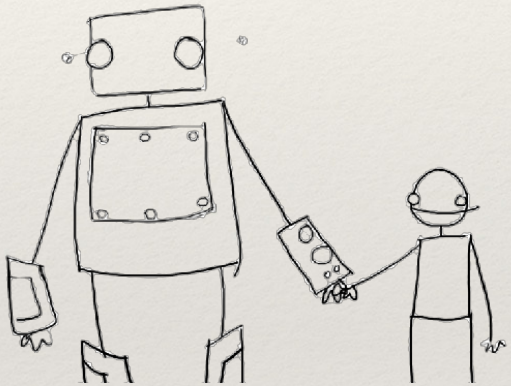
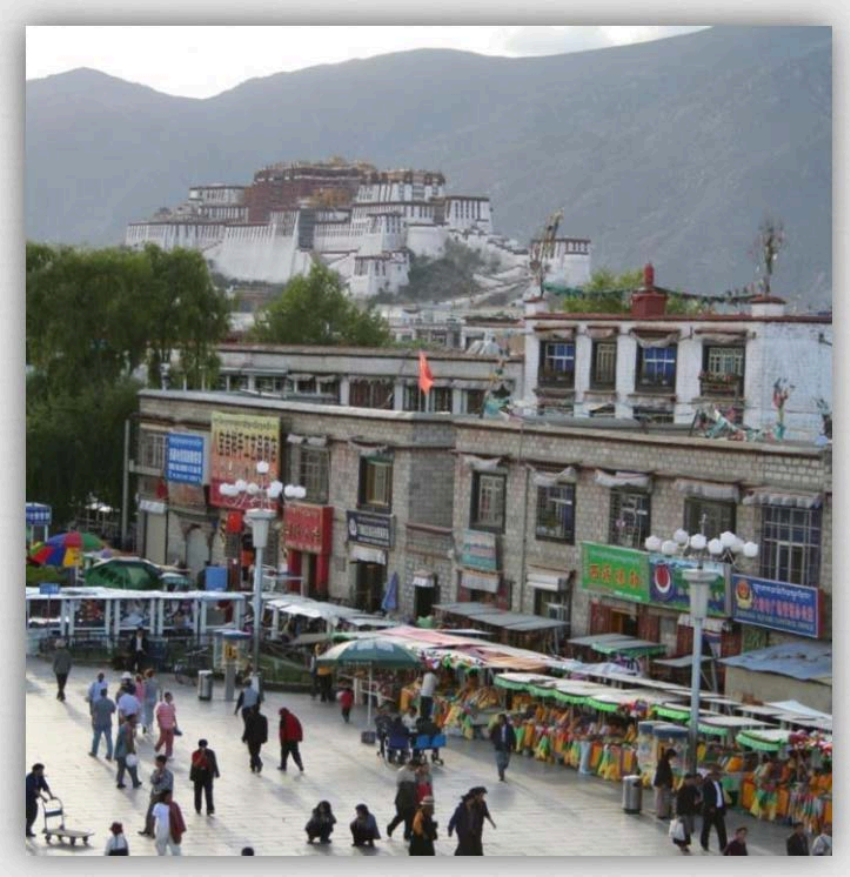
ROBOT VISION



ROBOT VISION

Make computers / robots understand images and video

- Specific Recognition Tasks
  - Outdoor, indoor.
  - City, forest, factory.
- Image Annotation
  - street
  - people
  - building
  - mountain
  - tourism
  - cloudy
  - brick



ROBOT VISION

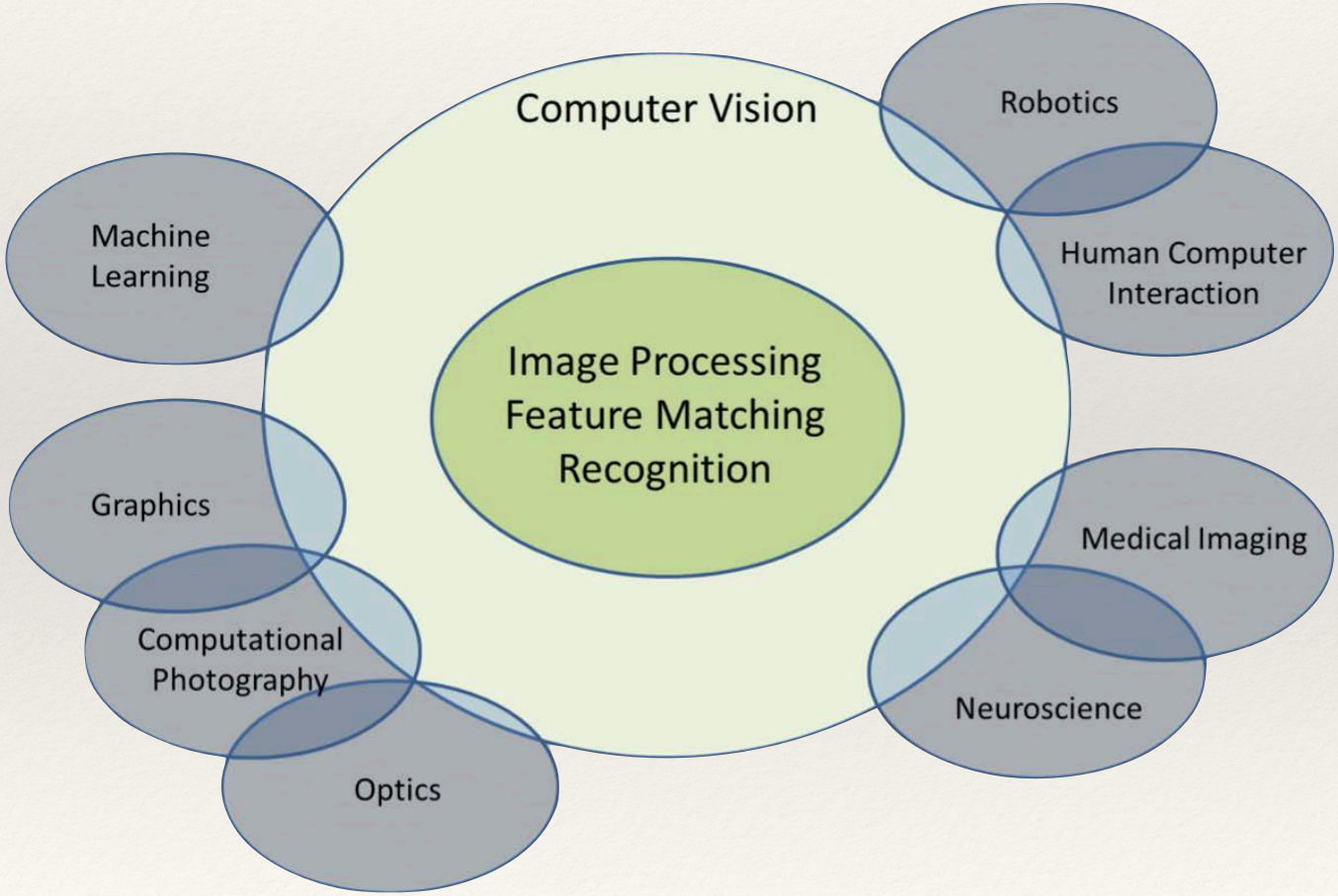
Make computers / robots understand images and video

