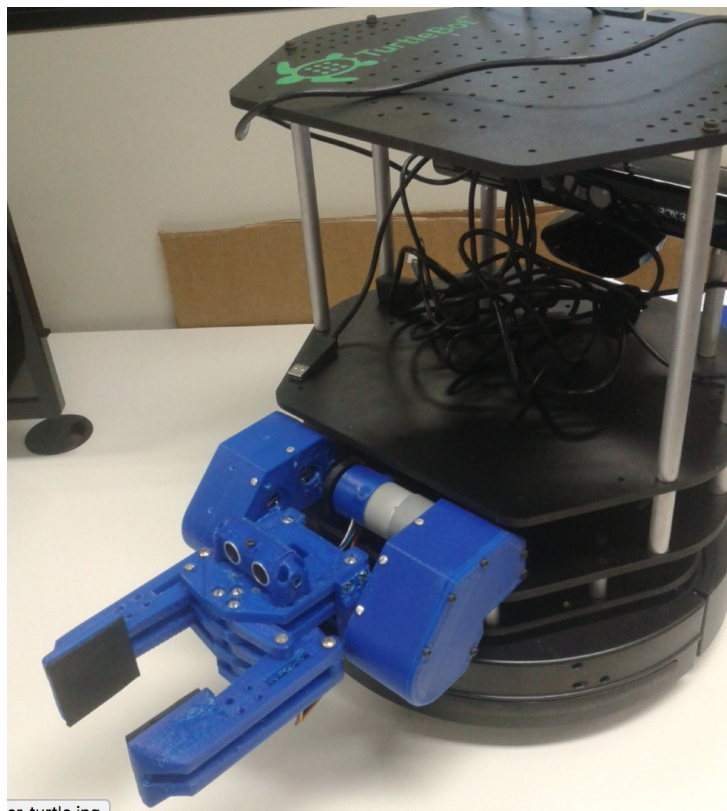
- I. Objetivo
- II. Evolução da gripper: v1, v2
- III. Software
- IV. Hardware
- V. Resultados

# Objetivo

Desenvolver uma garra inteligente para o Turtlebot para que ele possa carregar objetos do ambiente.

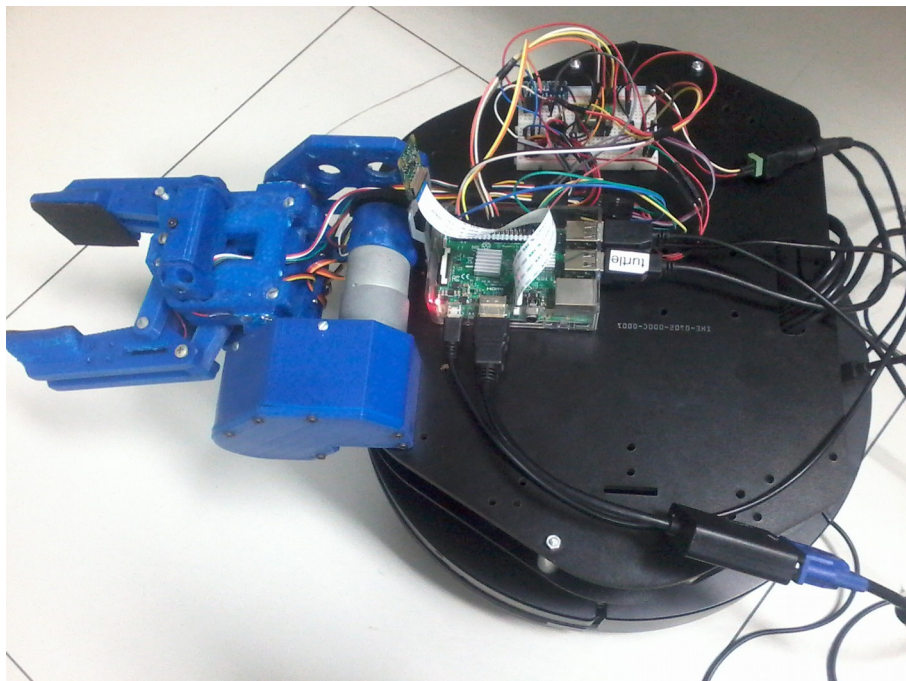
A versão 1.0 foi construída em 2014 no Laboratório de Sistemas Autônomos(LSA) - FACIN/PUCRS.

