

Work Package/Deliverables (WPD): Simulation of Inverted Pendulum

Sections 1-7 need to be completed prior to commencing the WPD. Once the assignees and respective reviewers approve the completion of WPD, proceed with sections 8-11.

1 What is the requirement for this WPD:

Software to control a motor with reaction wheel to balance an inverted pendulum, simulated or real. End goal is balancing a stationary bicycle indefinitely.

2 What is required for this WPD:

A bicycle equipped with a reaction wheel with a motor and motor driver. The reaction wheel should be mounted perpendicular to the ground and the direction of the bike. Simulation and / or Pendulum prototype.

3 Why is it necessary to complete this WPD:

It is necessary to have a control algorithm to balance the bicycle.

4 How should the WPD be completed, What task is required:

1. Design a base PID
 - (a) Balance simulation for 10 seconds.
 - (b) Balance prototype for 10 seconds.
2. Explore possibilities for manual or auto tuning PID, or alternative control method.
3. Transfer control systems to bike.
4. Balance bicycle.

5 Are there any dependencies of this WPD on other WPDs:

The reaction wheel, motor and driver must be in place for the completion of this WPD. Initial work can be done using a simulation and/or pendulum prototype.

6 Are there any WPDs dependent on this WPD

The balancing system will be incomplete without it.

7 Start time:

2023-10-13

8 Finish time:

Expected: 2023-10-23 Completed:

9 Does this WPD require a User manual - dependent on other WPD (Yes or No):

Yes.

10 Does this WPD require a User manual - independent (Yes or No):

No.

11 Does this WPD require a Troubleshooting guide (Yes or No):

To be decided. Tuning a PID can be an involved process, but the systems are usually fairly simple to comprehend.