Introduction

Double Pendulum's Equation of Motion

用於數值積分之雙擺動力方程：

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

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

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

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

模擬變數：

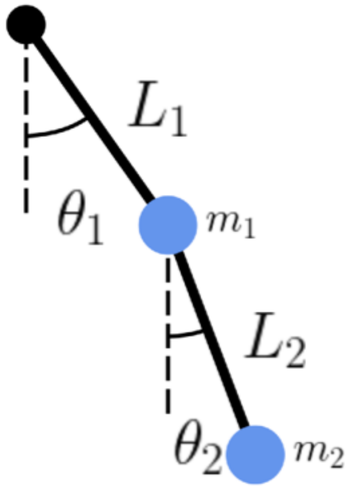
θ_1：擺角 1 的角度

θ_2：擺角 2 的角度

$\dot{\theta}_1$：擺角 1 的角速度

$\dot{\theta}_2$：擺角 2 的角速度

Illustration of a double pendulum



Introduction

> Dynamic Core of Double Pendulum in Python

```
class DoublePendulum:
    """
    Create a double pendulum object.
    """
    def __init__(self,
                 l1: float,
                 l2: float,
                 m1: float,
                 m2: float,
                 theta1: float = 0,
                 theta2: float = 0,
                 theta1dot: float = 0,
                 theta2dot: float = 0,
    ...
```