

Exploring and Enhancing the Capabilities of a 6-Axis Robotic Arm

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Meet NED

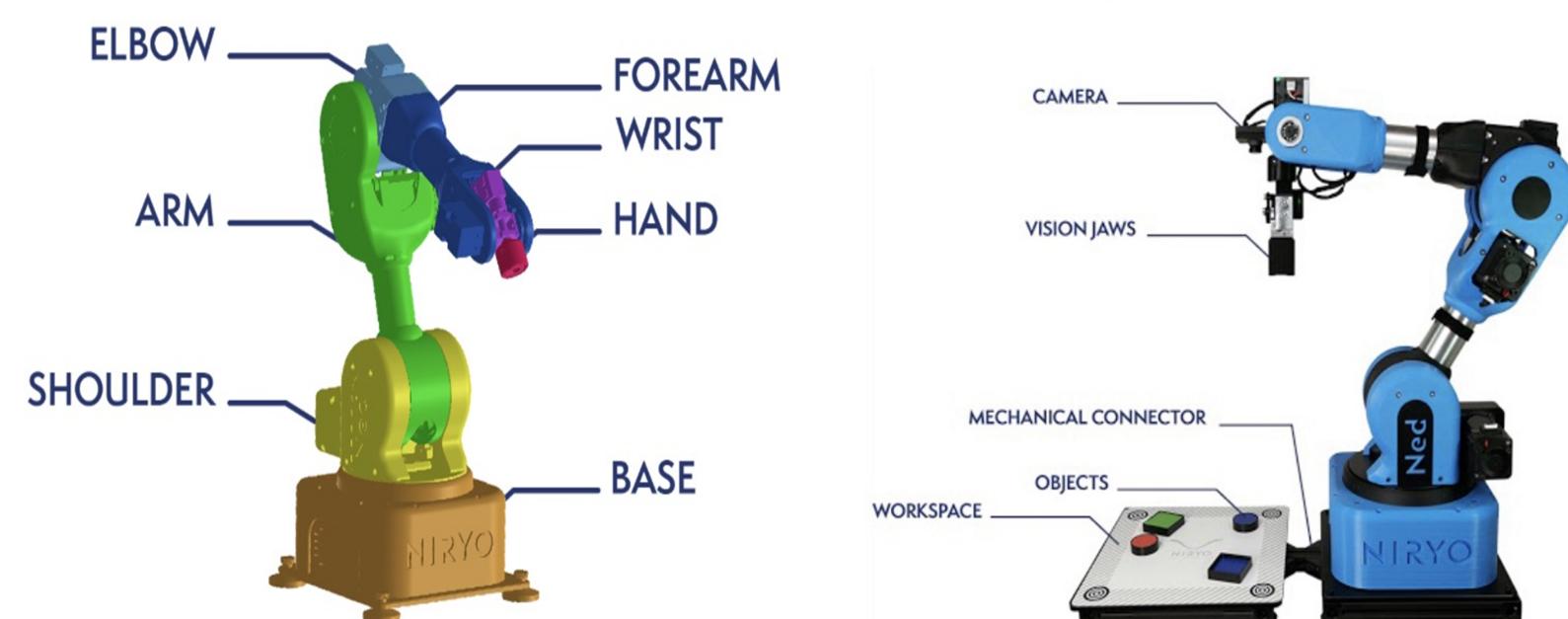
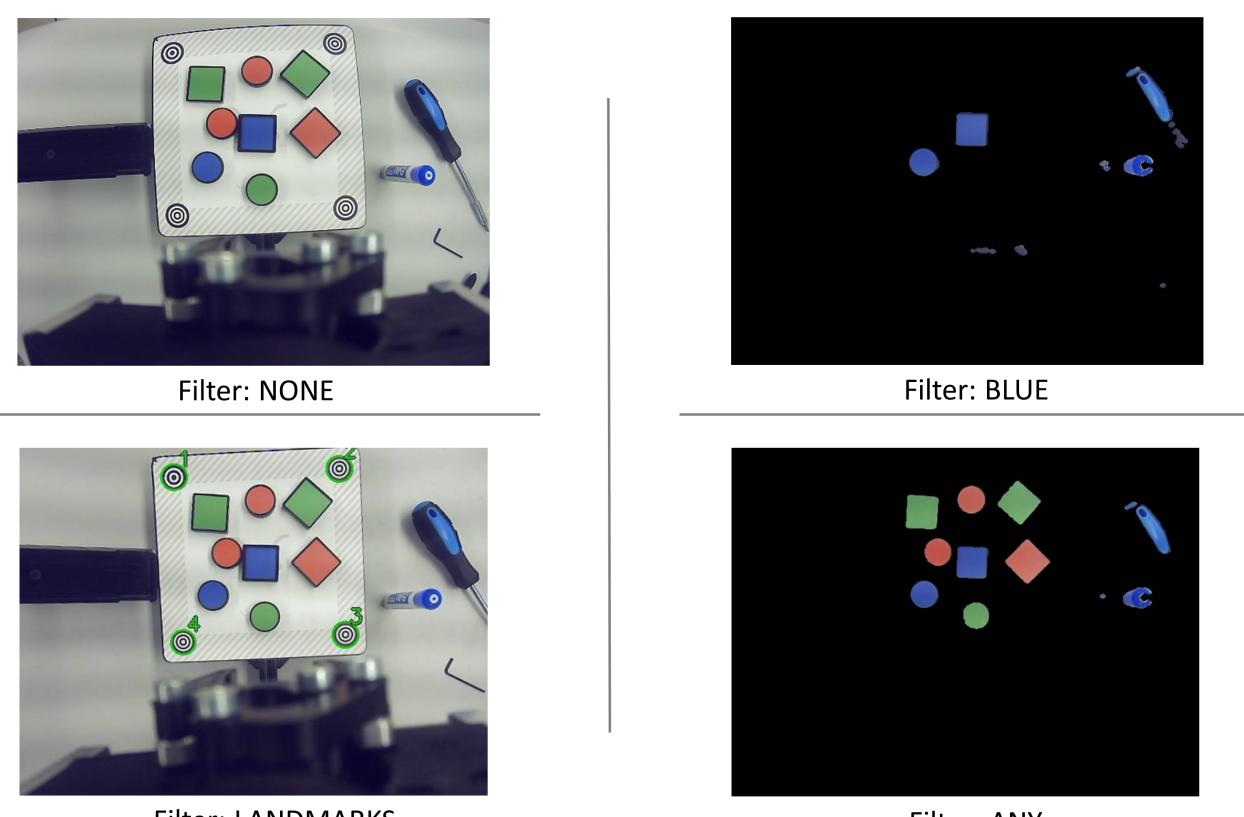