- Object Detection
  - Find Pedestrian

- Image Segmentation

ROBOT VISION

Computer Vision Scope



ROBOT VISION

Computer Vision is **Challenging…**

ROBOT VISION

Computer Vision is **Challenging…very**

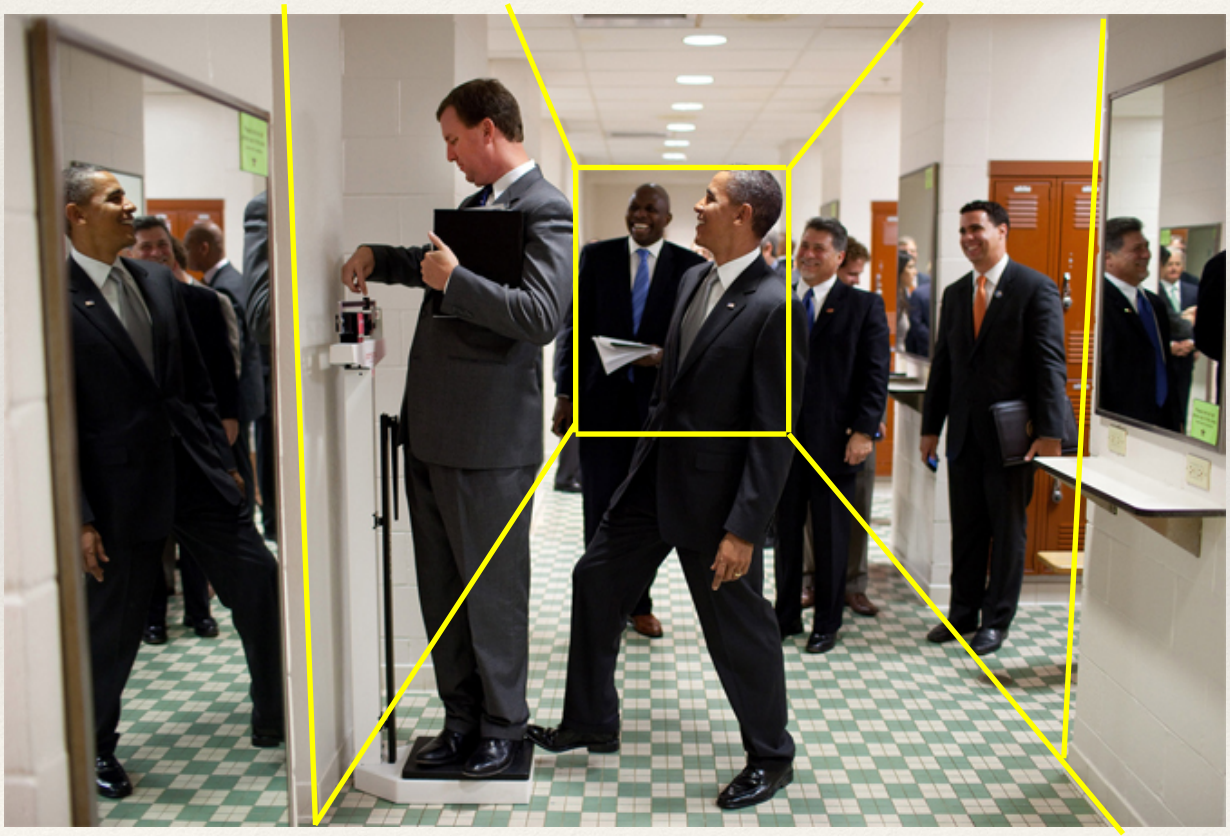
ROBOT VISION

Computer Vision is **Challenging…**

- Where was this picture taken ?
- How many people are there ?
- What are they doing ?
- What is the object the person on the left is standing on?
- Why is this a funny picture ?

ROBOT VISION

Computer Vision is **Challenging…**



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ROBOT VISION

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ROBOT VISION

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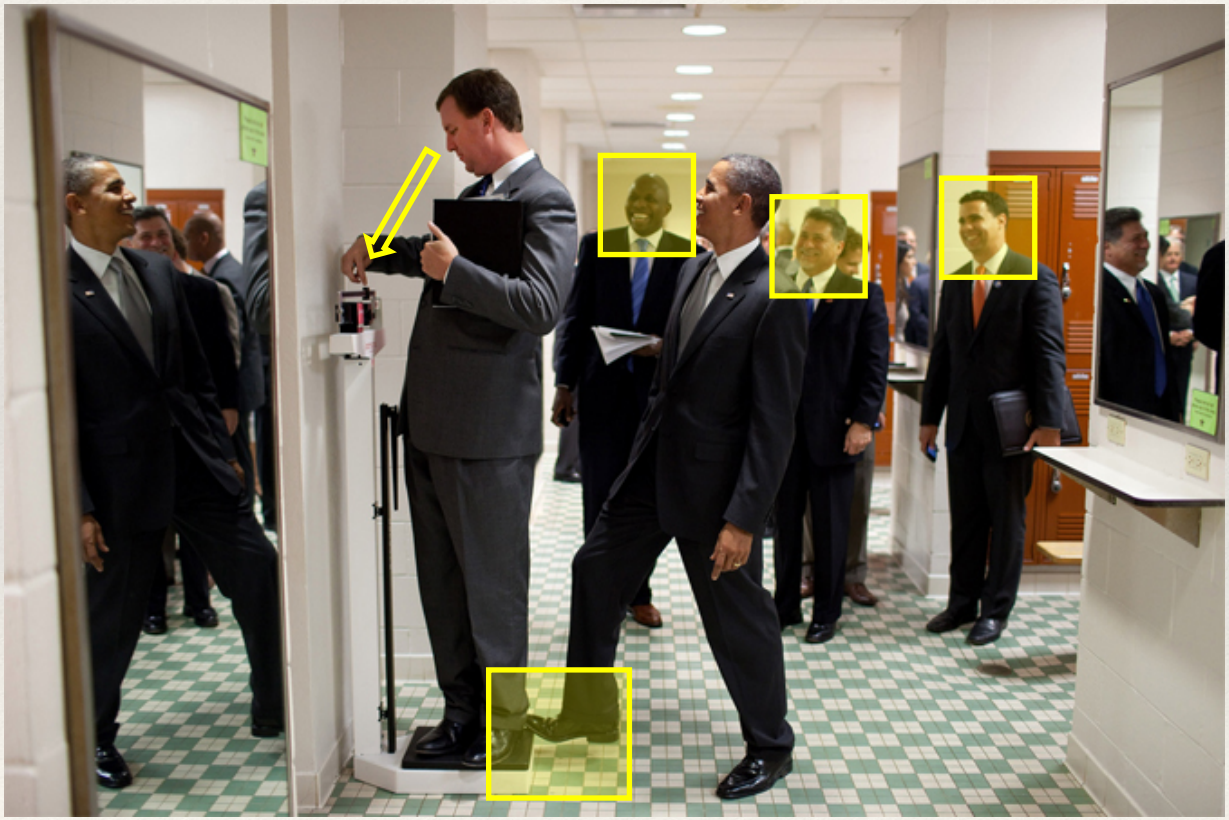
ROBOT VISION

Computer Vision is **Challenging…**



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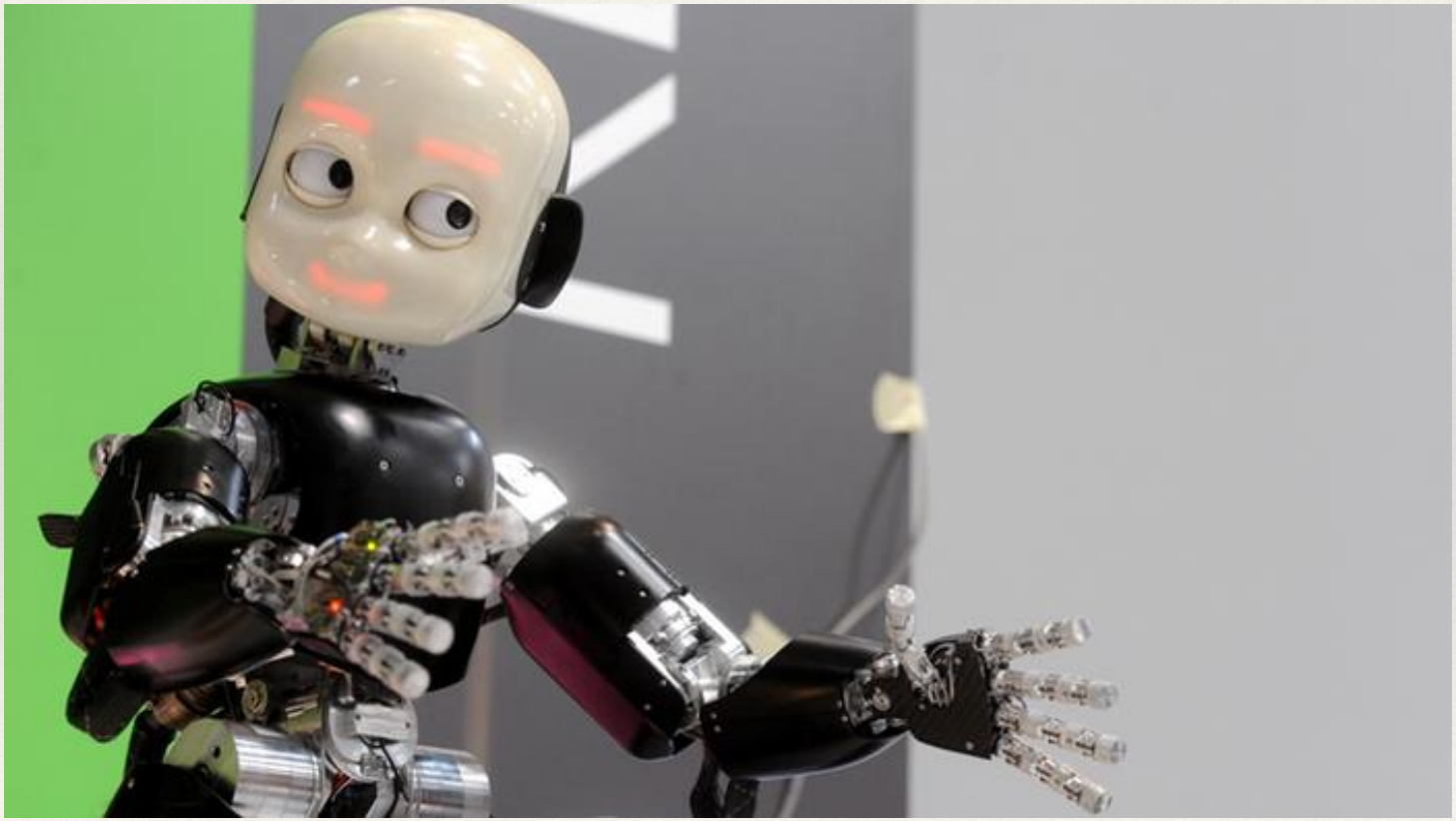
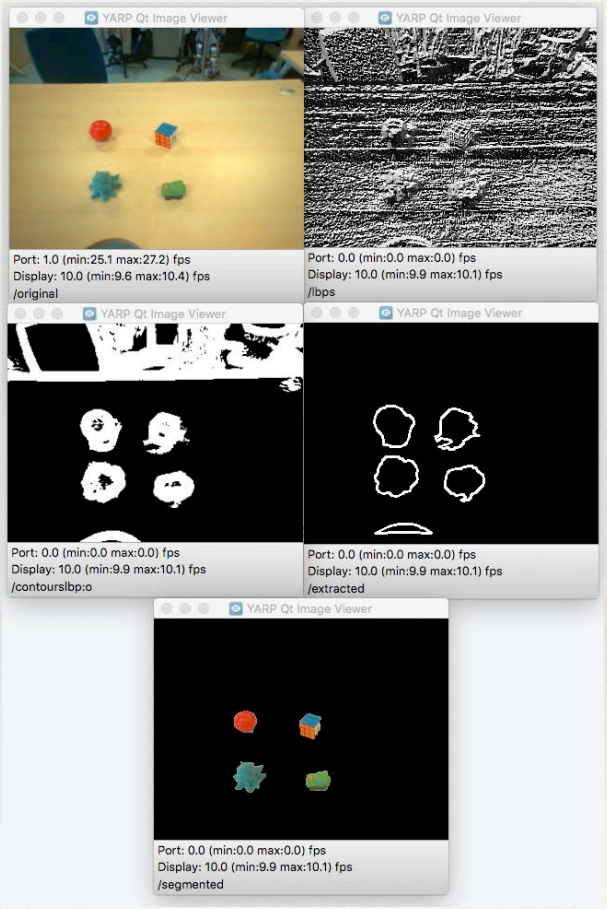
ROBOT VISION

