SYMBIOSIS INSTITUTE OF TECHNOLOGY, PUNE

RCS KDR Mini Project– Batch 2022-26

Title of the project - Inverted Pendulum cart using PID Controller

INTRODUCTION

The inverted pendulum serves as a quintessential problem in control theory due to its inherent instability; the pendulum naturally tends to fall over, requiring continuous adjustment of the cart's position to counteract this instability. This setup provides a practical framework for exploring various control strategies, such as proportional-integral-derivative (PID) control, optimal control, and even more advanced techniques like reinforcement learning. Mastering control of the inverted pendulum has applications ranging from robotics to aerospace engineering, making it a cornerstone in the study of dynamic systems.

OBJECTIVES & AIMS :

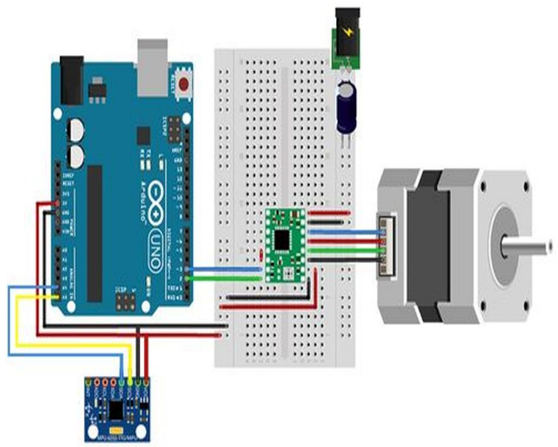
1. **Controller Design:** Developing and tuning PID controller parameters to achieve optimal stability and responsiveness.
2. **Performance Evaluation:** Assessing the system's ability to maintain the pendulum in an upright position and its response to external perturbations.
3. **Education and Research:** Providing a platform for learning fundamental concepts in control theory and conducting advanced research in dynamic systems and control algorithms.

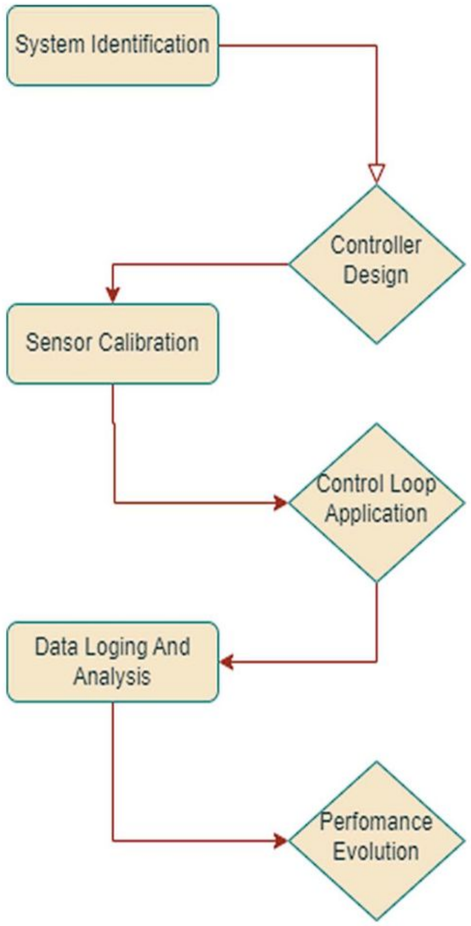
Aim:

Designing a control system for an inverted pendulum experiment to maintain the pendulum in an upright position, despite external disturbances, using a limited range of motion and without direct physical contact, to understand the principles of stability and control in dynamic systems.

METHODOLOGY

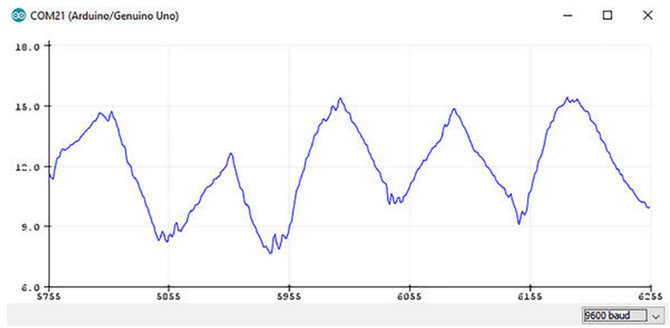
The Inverted Pendulum Self Balancing Cart experiment showcases the effectiveness of control systems in stabilizing unstable systems. Through the implementation of advanced control algorithms such as PID the cart was able to balance the pendulum and counter external disturbances. Overall, this experiment offers valuable insights into the field of control systems and its practical applications in real world scenarios.





RESULTS :

Using a PID controller, the inverted pendulum cart system demonstrates stable behavior, effectively maintaining the pendulum in an upright position despite disturbances, showcasing the efficacy of this control technique.



CONCLUSIONS :

The Inverted Pendulum Self Balancing Cart experiment showcases the effectiveness of control systems in stabilizing unstable systems. Through the implementation of advanced control algorithms such as PID the cart was able to balance the pendulum and counter external disturbances. Overall, this experiment offers valuable insights into the field of control systems and its practical applications in real world scenarios.

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