UNIVERSITÀ
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Department of
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Master Thesis

2nd Update

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Angular Kinetic Energy

- Kinetic energy with the “Industrial Robotics” method (considering lumped mass $\rightarrow I_{xx} = \frac{1}{4}ml^2$):

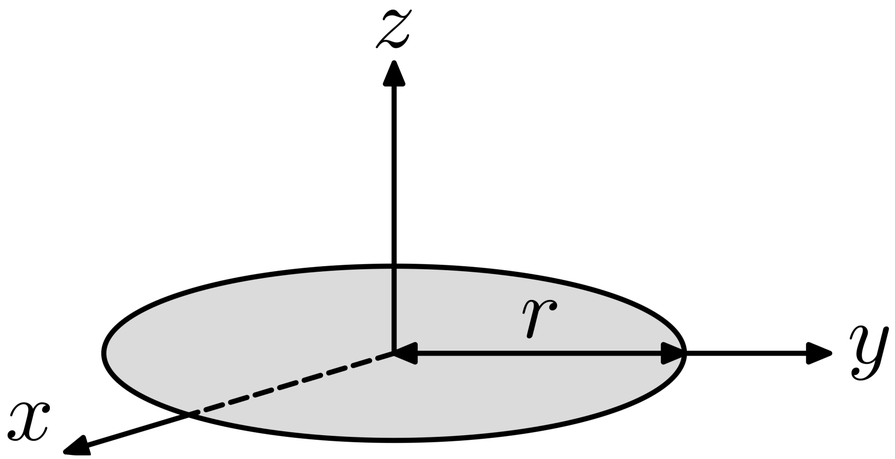
$$T = \frac{1}{2}Tr\left(WJW^T\right)$$

- Same result with “classic method”:

$$T = \frac{1}{2}mv^2$$

Satellite Configuration

- Here, the contact point's distance from the centre is constant (r)
- Should the content point angle be constant or a variable of time? If so, the DoF go from:
  $\psi = \{x(t), y(t), \Omega(t)\} \rightarrow \psi = \{x(t), y(t), \Omega(t), \theta(t)\}$
  and the Jacobian becomes larger



Approximated 2D satellite

Singular Matrix

$$G = M + J^T (J_s^+)^T M_s J_s^+ J$$

$$H = M\dot{p}_i + J^T (J_s^+)^T M_s \dot{\psi}_i$$

$$\dot{p}_f = G^{-1} H$$

$$\dot{\psi}_f = J_s^+ J \dot{p}_f$$

- G is not invertible: $Det(G) = 0$

Thesis' Chapters

1. Introduction
2. State-of-art of space manipulators
3. Kinematics
4. Dynamics
    1. Newton-Euler approach
    2. Lagrangian approach
5. Mechanical vibration theory
    1. Finite number of DoF
    2. Infinite number of DoF (modal functions)
6. Impact analysis
    1. Rigid bodies and plastic impact
    2. Non-rigid bodies and plastic impact
    3. Non-rigid bodies and elastic impact
7. Kinetic properties' retrieval
8. Conclusion