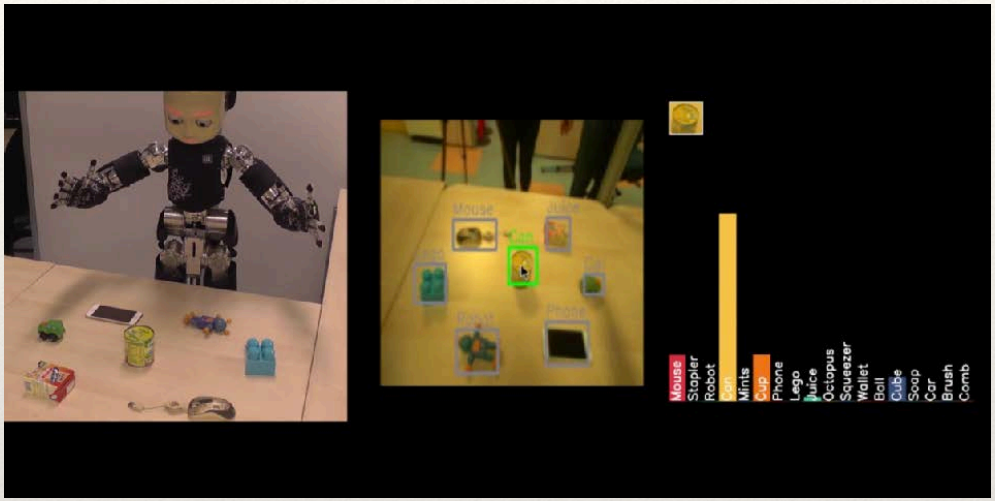
Fundamentals and Applications - 2D Vision

