

# B38RO - Robotics Group Project

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# 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 angles (were calculated using (Bernardes and Viollet, 2022)), FK and IK, and DH params of our robot.

# 3 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. cite pykin like (Jin, 2024)

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.

## 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.
- Jin, DaeJong (Apr. 14, 2024). *Pykin*. URL: <https://github.com/jdj2261/pykin> (visited on 04/14/2024).