# Gripper V1



- **Microcontrolador: Arduino nano**
- Driver: TB6612-Dual Motor Driver
- Atuadores: 2 Graus de liberdade
- Sensores:
  - Sensor de força
  - Sensor ultrasônico
  - Sensor de corrente
  - Chave fim de curso
- Força aplicada a objeto: 500g
- Peso máximo de sustentação: 700g

# Gripper V2



- **Microprocessador: Rasp. 3**
- **Câmera rasp**
- Driver: TB6612-Dual Motor Driver
- Atuadores: 2 Graus de liberdade
- **Conversor ADC**
  
- Sensores:
  - Sensor de força
  - Sensor ultrassônico
  - Sensor de corrente
  
- Força aplicada a objeto: 500g
- Peso máximo de sustentação: 700g

# **SOFTWARE & HARDWARE**

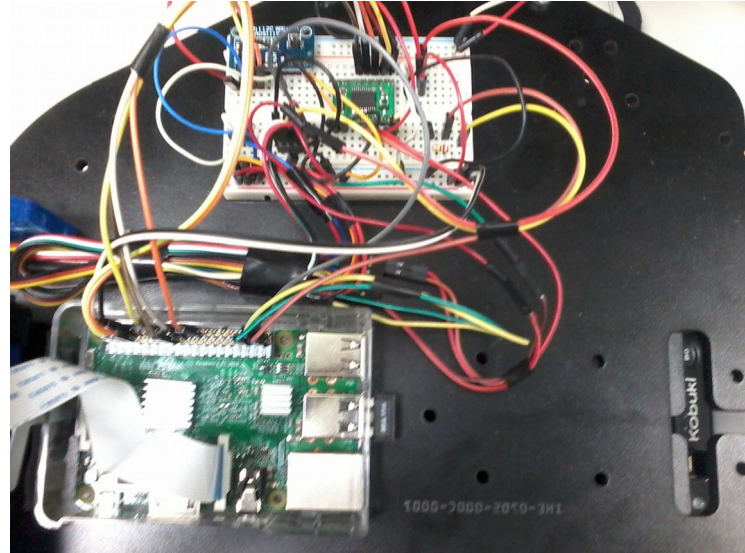
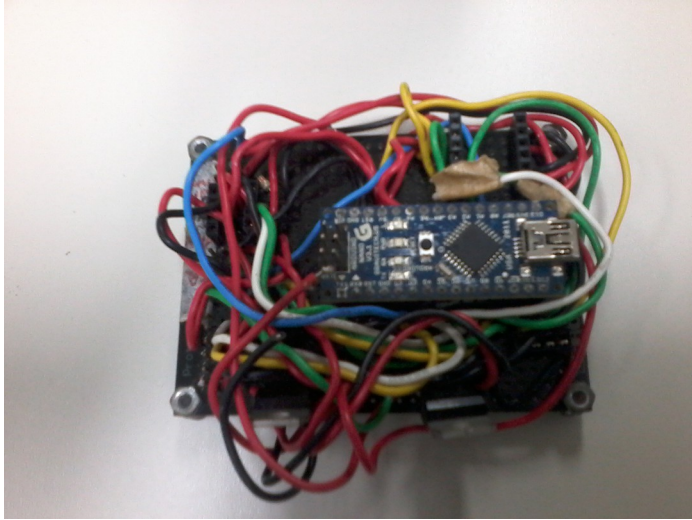
# **HARDWARE**

