

Human Robot Collaboration

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Mechanical Engineering



Introduction:

Assembly / Disassembly Tasks



High Flexibility

low Efficiency

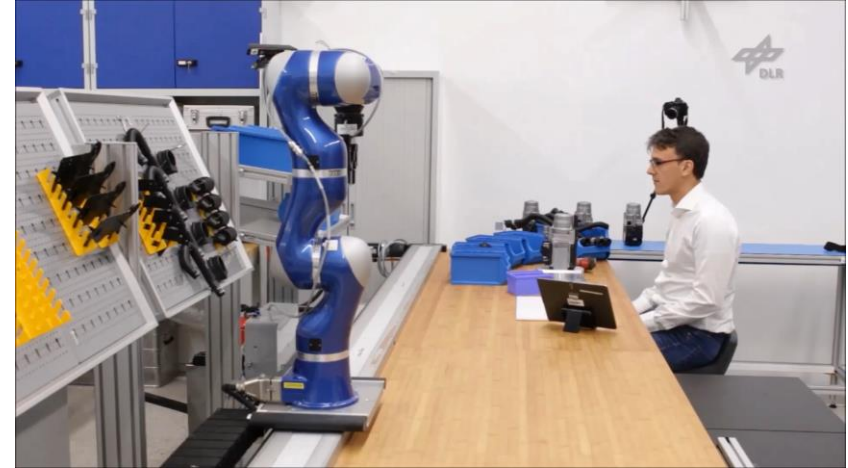
High labor cost



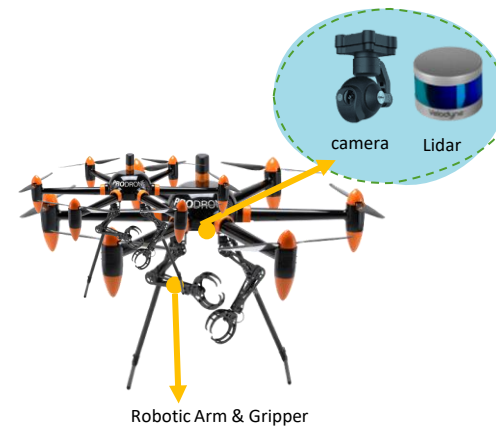
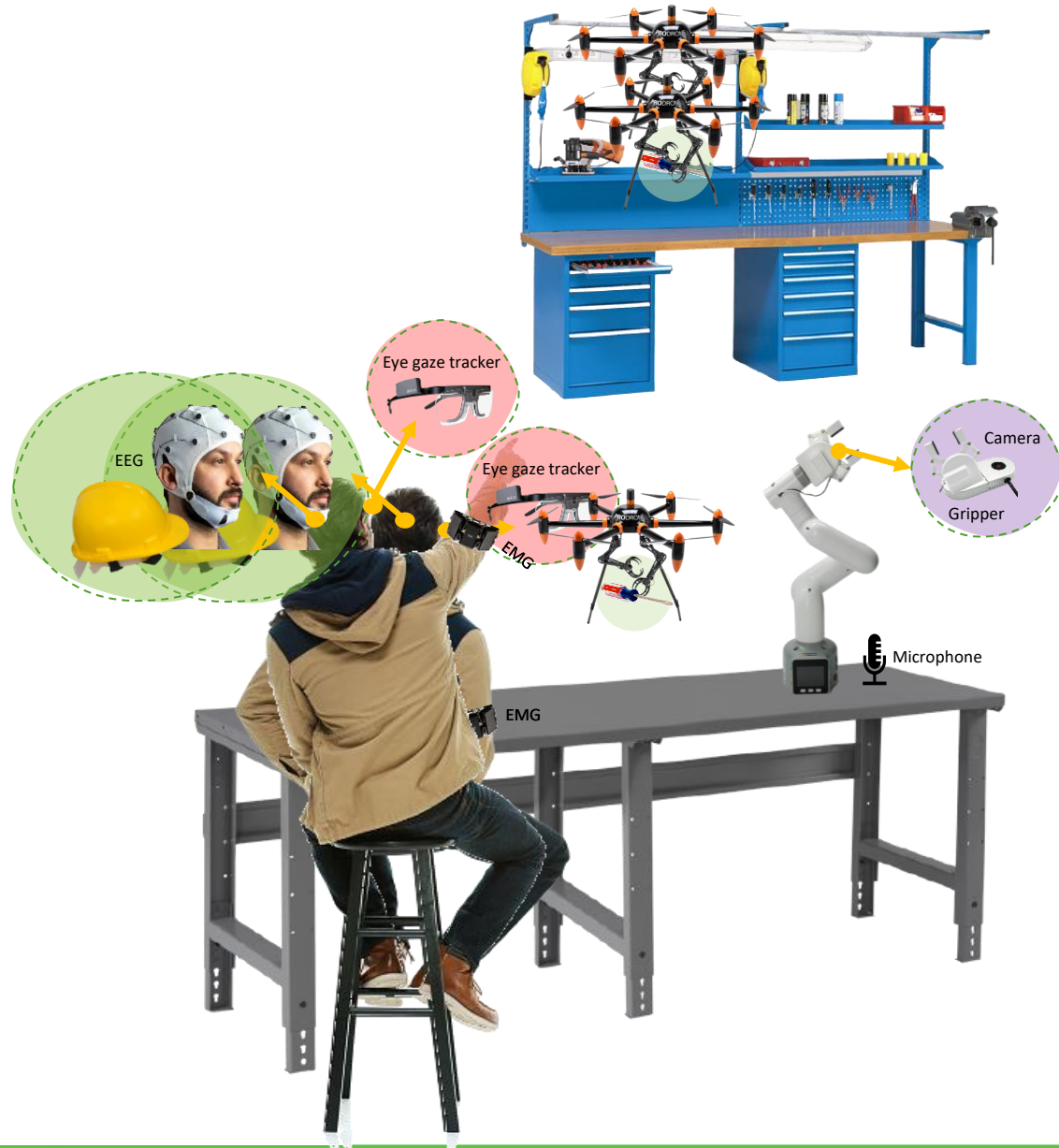
High Efficiency

