**Impedance Control and Compliance Control with UR5 Robot Study Report**

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1. **Abstract**

The purpose of this project is to implement an algorithm for manipulating flexible objects using impedance control techniques. (to be updated)

1. **Introduction**

The purpose of the proposed project is to implement an algorithm for manipulating flexible objects using impedance control techniques. To achieve this purpose, simulations will be mainly done under MoJoCo environment. Therefore, the implementation of the project requires knowledge of impedance control and skills in python programming.

In this the first few weeks, we firstly learned the basic python programming and impedance control concepts by establishing some simple model related, as shown in the sub-section 1 of section III Models. Then, we adapted several techniques of impedance control on a developed MATLAB model and tried to improve the

1. **Models**
2. **Pendulum and simple spring oscillator simulations in Python**

Based on the ideal double pendulum simulator, we added effect of damping on joint and elasticity of the rod. The main purpose of this practice is to be more familiar with Python.

1. **Impedance Control for a 2-Link Robot Arm**

The model is based on one of the projects from the open resources in MathWorks. The original project is a user interactive 2-link robot arm that applied impedance control and returns demand joint torque values. On top of the original source code, we implemented few additional features. First, we separated the physics portion from the controller dynamics by assigning them different frequency as that is more relatable to the real-world implementation. Also, we realize the position-based control system on top of the existing control method, dynamic-based control. Lastly, we observed the difference between the two control methods by comparing how the end-effector would follow the trajectory as well as the robustness and the accuracy of the systems.

1. **Summary**
2. **Appendix**
3. **References**

<https://github.com/mws262/MATLABImpedanceControlExample>

Accuracy/Robustness Dilemma in Impedance Control Tomer Valency @DOI: 10.1115/1.1590685#

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