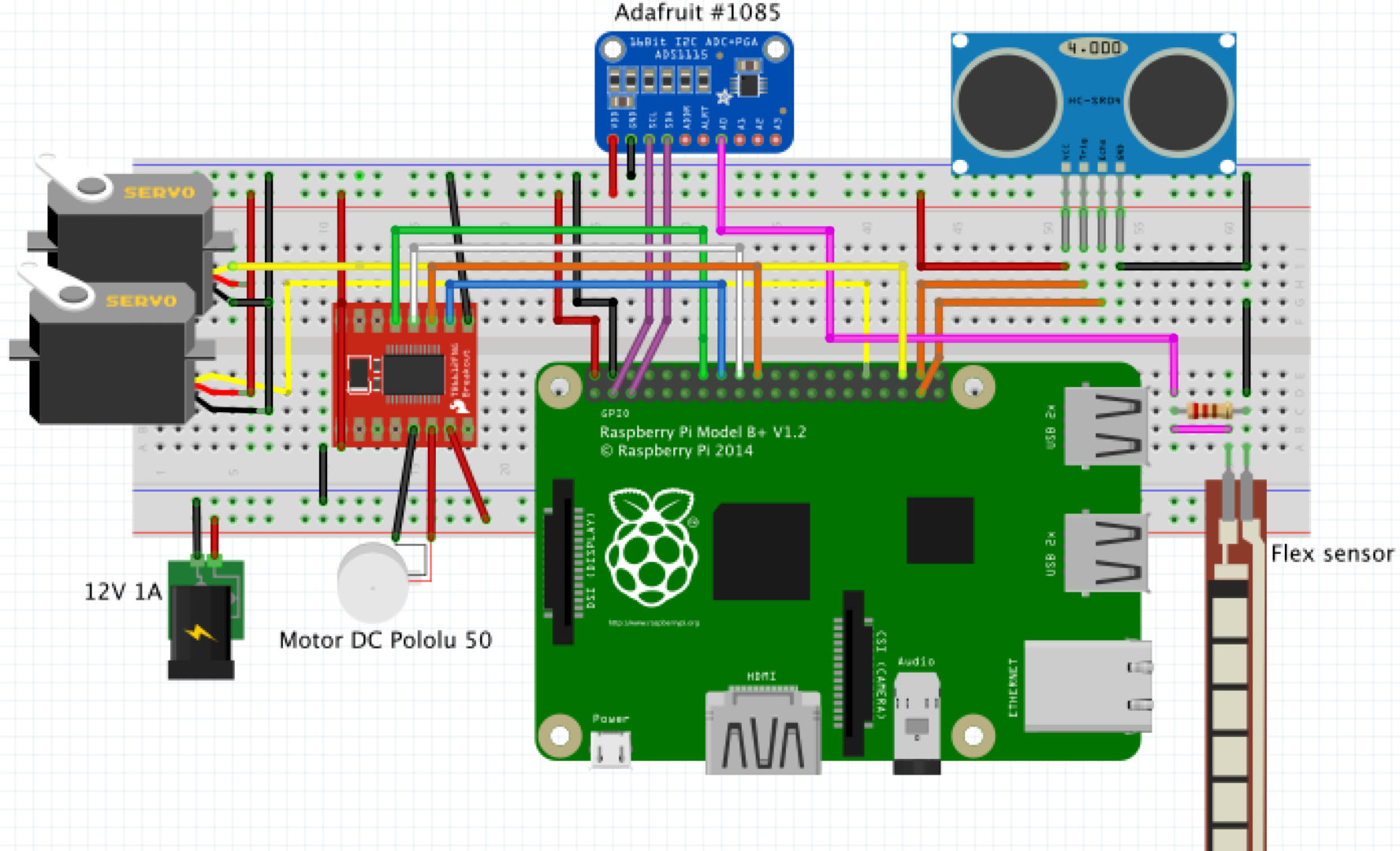
# Gripper V2 - Hardware

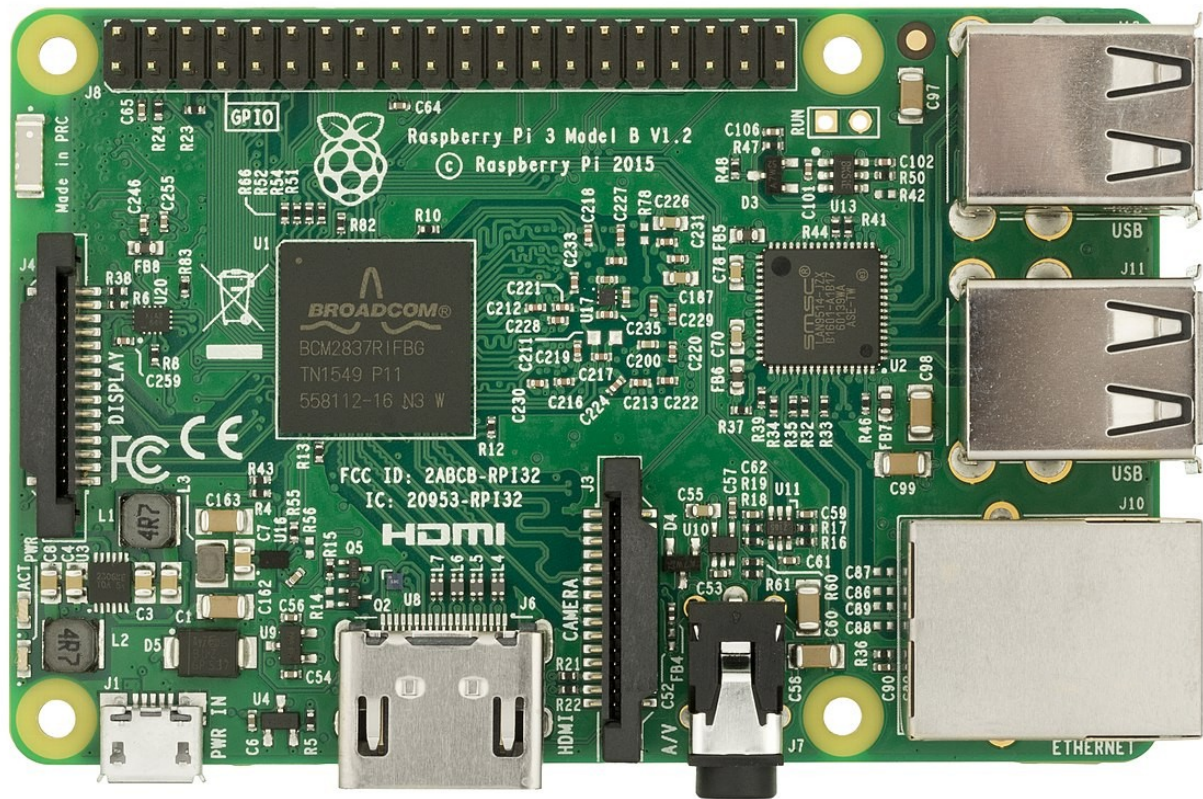
1. Raspberry 3
2. Câmera raspberry
3. Conversor analógico digital
4. Circuito elétrico arduino → raspberry



