B38RO - Robotics Group Project

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Contents

1 Introduction

Explain what we are doing with simulating a robotic manipulator, why a robotic manipulator, what we doing with it (a game), and we chose the manipulator.

This document references a book (Craig, 2014) (use in next section actually).

2 Theory

Describe stuff about euler angeles (were calculated using (Bernardes and Viollet, 2022)), FK and IK, and DH params of our robot.

3 Developing software

3.1 Framework

mainly talk bout ROS and our joint-angle protocol, as well as our unconventional use of quaternions to store euler angles. also describe and cite our pykin/ikpy library.

this also talks about most of the project requirements, on how we compute those and whatnot.

3.2 Simulation

talk about how we setup coppeliasim for the simulation, including the arm, its gripper, and the scene.

also a paragraph on how we setup the controller.

3.3 Game logic

we describe our TTT AI, our computer vision, and the FSM logic used for playing the game, as well as the pick and place theory.

3.4 Testing on hardware

we describe the challenges and considerations we had to take while operating our code on hardware.

4 Conclusion

simple stuff + where we our work can be used IRL.

5 References

References

Bernardes, Evandro and Stéphane Viollet (Nov. 10, 2022). "Quaternion to Euler Angles Conversion: A Direct, General and Computationally Efficient Method". In: *PLOS ONE* 17.11, e0276302. ISSN: 1932-6203. DOI: 10.1371/journal.pone.0276302. pmid: 36355707. URL: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9648712/ (visited on 03/31/2024).

Craig, John J. (2014). *Introduction to Robotics: Mechanics and Control*. 3. ed., new internat. ed. Harlow: Pearson Education. 373 pp. ISBN: 978-1-292-04004-2.