

Model Documentation of the: Heisenberg Flywheel

1 Nomenclature

1.1 Nomenclature for Model Equations

x ,	Position of the mass
θ	angle
I	moment of inertia of the flywheel
m	mass
τ	torque
v	velocity of mass along the rod

2 Model Equations

State Vector and Input Vector:

$$\underline{x} = (x_1 \ x_2 \ x_3)^T = (x \ y \ \theta)^T$$
$$\underline{u} = (u_1 \ u_2)^T = (v \ \tau)^T$$

System Equations:

$$\dot{x}_1 = u_2 \tag{1a}$$

$$\dot{x}_2 = u_1 \tag{1b}$$

$$\dot{x}_3 = \alpha x_2 u_2 - \alpha x_1 u_1 \tag{1c}$$

with $\alpha = -\frac{I}{m}$

Parameters: m

Outputs:

2.1 Assumptions

1. Mass m is a pointmass
2. rod, which connecting m to the flywheel is massless
3. joint, which connects the flywheel to the table is frictionless and doesn't exert torque on the system

References

- [1] Bagagiolo, F.; Zopello, M.: *Hysteresis and Controllability of affine driftless systems: some case studies*, p. 10, mmnp-journal 2020