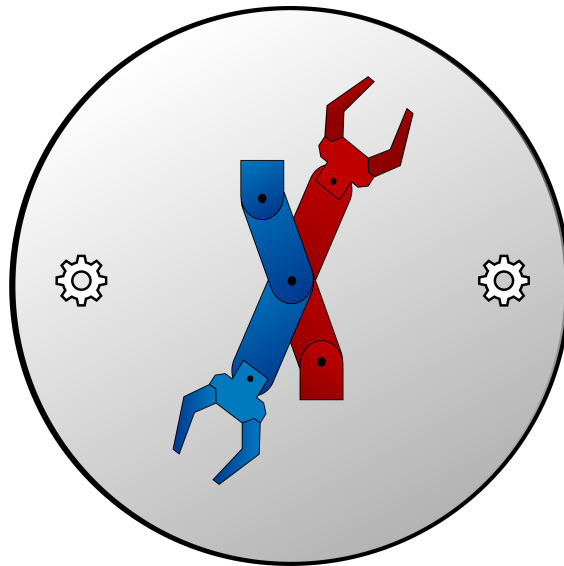


SPECIFICATIONS

Trey Dufrene, Alan Wallingford, David Orcutt, Ryan Warner, Zack Johnson



ME 407

Preliminary Design of Robotic Systems

Embry-Riddle Aeronautical University



Meiosis

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1 Introduction

2 Design Requirements

2.1 Hardware

- 2.1.1 The system shall cost the end-user no more than \$1000.
- 2.1.2 The system shall be fully dexterous without being kinematically redundant.
- 2.1.3 The system end effector shall maintain a positional accuracy magnitude of ± 1 mm and an orientation accuracy of $\pm 5^\circ$ eigen angle from the base frame.
- 2.1.4 The system end effector shall maintain a pose repeatability magnitude between 0.1—1.5 mm for the position and $\pm 4^\circ$ eigen angle from the base frame for the orientation.
- 2.1.5 The system's reachable workspace shall be a hemisphere with a radius of 300-700 mm.
- 2.1.6 The system's dexterous workspace shall be a hemisphere within the workspace with a difference between the outer and inner radii of 280 mm.
- 2.1.7 The system shall have a removable end effector capable of picking and placing a low-odor chisel tip Expo dry erase marker.

This creates a robot capable of performing a variety of basic tasks, which enhances its educational value.

2.1.7a. The system will use a parallel gripper (purchased or 3D-Printed).

This will be sufficient to perform pick and place operation on an Expo dry erase marker.

2.1.7b. The end effector will attach to the manipulator using screws.

This connection point will be standardized and will support many different

configurations of screw positions. This allows for various grippers or custom end effectors to be implemented.

2.1.8 The system shall be able to write with a low-odor chisel tip Expo dry erase marker.

2.1.8a. The end effector will be capable of holding the marker still while moving.

In order to be reliable when drawing, the marker should not move while being manipulated by the robot.

2.1.8b. The end user will be able to select two points at which the robot will follow a trajectory between.

This keeps the marker on the surface while moving to enable the robot to draw.

2.2 Software

2.2.1 The system shall be open source.

2.2.2 The system shall be capable of operating given only desired end effector cartesian coordinates specified with respect to the base frame.