Cognitive Grasping System: un caso applicativo di Reti Neurali Convoluzionali per una manipolazione industriale autonoma e robusta

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Ricerca ed Innovazione

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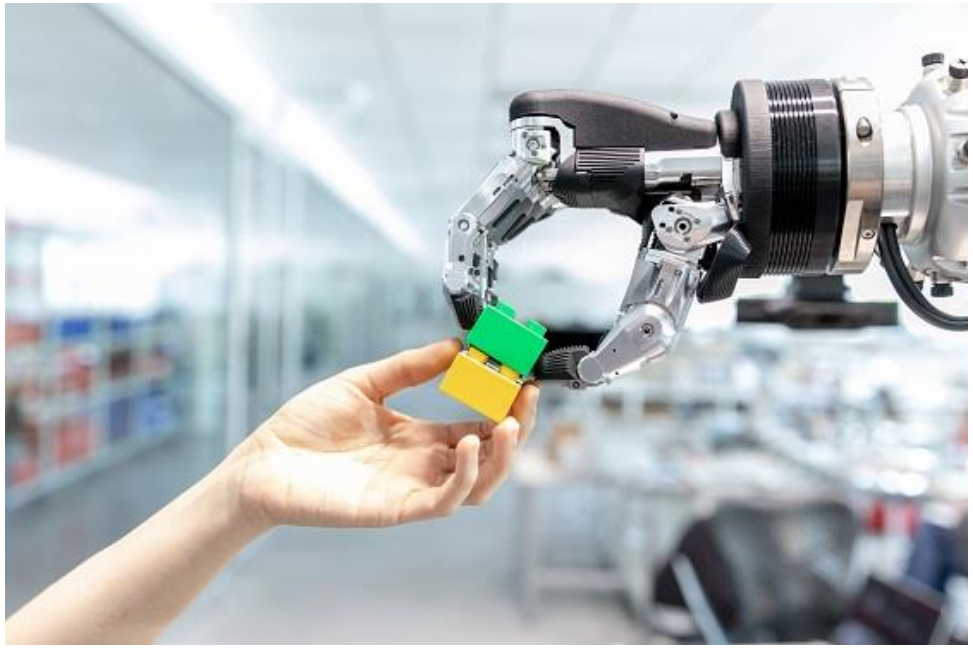
Cognitive Grasping

Easy grasping and manipulation capabilities without provide any information on shape, dimension and surrounding condition. No need to reprogram the robot for a new object.

Industrial use case: different units in a production line that have to be tested and manipulated.

Integration with **different cameras and grippers** typologies in order to improve perception and manipulation capabilities.

Robustness with respect to different **environmental conditions** (lighting…)



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Layout

VISION

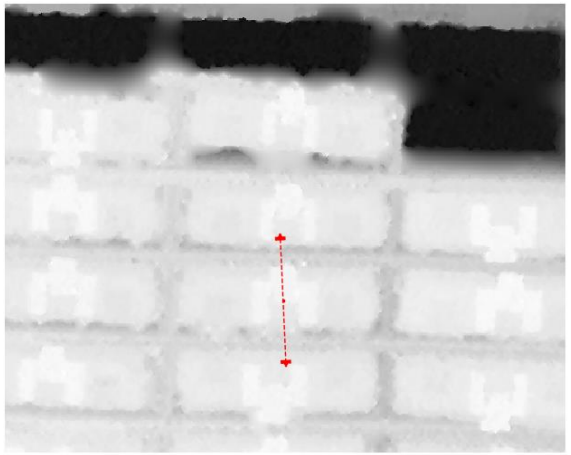
- Image acquisition
- Input to the neural network