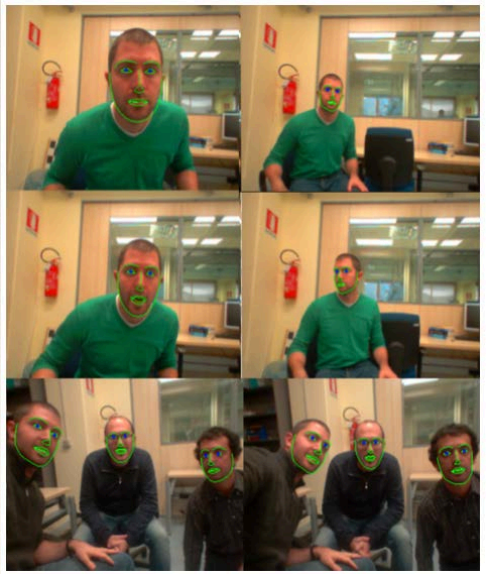


ROBOT VISION

Fundamentals and Applications - 2D Vision

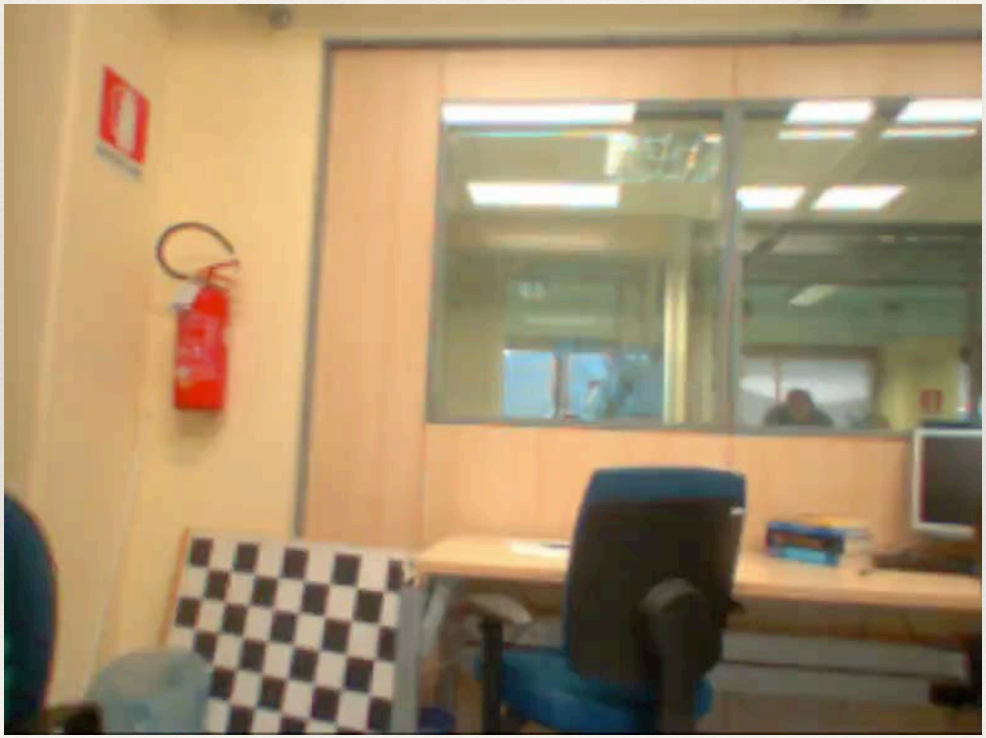






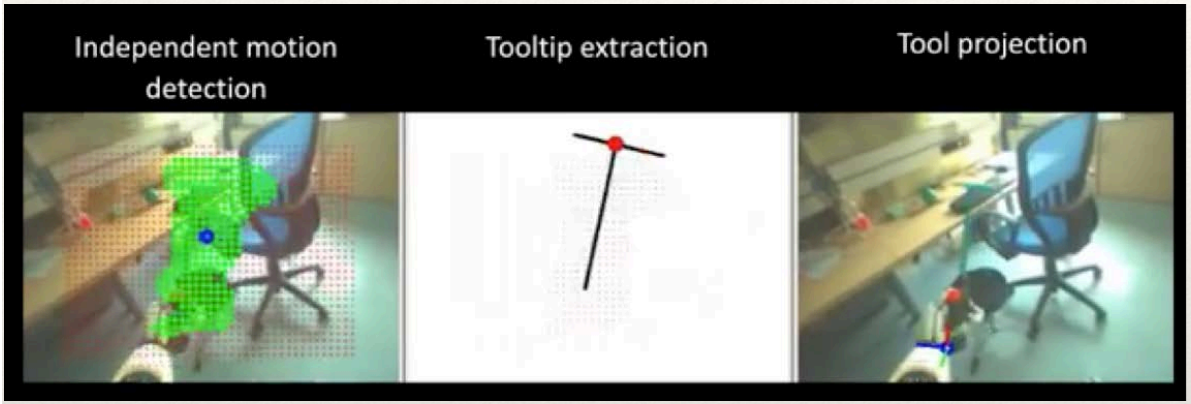
ROBOT VISION

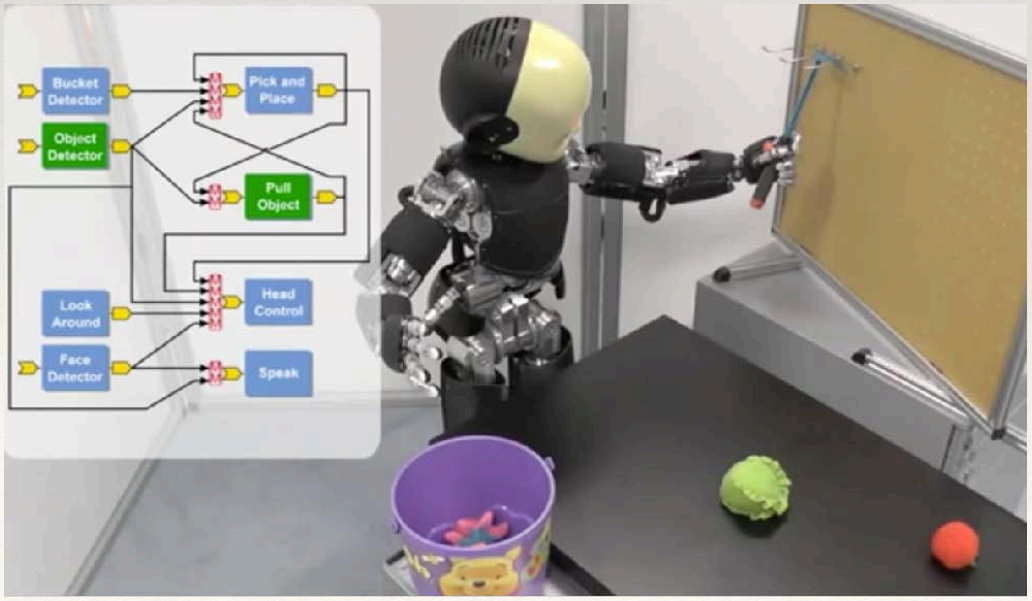
Fundamentals and Applications - 2D Vision

