# CART – POLE PROBLEM

**Aim:** To investigate the stability of the cart-pole system under different control strategies, involving an understanding of how variations in system parameters such as pole length or cart mass affect the stability of the pole in an upright position.

**Description:**

**Cart-Pole Problem**

The cart-pole problem is a fundamental challenge in reinforcement learning, focusing on developing algorithms to balance an inverted pendulum (pole) atop a moving cart. This setup comprises a pole attached to a cart via an unactuated joint, allowing the cart to move along a frictionless track. The main task is to maintain the pole's upright position by applying precise horizontal forces to the cart. Due to its inherent nonlinearity and instability, minor adjustments to the cart's movements can cause the pole to tip over, posing a complex problem in control theory and reinforcement learning.

**The goal of Cart-Pole Problem**

The primary objective of the cart-pole problem is to devise effective control strategies that enable the cart to keep the pole balanced. This entails maneuvering the cart to prevent the pole from exceeding certain angle thresholds, thereby avoiding instability. Reinforcement learning techniques are commonly applied to train agents capable of learning optimal control policies, maximizing the duration the pole remains balanced. Ultimately, the aim is to develop algorithms proficient in maintaining stability within dynamic and nonlinear systems akin to the cart-pole setup.

**Result:**

Successfully implemented the cart-pole problem, demonstrating effective control strategies for balancing the pole atop the moving cart.