

# Experiment

## Experiment 3: Extended Kalman Filter (每1秒分析一次，使用擴展卡爾曼濾波器)

評論：

接下來我想到可能比較具挑戰性的部份是：為了要做 EKF，還需要推導此雙擺的 tangent linear model (TLM) ，我猜測你應該可以成功完成，但在 energy constraint 的部份或許會有一點困難，我建議若對應於 energy constraint 步驟的 TLM 不好推導，可以先在 TLM 中省略這部份，這造成的微小的誤差或許不會影響 TLM 的可用性。

11月11日下午 6:22

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# Sympy

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### About

Sympy is a Python library for symbolic mathematics. It aims to become a full-featured computer algebra system (CAS) while keeping the code as simple as possible in order to be comprehensible and easily extensible. SymPy is written entirely in Python.

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$$\theta_{1i} = \theta_{1_{i-1}} + \dot{\theta}_{1i} \Delta t$$

$$\theta_{2i} = \theta_{2_{i-1}} + \dot{\theta}_{2i} \Delta t$$

$$\dot{\theta}_{1i} = \dot{\theta}_{1_{i-1}} + \frac{m_2 g \sin \theta_{2i} \cos(\theta_{1i} - \theta_{2i}) - m_2 \sin(\theta_{1i} - \theta_{2i})(l_1 z_1^2 \cos(\theta_{1i} - \theta_{2i}) + l_2 z_2^2) - (m_1 + m_2)g \sin \theta_{1i}}{l_1(m_1 + m_2 \sin^2(\theta_{1i} - \theta_{2i}))} \Delta t$$

$$\dot{\theta}_{2i} = \dot{\theta}_{2_{i-1}} + \frac{(m_1 + m_2)[l_1 z_1^2 \sin(\theta_{1i} - \theta_{2i}) - g \sin \theta_{2i} + g \sin \theta_{1i} \cos(\theta_{1i} - \theta_{2i})] + m_2 l_2 z_2^2 \sin(\theta_{1i} - \theta_{2i}) \cos(\theta_{1i} - \theta_{2i})}{l_2[m_1 + m_2 \sin^2(\theta_{1i} - \theta_{2i})]} \Delta t$$