Figure: Niryo NED. A 6-axis robotic arm.

NED's Capabilities

- Color and shape differentiation
- Video streaming
- Software compatibility



NED's Limitations

- Inability to discern a successful pick or a miss
- Robot and workspace manual calibration
- Manual place and observation pose
- Inability to detect surroundings
- Visual hierarchy

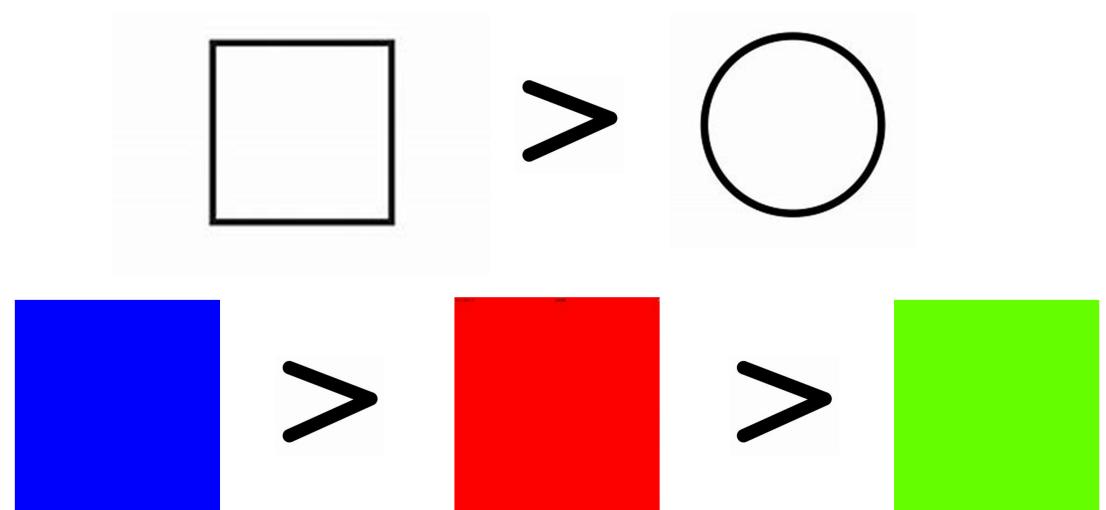


Figure: Vision Pick Hierarchy. The robot will first prioritize shape then color then position (not shown in the image).