# Gripper V2 - Hardware



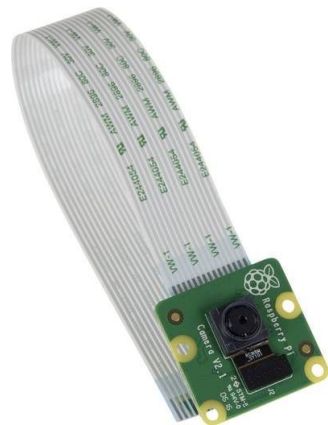




ubuntu MATE

Xenial  
16.04



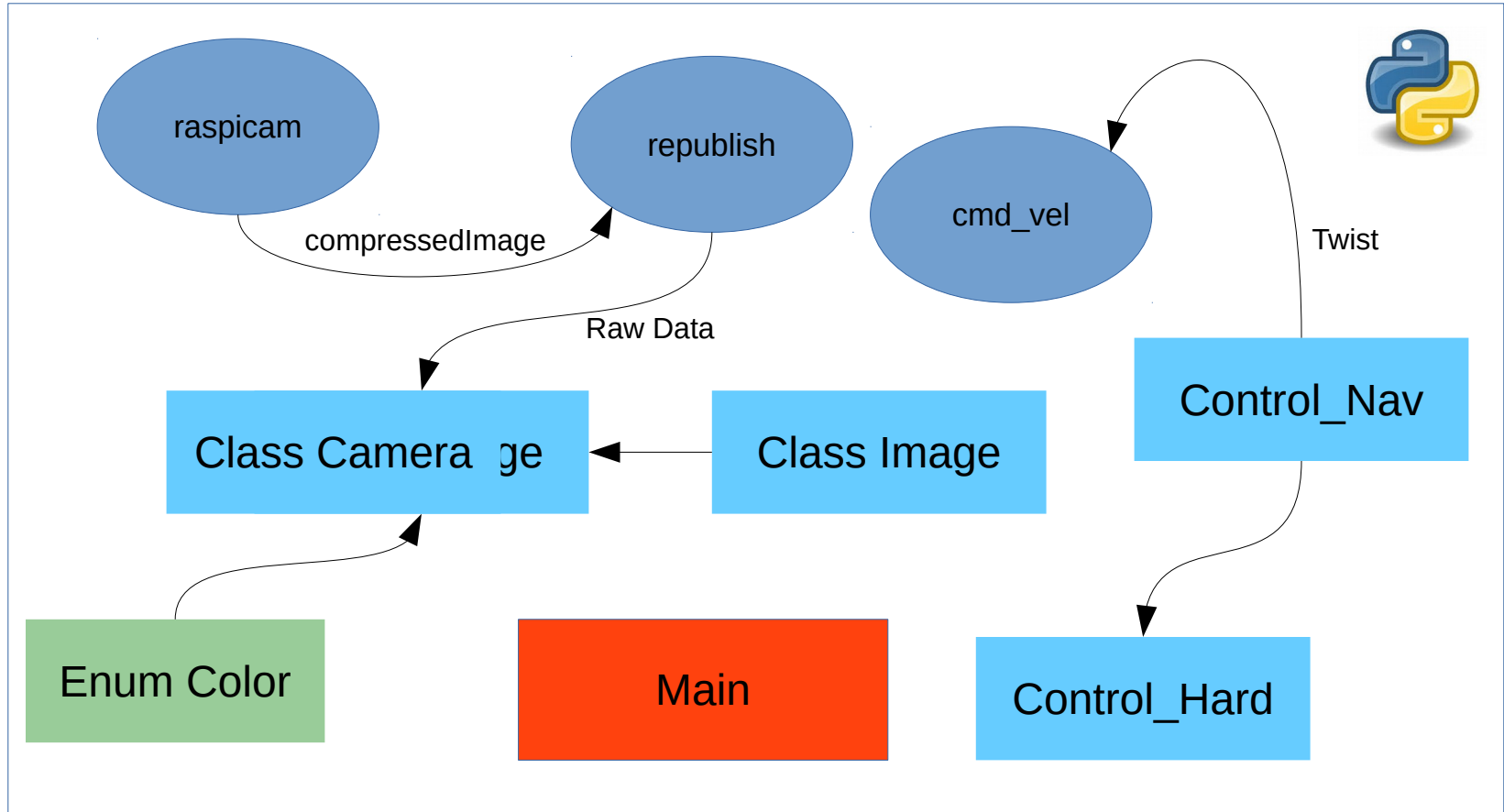


# **SOFTWARE**

# Gripper V2 - Software

- Linguagem unificada Python
- Módulo para controle do hardware
- Módulo para manipular imagens
- Módulo para integração do ROS

# Gripper



# Main.py

```
class Gripper(object):
    def __init__(self):
        cc = camera()
        img = process_image()
        gripper = control_hardware()

        # wait camera
        time.sleep(3.0)

    while(1):
        cv2.imshow("Video", cc.showImage)
        cv2.imshow("Mask Target", img.mask_img(cc.showImage))

        if img.find_object:
            gripper.forward()
        else:
            gripper.turn()
        cv2.waitKey(1) & 0xFF

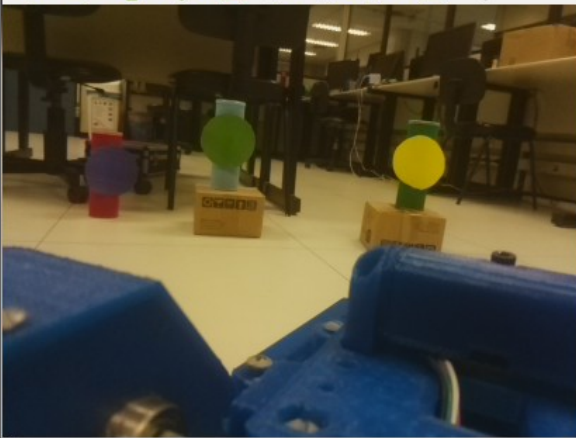
    cv2.destroyAllWindows()

def main():

    rospy.init_node('gripper', anonymous=True)
    robot = Gripper()
    rospy.spin()
```



Video



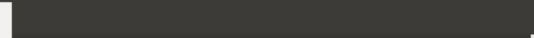
```
[INFO] [1513072253.959852]: Gripper is moving forward ...  
[INFO] [1513072254.112679]: Gripper is moving forward ...  
[INFO] [1513072254.270219]: Gripper is moving forward ...  
[INFO] [1513072254.424608]: Gripper is moving forward ...  
[INFO] [1513072254.602562]: Gripper is moving forward ...
```

Mask Target



(x=313, v=270) ~ L:0

\_node/launch/camerav2\_410x308\_30fps.l



```
pid [5798]  
[5799]  
CameraInfo from package://raspicam_node/  
component done  
component done  
calibration URL: package://raspicam_node/  
successfully calibrated  
figure Request: contrast 0, sharpness 0, br  
posureCompensation 0, videoStabilisation 0  
_mode antishake, awb_mode auto  
figure done  
[5799]: Starting video capture (410, 308, 80, 30)  
[11906]: Video capture started
```

Perguntas?