ARTIFICIAL INTELLIGENCE

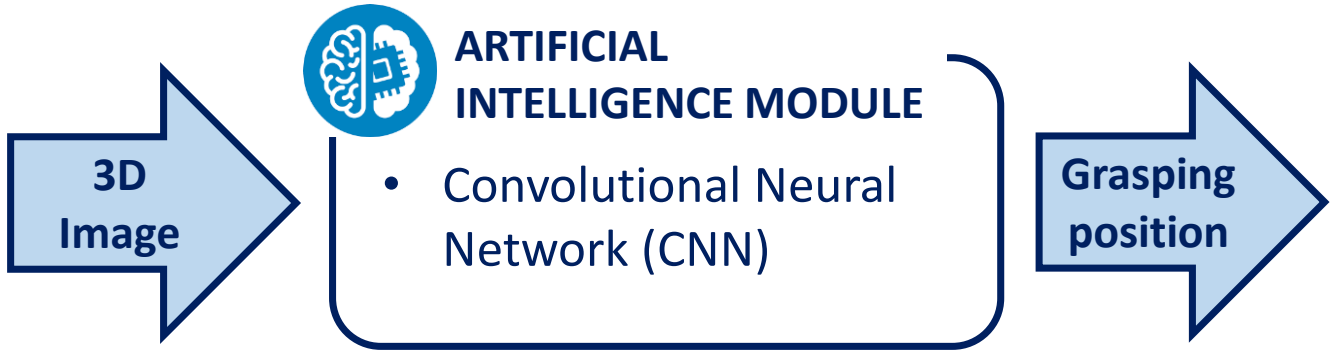
- Best grasping point computation

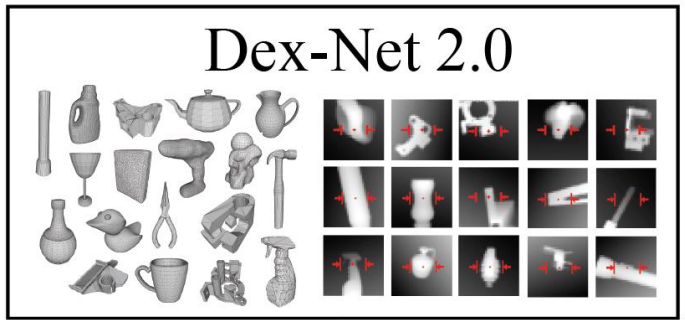
COBOT

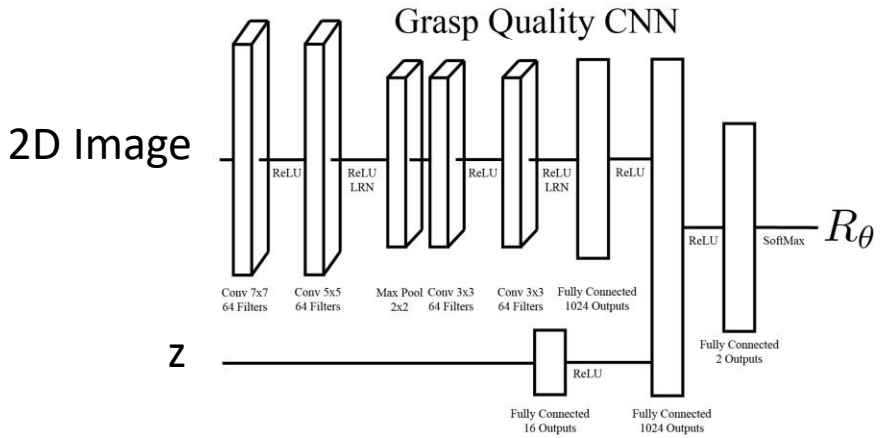
- Workspace shared with the operator



AI Technologies







J. Mahler, J. Liang, S. Niyaz, M. Laskey, R. Doan, X. Liu, J. A. Ojea, and K. Goldberg, "Dex-net 2.0: Deep learning to plan robust grasps with synthetic point clouds and analytic grasp metrics," in Proc. Robotics: Science and Systems (RSS), 2017.

Use Case:

Objective: In a production line there are different objects to be handle and every time (at the beginning of their production) the coordinates where to grab the object should be provided to the robot.
With AI, the robot is automonously computing where is the best way to grab the object, without a-priori knowledge.

Grasping reliability ~97%

Best grasp evaluation

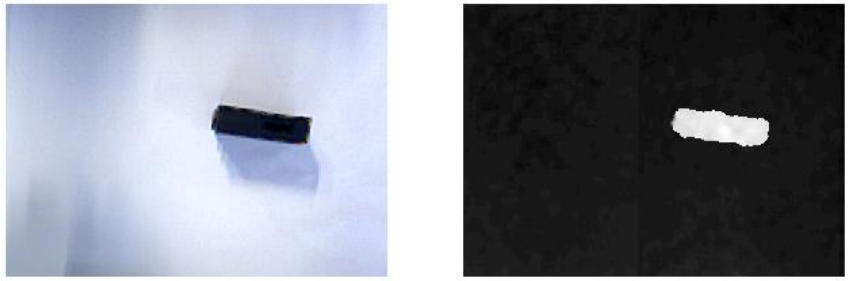
- ROS
- Ubuntu 16.04 with Intel i7 Quad-Core processor and Nvidia Quadro board.
- ~2 s processing time

Training

1500 models of objects:

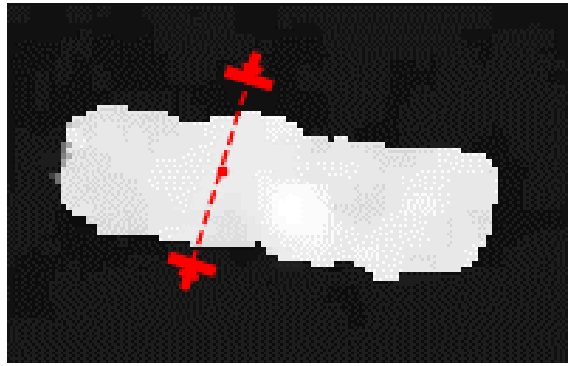
- 1358 3D synthetic objects generated from CAD
- 142 Point Cloud acquired from the 3D camera

INPUT = 3D image



Best grasp evaluation (3 iterations)

Best grasp



Open points

? Methods and strategies to ensure and guarantee grasping point repeatability.

? Processor and hardware support in order to improve performances.

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