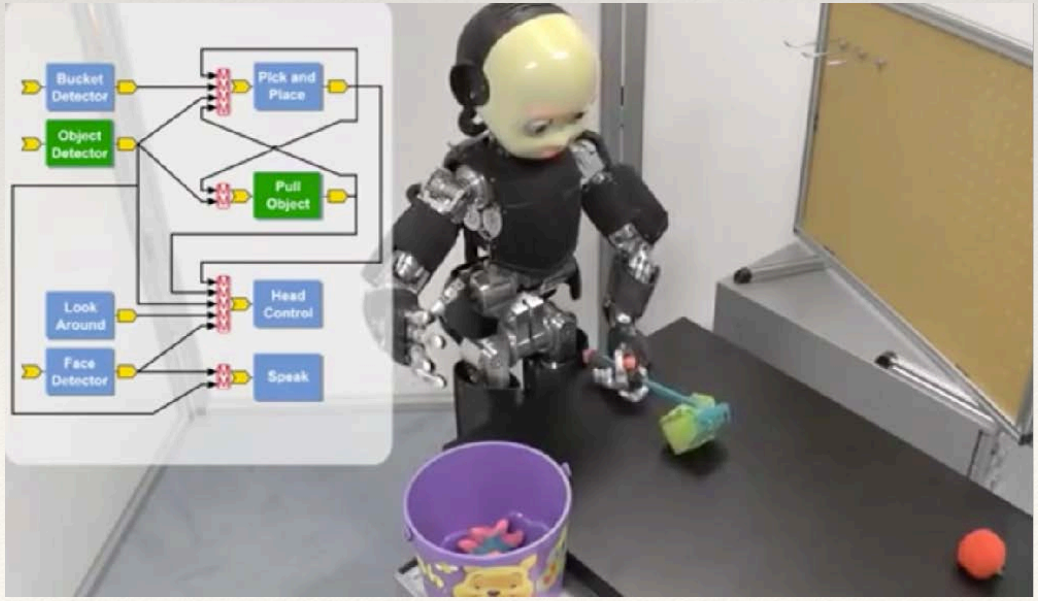


ROBOT VISION

Fundamentals and Applications - 2D Vision

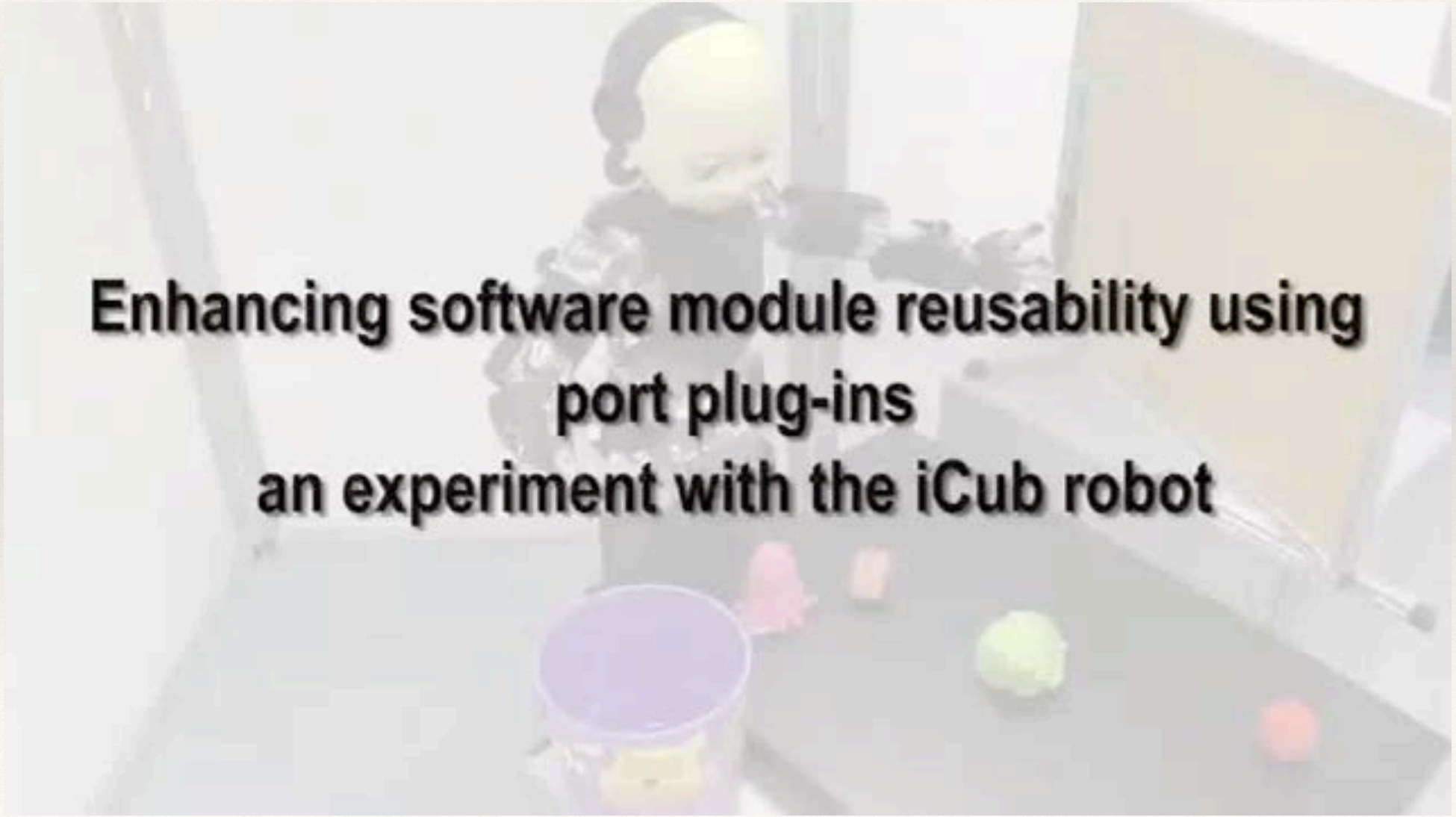






ROBOT VISION

Fundamentals and Applications - 2D Vision

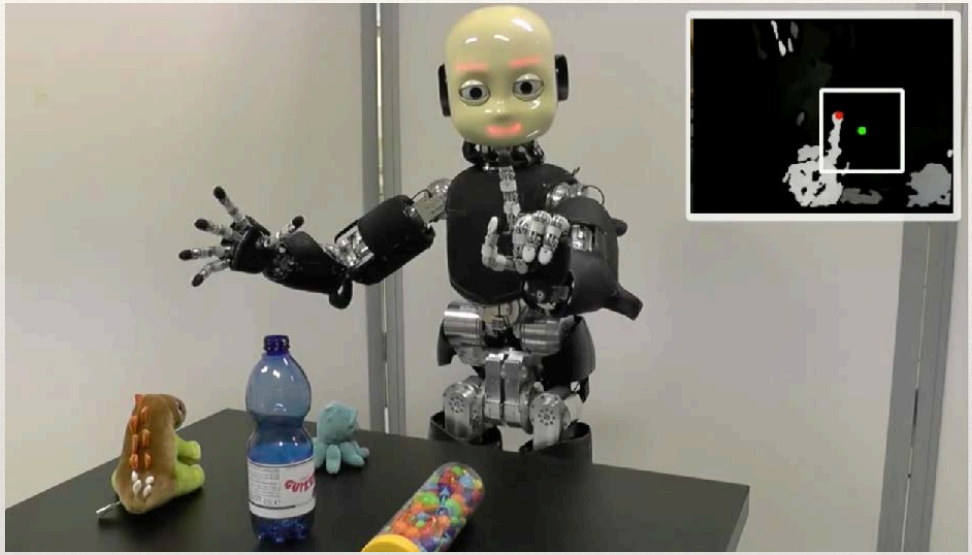


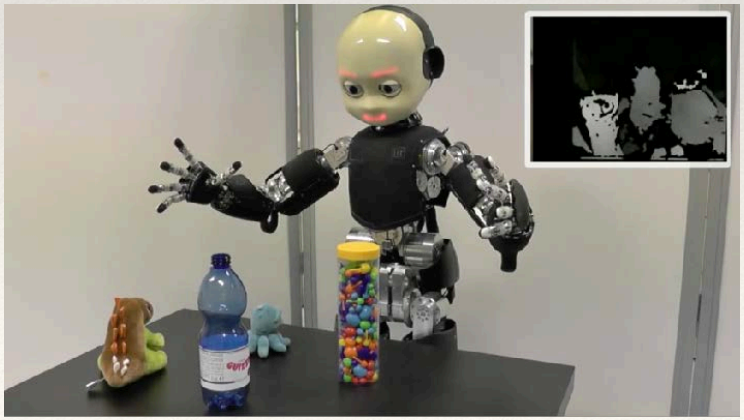
ROBOT VISION

Fundamentals and Applications - 3D Vision

ROBOT VISION

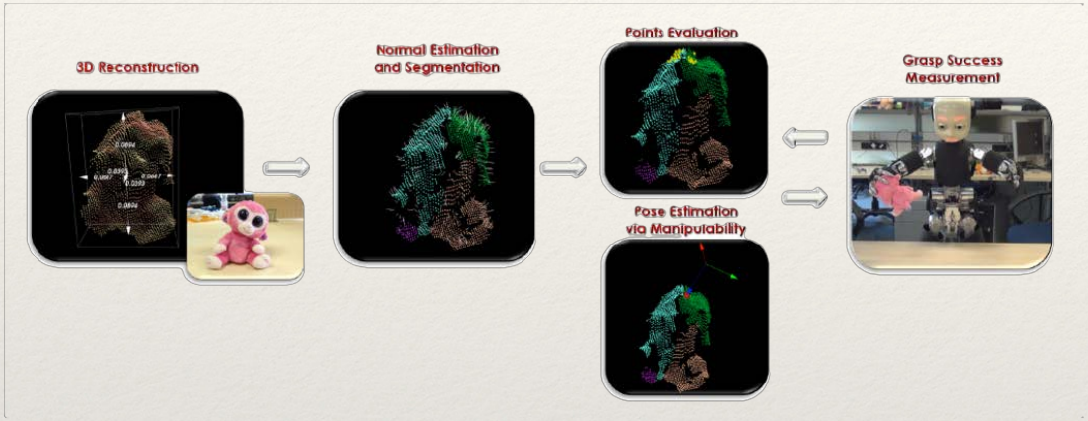
Fundamentals and Applications - 3D Vision

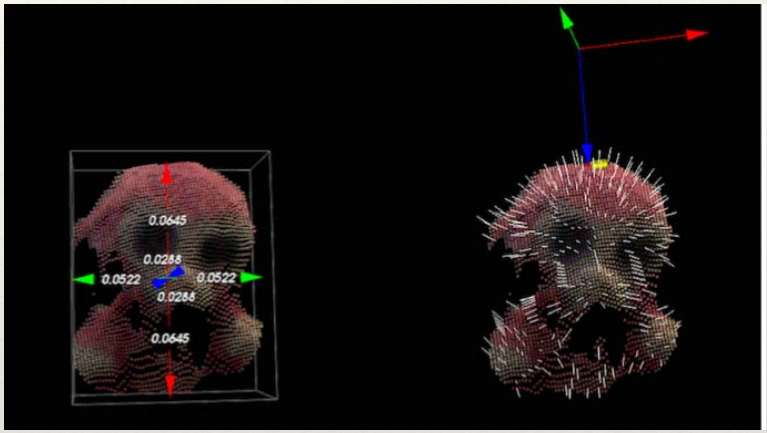


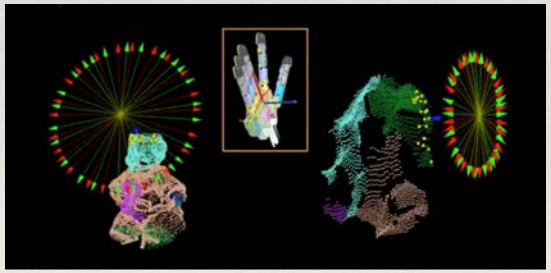


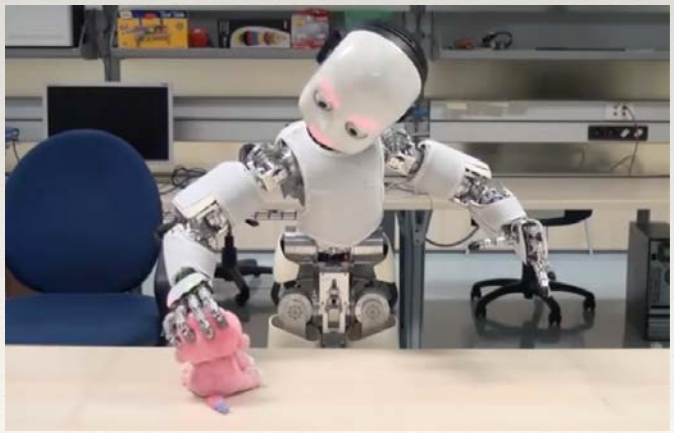
ROBOT VISION

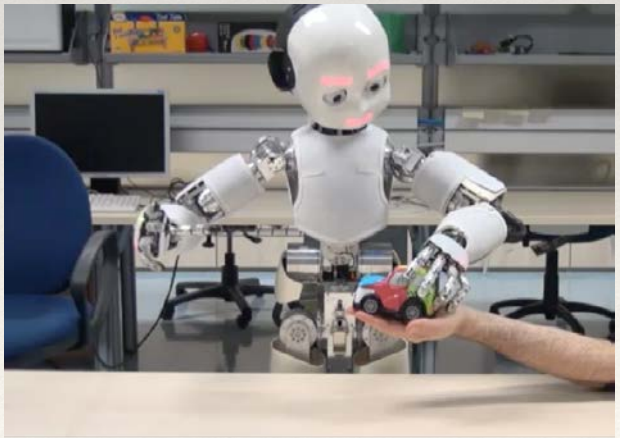
Fundamentals and Applications - 3D Vision