Low flexibility

High capital cost

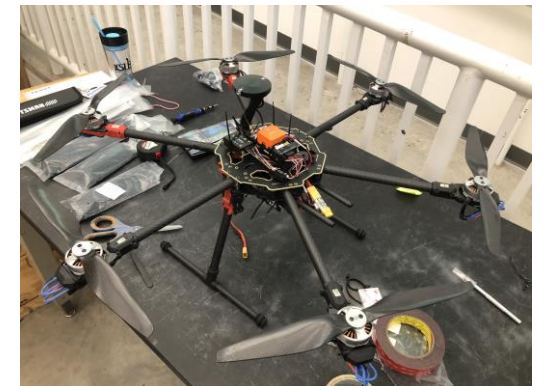
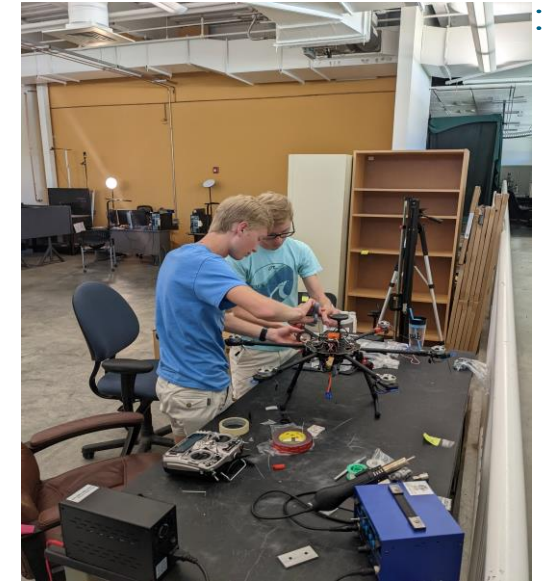


Conceptual Framework:



- 1- Action Recognition/Intention Prediction
- 2- Localization & Path Planning
- 3- Object Detection
- 4- Grasping

Drone Design:



Autonomous Flight:



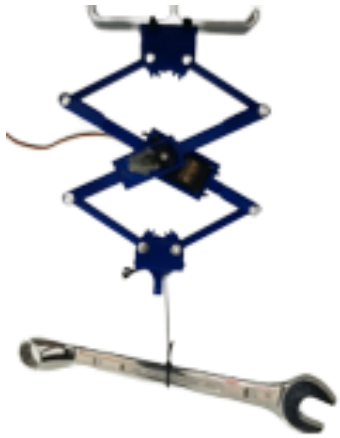
Mission:

