Basic Python and Impedance Control Study Report

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1. **Introduction**

In this project, it requires knowledge of impedance control and skills in python programming. Therefore, to better understand and develop the project, we have learned the basic python programming and impedance control concepts by establishing some simple model related in the first several weeks, under the help of the supervisor PhD. Israel.

1. **Models**
2. **Double pendulum in Python**
3. **Simple pendulum and Simple spring system vibration analysis in Python**
4. **Impedance Control for a 2-Link Robot Arm**

The basic 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 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#

Impedance and Interaction Control Ch19, Neville Hogan, Stephen P. Buerger

Research on Position-based impedance control in Cartesian space of Robot manipulators, Lv Bohan, Zhao Xinying, Zhong Yue, Zeng Guangshang.