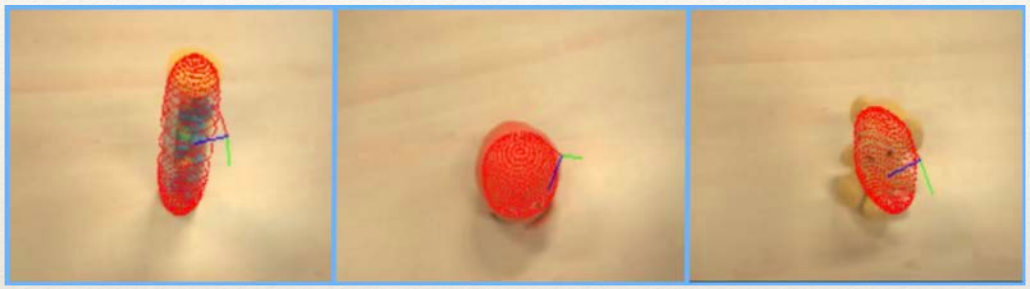






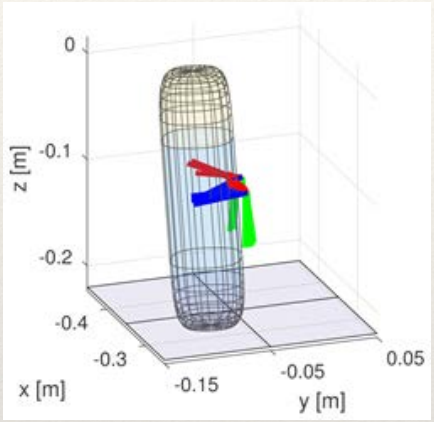
ROBOT VISION

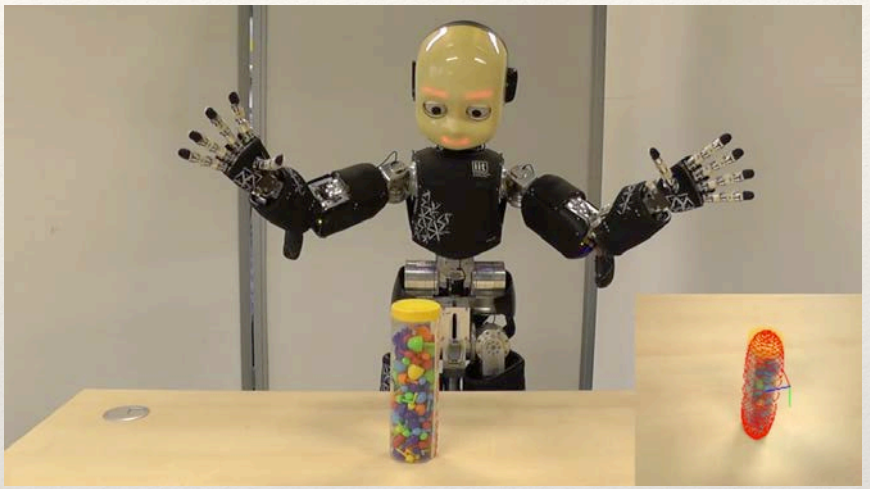
Fundamentals and Applications - 3D Vision



ROBOT VISION

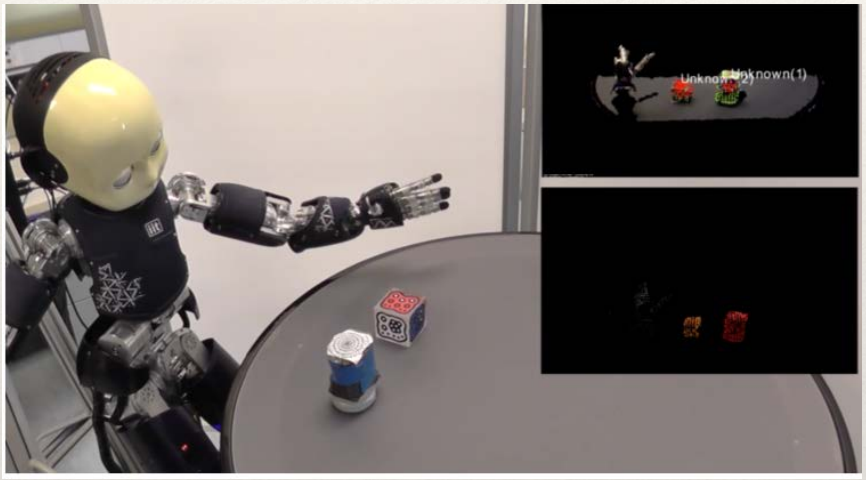
Fundamentals and Applications - 3D Vision

