

NONLINEAR CONTROL THEORY

Homework 5 → for Tuesday 28 April 2020, 23:59

the Robot hopping on a small planet with a weak gravity

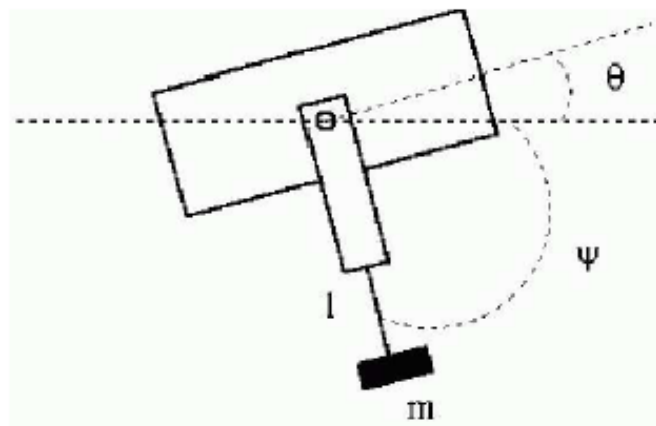


Figure 2.3: Jumping robot

as $(x_1, \dots, x_6) = (l, \dot{l}, \theta, \dot{\theta}, \psi, \dot{\psi})$, the resulting state equations are

$$\dot{x} = \begin{pmatrix} x_2 \\ x_1 x_6^2 \\ x_4 \\ 0 \\ x_6 \\ -2 \frac{x_2 x_6}{x_1} \end{pmatrix} + \begin{pmatrix} 0 & 0 \\ 0 & 1/m \\ 0 & 0 \\ 1/J & 0 \\ 0 & 0 \\ -\frac{1}{m x_1^2} & 0 \end{pmatrix} \begin{pmatrix} u_1 \\ u_2 \end{pmatrix} \quad (2.19)$$

J and m are constant parameters, and the gravity is neglected.

- Compute the H_2 , and check whether it is fully integrable : pick a basis with as many exact forms as possible.

<https://www.youtube.com/watch?v=M0ZXmGRCuts>