Software

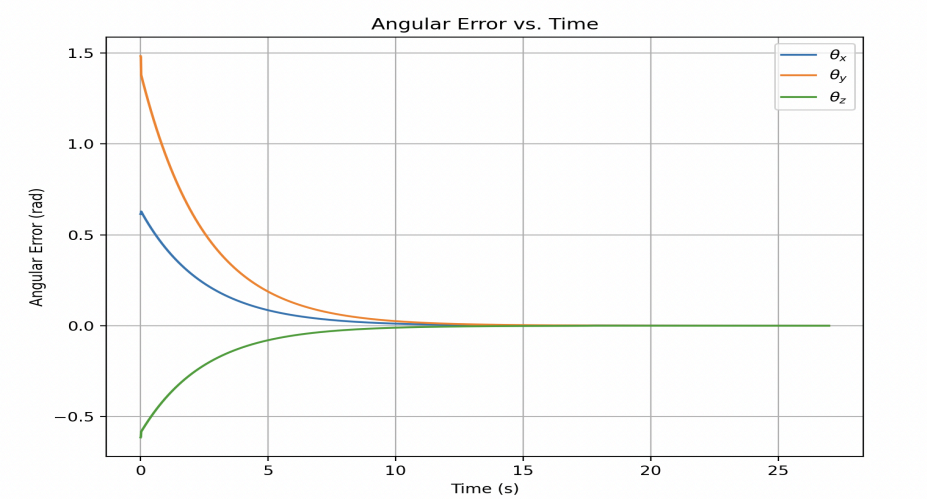
The goal of the project was to control a 5R mobile robot on Coppelia Sims. The task was for the robot to navigate, grab a cube and place it in a specific final configuration and location. The 59 robot was navigating on mecanum wheels. Feedback control was used to further refine the behavior of the robot and allow for precise movement.

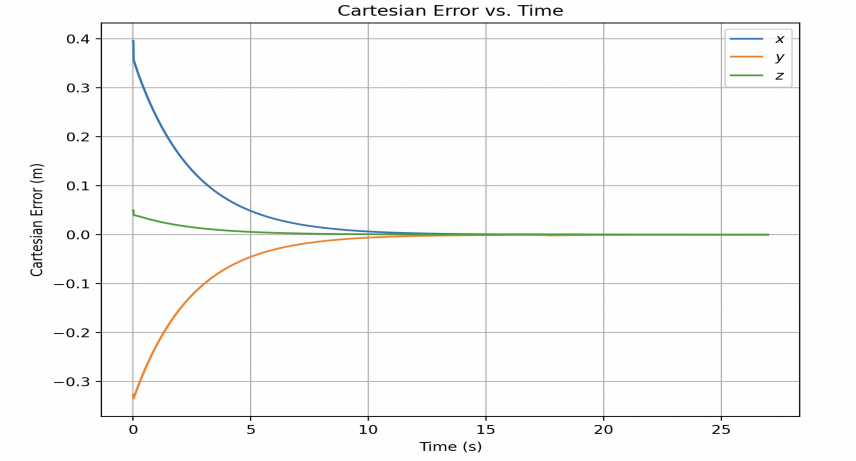
The code starts on one of three pages best.py, overshoot.py, and newTask.py, each with its own respective task. The best provides the best behavior of the robot for the task. Overshoot causes some delay in time and increase in motion in the join angles and robot itself. And new task strays from the original configuration points.

Each page starts with the initial configurations of the end-effector and the cubes, as well as the Kp and Ki values for feedback control. The use can adjust the Kp and Ki values for precise control or the initial configurations to vary uses.

The backend of the code is split into 4 parts. Milestone1.py moves the robot as a whole with the NextState function. Milestone2.py produces values to find the trajectory. Milestone3.py provides the feedback control values needed to adjust. And graph.py integrates all three and produces the graphs and datasets needed for animation.

