EE406 Experiment 5 - Supplementary

This document covers the calculation of cart masses.

Cart 1 Mass:

Previously it was calculated as follows:

$$M_{c1} = M_{IP02\_cart} + M_{IP02\_extra\_weight}$$

$$M_{c1} = 0.57 + 0.37 = 0.94\ kg$$

But, we also have to <u>account for the rotor inertia</u>. In other words, while deriving the equation of motions (EOMs) you were asked to ignore effect of rotor inertia; it is because we will add this effect while calculating mass of the 1st cart. So, cart 1 mass turns out to be;

$$M_{c1} = M_{c1} + \frac{\eta_g * K_g^2 * J_m}{r_{mp}^2}$$

$$M_{c1} = 0.94 + \frac{1 * 3.71^2 * 3.9 * 10^{-7}}{(6.35 * 10^{-3})^2}$$

$$M_{c1} = 0.94 + 0.1331 = 1.0731\ kg$$

Still we have to add half of the <u>spring assembly mass, which includes the mass of spring, 2 connection pieces and 8 screws</u>. Hence;

$$M_{c1} = M_{c1} + \frac{M_s}{2} = 1.0731 + \frac{0.145}{2}$$

$$\boldsymbol{M_{c1} = 1.1456\ kg}$$

Cart 2 Mass:

The passive cart used in this experiment has <u>2 extra masses</u> on it. We also have to add half of the spring assembly mass.

$$M_{c2} = M_{SLFJ\_cart} + 2 * M_{SLFJ\_extra\_weight\_with\_mounting\_screws} + \frac{M_s}{2}$$

$$M_{c2} = 0.220 + 2 * 0.125 + \frac{0.145}{2}$$

$$\boldsymbol{M_{c2} = 0.5425\ kg}$$