Lab report 4:

System identification and Interaction Control

System identification

To identify the stiction torque, the motor current was being increased in small steps until a movement is being detected (Δx > sensor noise, 0.616°). This stiction motor current was being recorded 5 times for each spinning direction of the motor and the mean stiction torque was being calculated. The damping relative to the paddle axis was calculated by using the motor characteristics from the datasheet.

**Equation:**

|  |  |
| --- | --- |
| Current needed to start moving cw(paddle) [A] | Current needed to start move ccw(paddle) [A] |
| -0.017133 | 0.008577 |
| -0.017133 | 0.012862 |
| -0.017133 | 0.012862 |
| -0.017133 | 0.017147 |
| -0.021418 | 0.017147 |
| Mean: -0.017990 | **Mean: 0.013719** |

|  |  |
| --- | --- |
| Motor torque needed to start moving  cw(paddle) [Nm] | Motor torque needed to start moving  ccw(paddle) [Nm] |
| -0.016071 | 0.008045 |
| -0.016071 | 0.012065 |
| -0.016071 | 0.012065 |
| -0.016071 | 0.016083 |
| -0.020090 | 0.016083 |
| Mean: -0.016875 | **Mean: 0.012868** |

**Motor damping coefficient:**

**Damping coefficient relative to the paddle axis:**

**Stiction:**

**Coulomb friction:**

**Viscous friction:**

Interaction Control

The VI developed in lab session 4a was completed by implementing two virtual walls (Φd ± 15°). Additionally boolean controls for the low-pass filter of the position, velocity and the virtual walls itself were implemented.