

Double Pendulum Dynamics

1 Single Pendulum

Our single pendulum model will consist of a point mass of mass m connected to a pivot by a massless rod of length l . The angle of the rod with respect to the vertical is defined as θ .

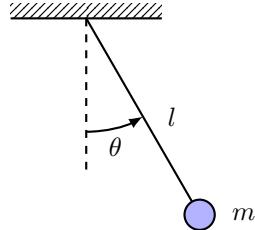


Figure 1: Single Pendulum

Figure 2 shows a free body diagram of the bob and rod. Using D'Alembert's principle, inertial forces are added inverse to acceleration due to rotation. Reaction forces at the pivot are also added

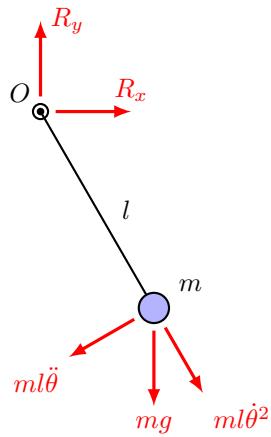


Figure 2: Free Body Diagram of Single Pendulum

Because reaction forces are unknown, the summation of moments about the pivot is calculated:

$$\sum F^* = 0 = -mgl \sin \theta - \ddot{\theta}ml^2$$

$$0 = \ddot{\theta} + \frac{g}{l} \sin \theta$$

2 System Description

The double pendulum consists of two masses m_1 and m_2 attached by rigid massless rods of lengths l_1 and l_2 .

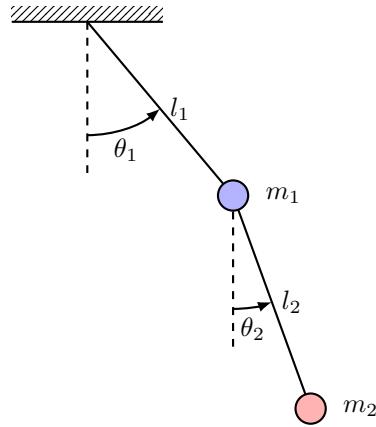


Figure 3: Double Pendulum Diagram showing lengths l_1, l_2 , masses m_1, m_2 , and angles θ_1, θ_2 .