Best



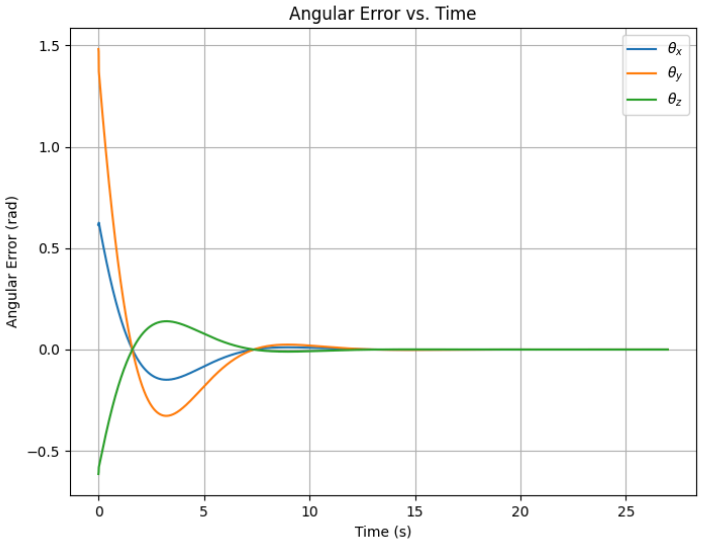


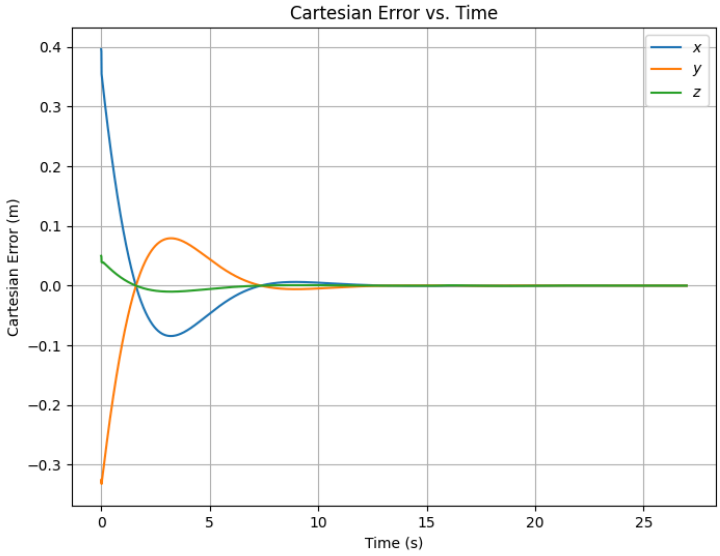
Conditions:

Cube Configuration: [1(m), 0, 0] to [0, -1(m), -pi/2(rad)]
Kp = 0.4 Ki =0
Max Wheel and Joint Velocity = 10

The results display show no osicalliation, showing this is an ideal behavior due t feedback control.

Overshoot





Conditions:

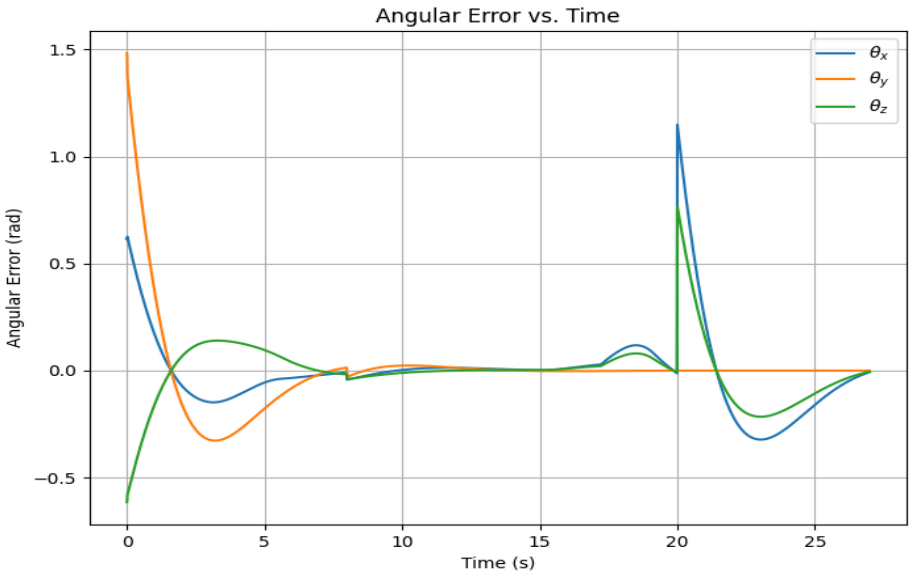
Cube Configuration: [1(m), 0, 0] to [0, -1(m), -pi/2(rad)]

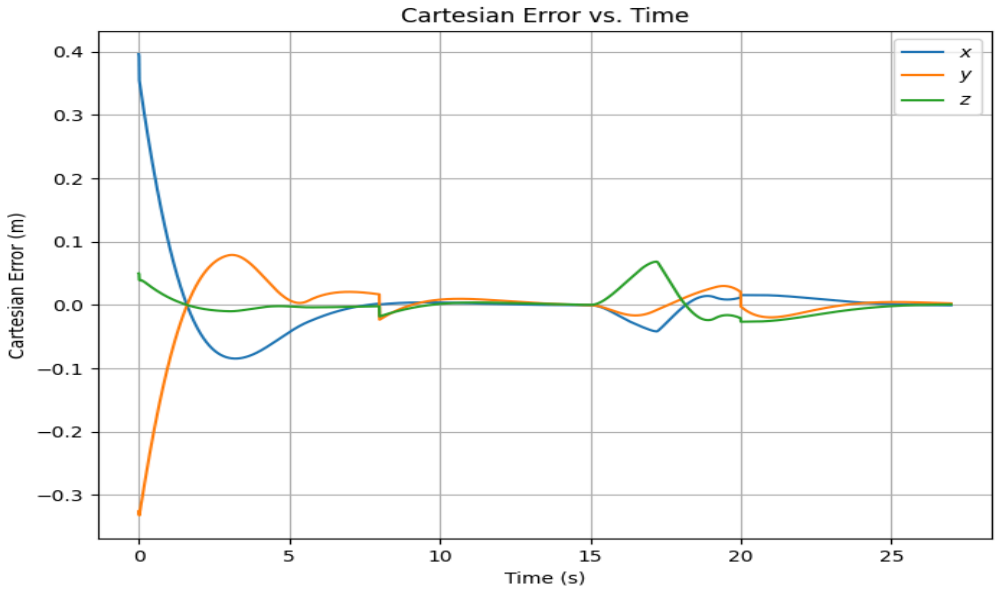
Kp = 0.9 Ki 0.4

Max Wheel and Joint Velocity = 10

The results show an osciallition however this doesn't affect the completion of the task.

New Task





Conditions:

Cube Configuration: [1.5(m), -0.(m)5,] to [0.2, -1.2(m), .025(rad)]

Kp = 0.9 Ki 0.4

Max Wheel and Joint Velocity = 10

The results show an several oscillations and shows that the there is convergence but the robot doesn't come at rest till near the end.