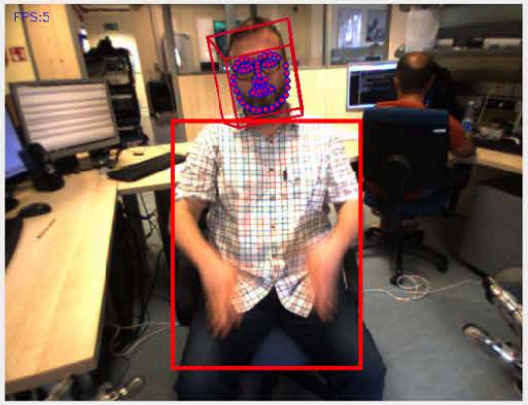


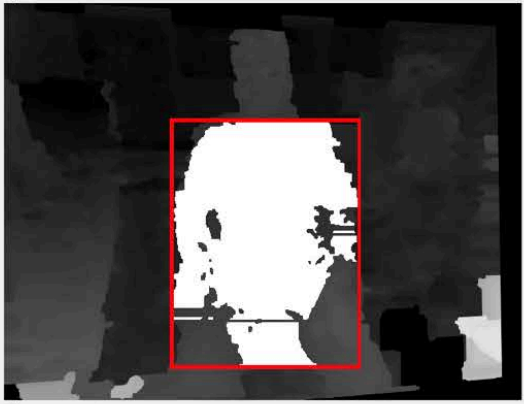


ROBOT VISION

Fundamentals and Applications - 3D Vision



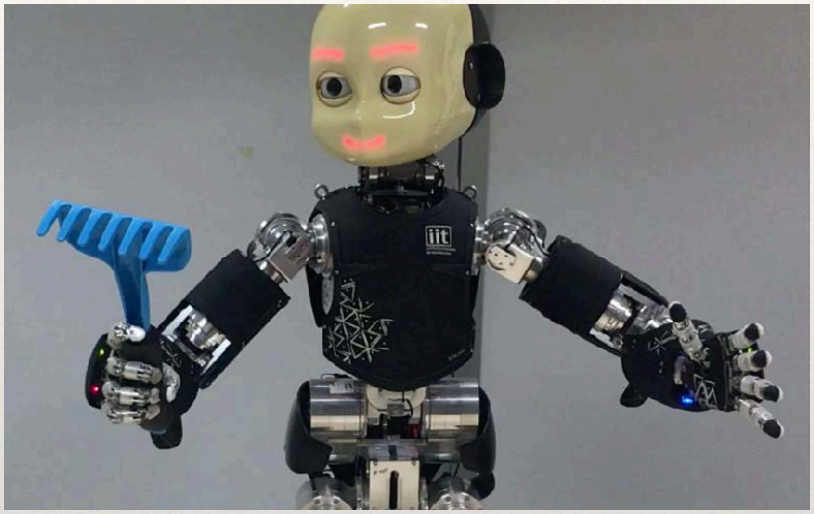


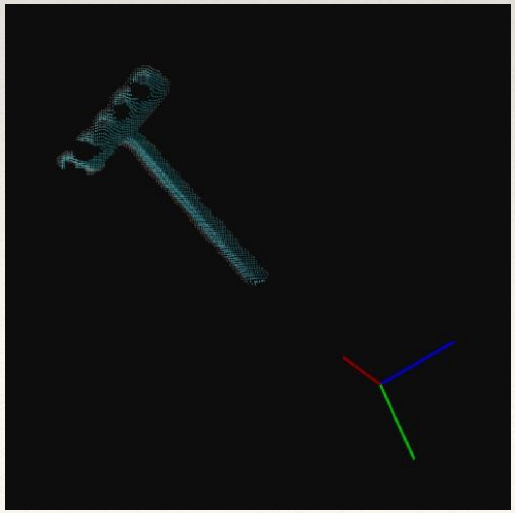


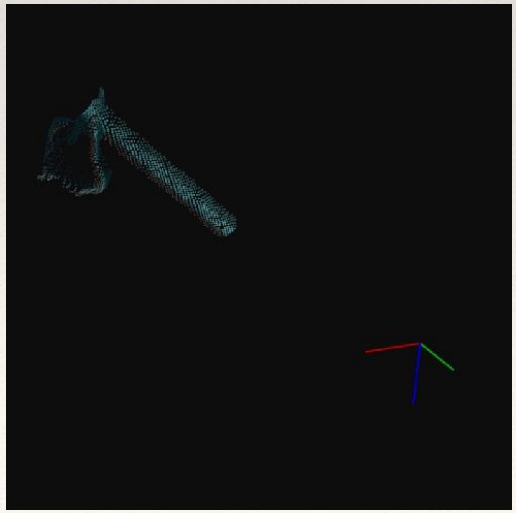
ROBOT VISION

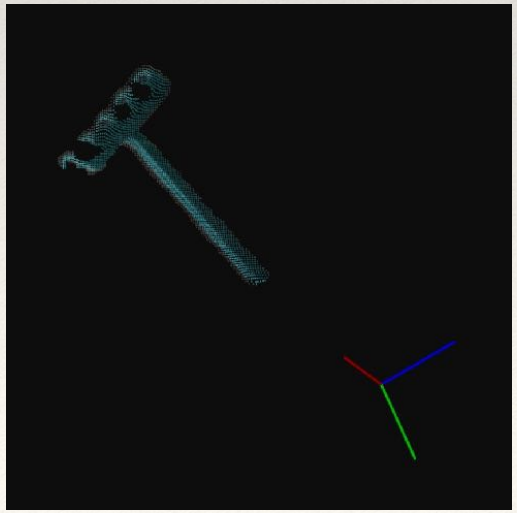
ROBOT VISION

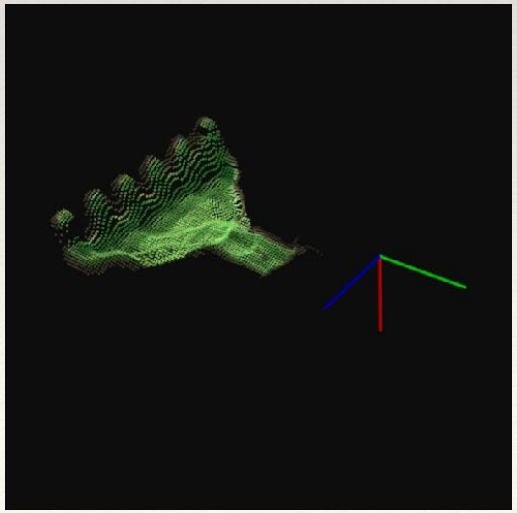
Fundamentals and Applications - 3D Vision





