Screwdriver-Fastening Application

1 Application Selection for the Robotic Manipulator Project

In our project, we selected the application of a screwdriver-fastening robotic manipulator. This application was chosen primarily due to its relative simplicity, which allows us to focus on achieving reliable performance within the simulation environment. A simpler task reduces the complexity of control and motion planning, increasing the likelihood of successful implementation. Additionally, this application aligns well with our project goals, as it allows us to test both kinematic and dynamic aspects of robotic manipulation in a controlled setting.

Another key factor in choosing this application was the availability of suitable robotic models. We identified potential manipulator models with 4–7 degrees of freedom (DOF), which match the requirements for the intended tasks. These models offer enough flexibility to perform precise movements required for fastening operations while maintaining manageable control complexity. Using such models ensures that our simulated manipulator can accurately mimic real-world behaviors, providing valuable insights before any physical implementation.

2 Relevance of Selected Research Paper

The research paper *"Robotic Fastening with a Manual Screwdriver"* by Ling Tang and Yan-Bin Jia is particularly relevant to our project for several reasons. Firstly, it proposes an application concept that closely resembles our intended project—a robotic manipulator performing screwdriver fastening operations. By studying this work, we can gain insights into practical approaches for motion planning, control strategies, and task execution in a fastening context.

Secondly, the paper utilizes the MuJoCo simulator, which is the same simulation platform we plan to use. This alignment is advantageous as it allows us to directly reference and adapt simulation techniques and parameter settings from their work. Finally, the paper employs a robotic model with 7 DOF, matching our project requirements for degrees of freedom. This ensures that the strategies and methodologies described in the paper

are directly applicable to our selected manipulator model, making it a valuable reference for guiding our project development.

References

[1] Tang, L., & Jia, Y.-B. (2023). *Robotic fastening with a manual screwdriver*. In *2023 IEEE International Conference on Robotics and Automation (ICRA)* (pp. 5269–5275). IEEE.