- 1- Go Up
- 2- Position 1 (P1)
- 3- Position 2 (P2)
- 4- Stay for 5 sec
- 4- Position 3 (P3)
- 5- Return to Position 1
- 6- Land



Grasping Mechanism

Ascension Mechanisms: Scissor Lift Mechanism



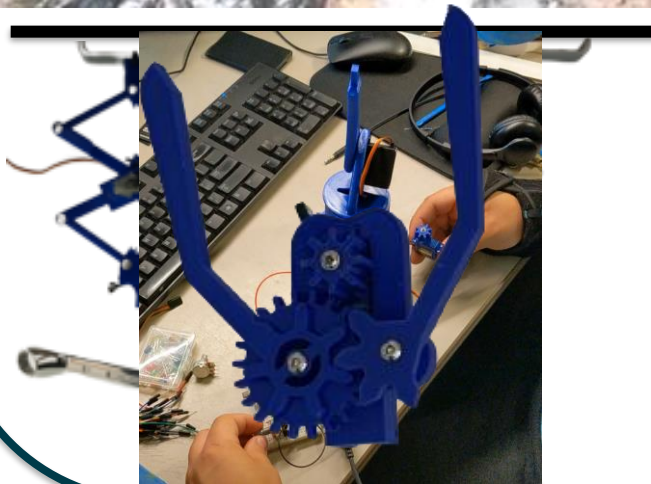
Robotic Arm



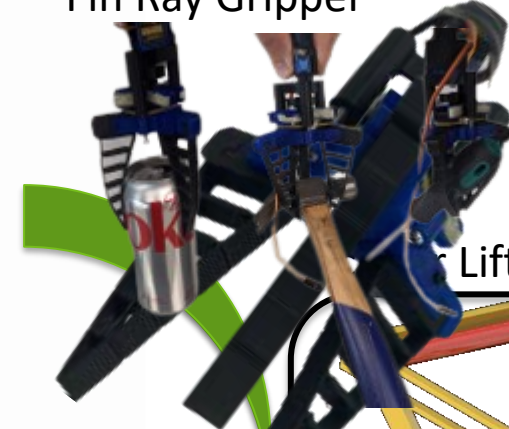
Gripper Mechanism: Mantis Claw



Two Finger Gripper

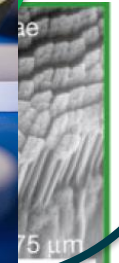
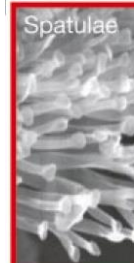


Fin Ray Gripper



Scissor Lift Mechanism:

Gecko Adhesive Gripper



Tool Detection:



Define Classes



Dataset Preparation



roboflow

Annotation



Dataset Generation

YOLOv5

Neural Network

Images
3,28
0 mis
136 n

Class

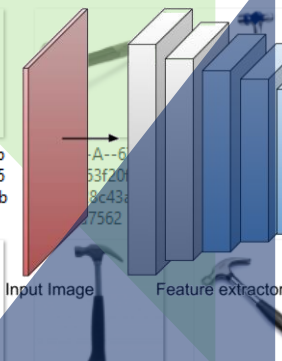
- Adjustable Wrench
- Tape Measure
- Double-Open-End Wrench
- Flat-Head Screwdriver
- Phillips Screwdriver
- Level
- Screwdriver
- Single-Open-End Wrench
- Pipe Wrench
- Pliers
- Mallet
- Nuts
- Hammer
- washer
- Double Box-end Wrench
- Combination Wrench



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Double Box-end Wrench 287
Combination Wrench 277



Input Image

Feature extractor



Regular Wrench 0.88
Regular Wrench 0.89
Regular Wrench 0.90
Regular Wrench 0.92

Adjustable Wrench 0.89

Future Works:

- 1- Camera Integration
- 2- Grasping Mechanism Integration
- 3- Indoor Localization
- 4- Path Planning
- 5- Indoor Testing

105 Toomey Hall



Thank you!