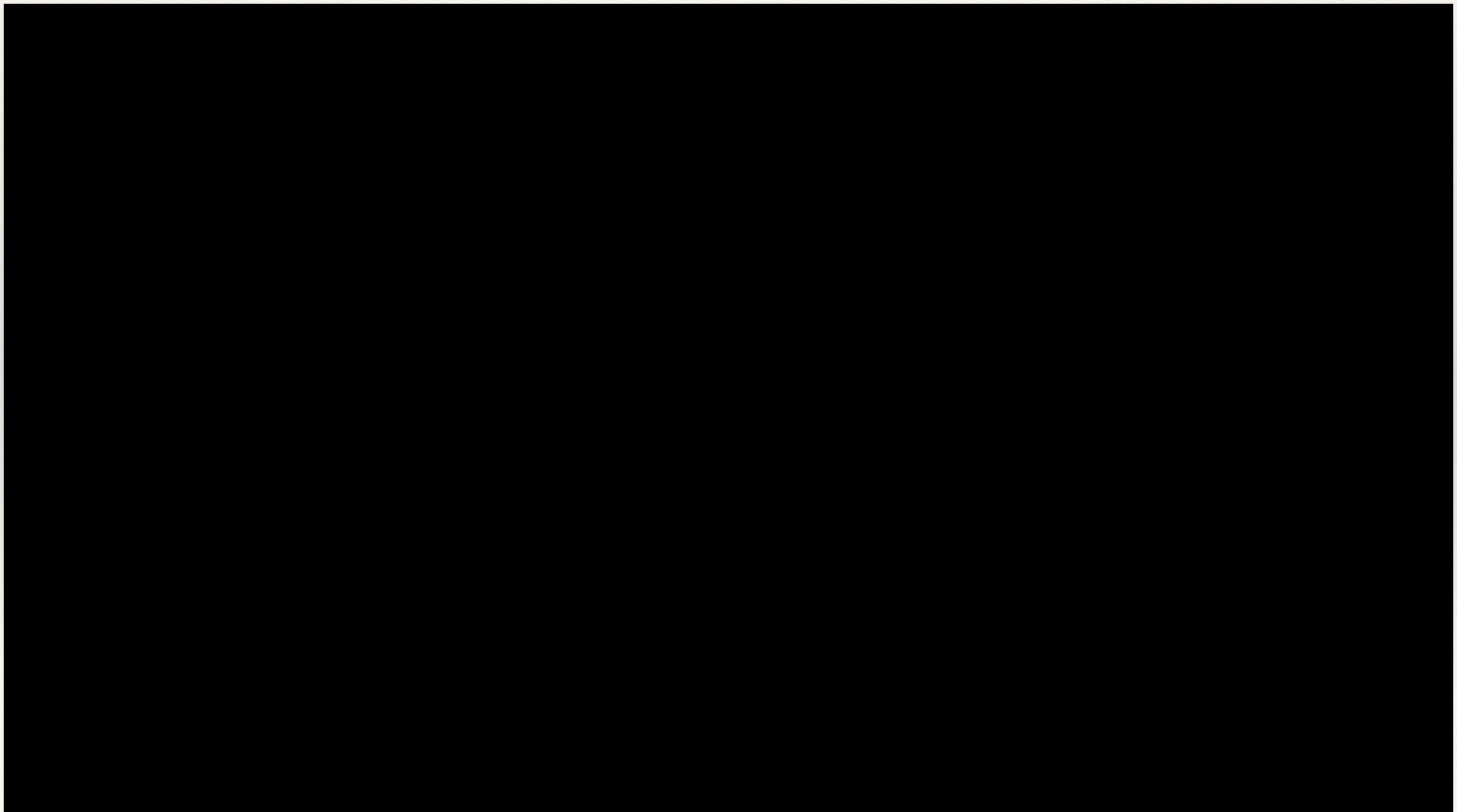




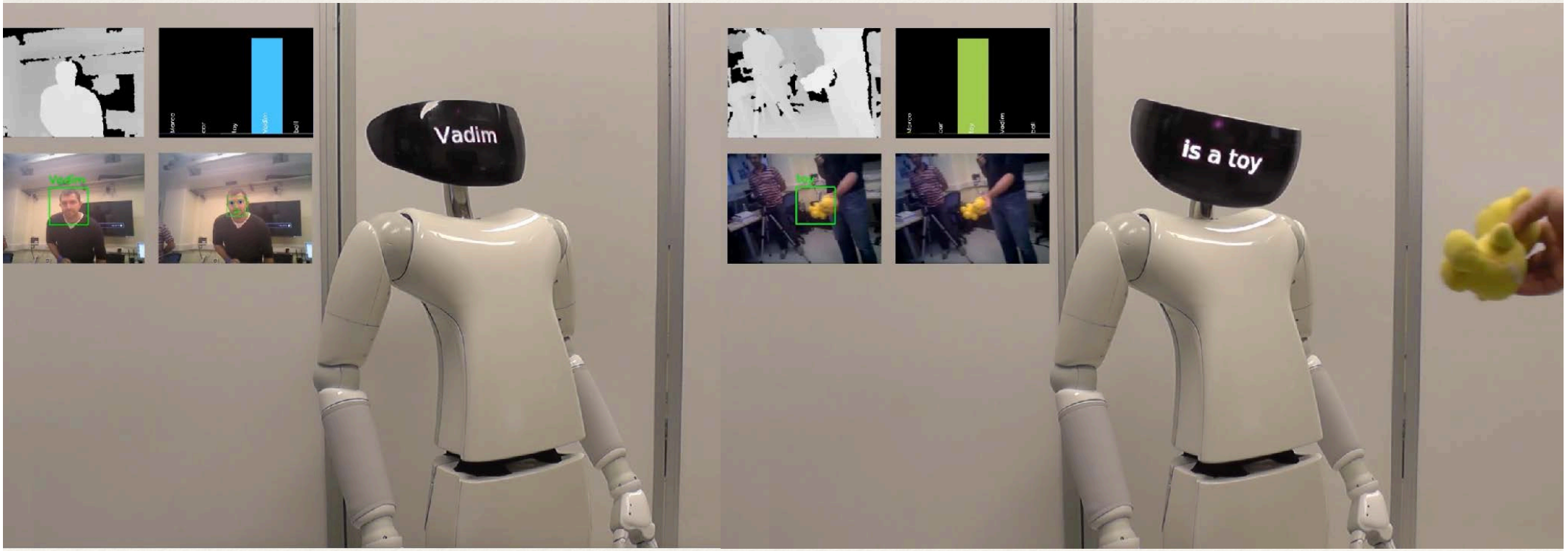


ROBOT VISION

Fundamentals and Applications - 3D Vision



ROBOT VISION

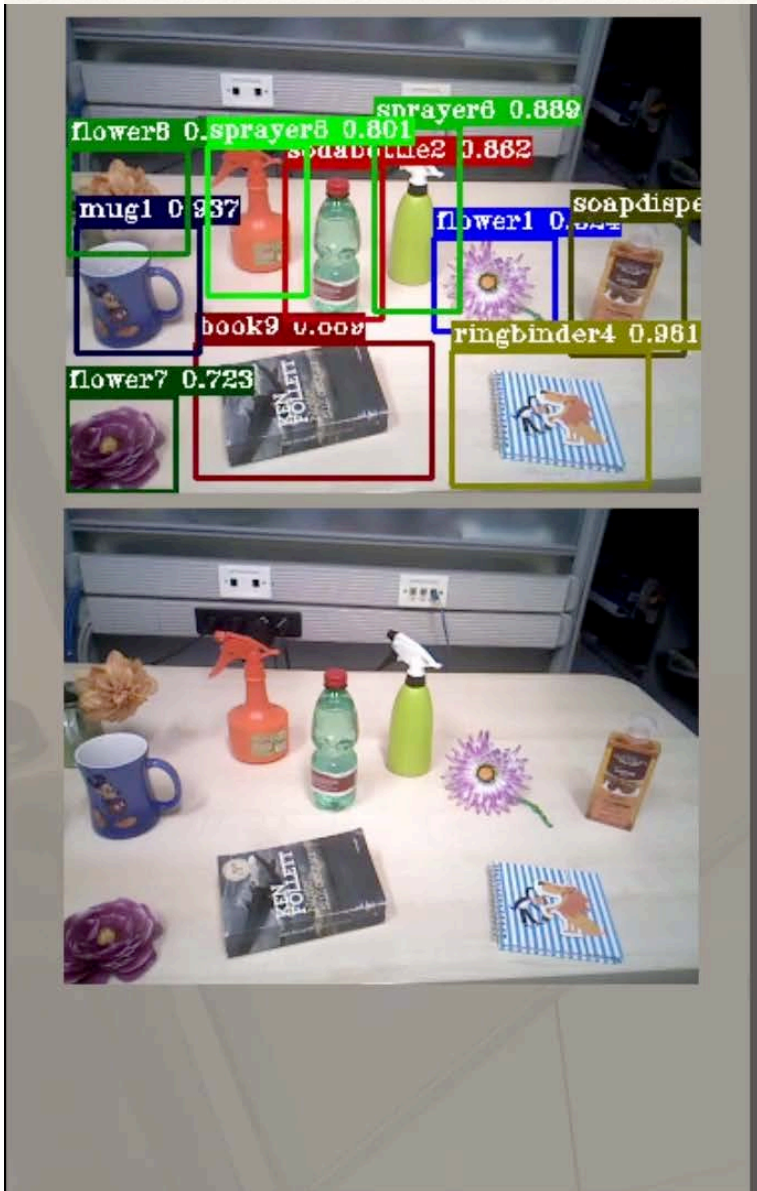


ROBOT VISION

Task 1: Object Identification

learning

ROBOT VISION



ROBOT VISION

Online Learning Object Detection Pipeline for Humanoid Robots

Elisa Maiettini, Vadim Tikhanoff, Giulia Pasquale
Lorenzo Natale, Lorenzo Rosasco

ROBOT VISION

Session Outline

- Assignment #1
  - Port callbacks
  - Integration of OpenCV
  - Find Closest Blob
  - Images processing
  - Play with streams of images
  - Extract closest blob

ROBOT VISION

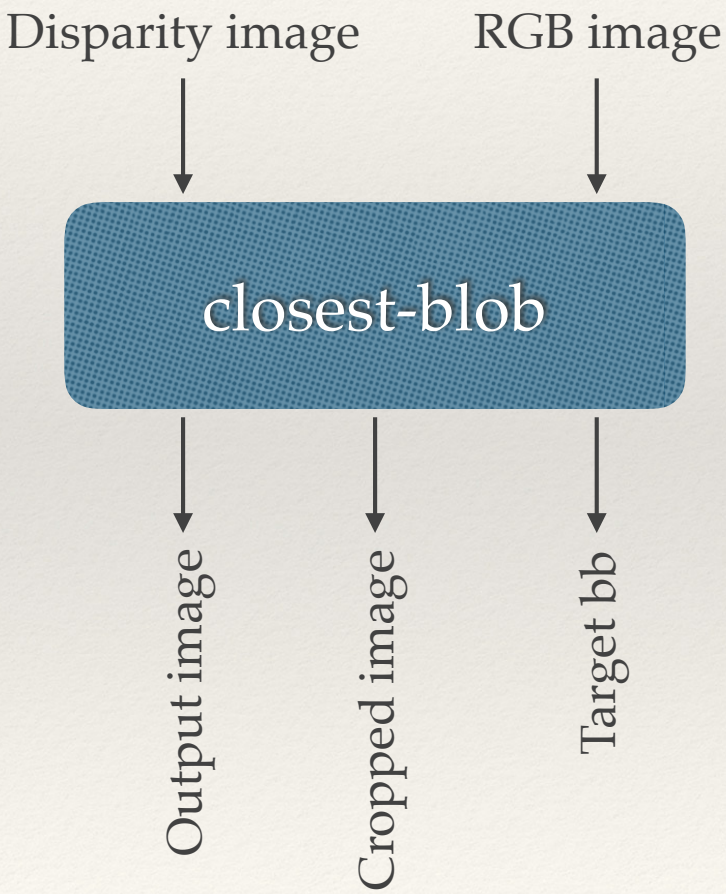
YARP Port Callbacks

RFmodule → Update with fixed time

RFmodule + Callbacks → Callback depending of input

ROBOT VISION

Module Structure



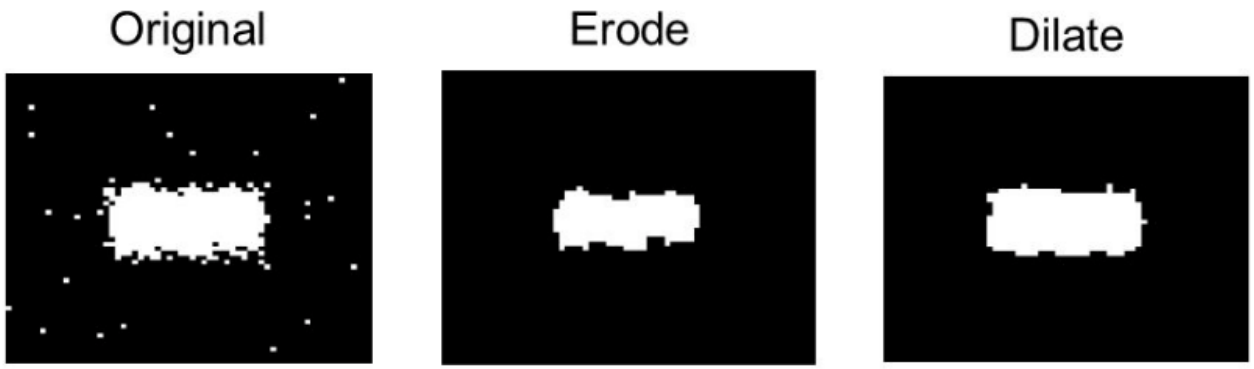
ROBOT VISION

Image Processing

Blurring image

Transforming image

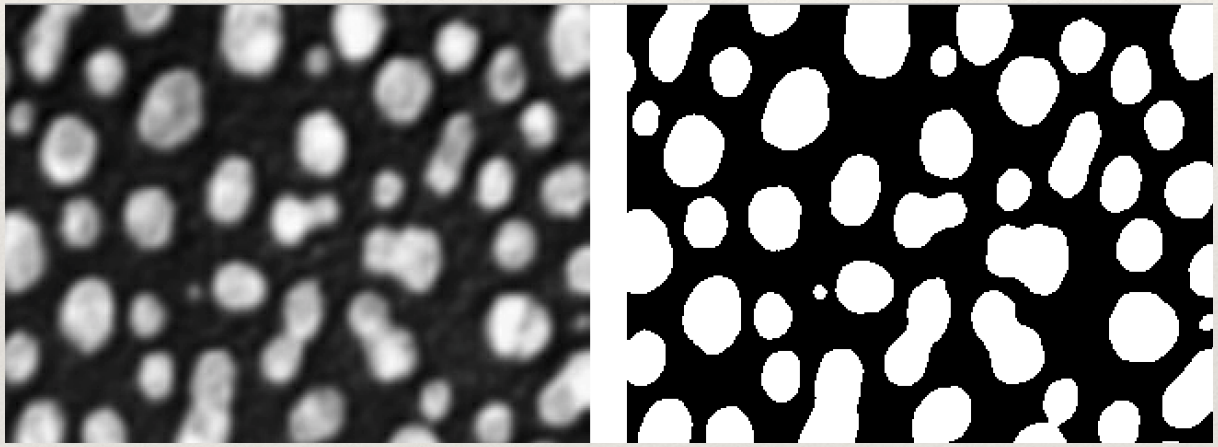
- Erode original image.
- Dilate eroded image.
- Smooths object boundaries, eliminates noise (isolated pixels) and maintains object size.



ROBOT VISION

Image Processing

Thresholding image



Find contours in image