Introduction

- Robotic manipulators are widely used in manufacturing industries as well as for medical applications.
- However, the industrial robotic manipulators are expensive.
- The aim is twofold:
 - Identify research ideas by exploring various capabilities and limitations of a *low cost* robotic manipulator.
 - Propose and implement a solution towards one of the research idea to enhance the capabilities.



Figure: NED in Observation Pose.

Applications

Sorting



Conveyor Belt



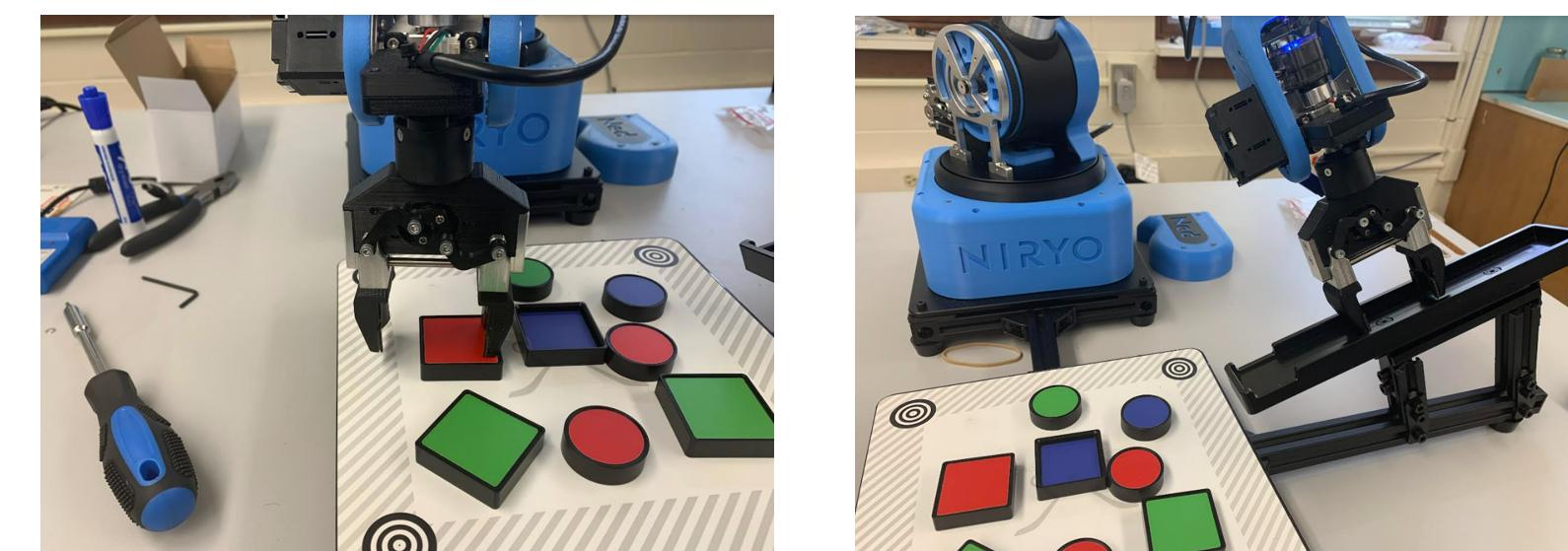
Pick and Place



Research Directions

- **Learning:** Integrating learning methods to decrease the chances of miss.
- **Smart Grippers:** Using (smart) sensors to enhance the performance of grippers
- **Motion planning:** Design algorithms to avoid obstacles.

Results



Grab-or-Miss Algorithm

- ① Move to *Observation pose*
- ② Determine characteristics of target $\rightarrow T_1$
- ③ Pick the target and return to Observation pose
- ④ Determine characteristics of new target $\rightarrow T_2$
- ⑤ If $T_1 = T_2$ then
- ⑥ Return "Missed"
- ⑦ Else
- ⑧ Return "Grabbed"
- ⑨ Repeat

Future Work

Developing learning based algorithms to improve grasping capabilities.

Contact Information

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Figure: LinkedIn