

- 1) First I tuned the parameters to angularly stabilize the bot. For this I first changed the value for the proportional term keeping the integral term zero but it led to constant error and hence I increased the integral coefficient to reduce the steady state error. And to allow for smooth operation to sudden disturbance I tuned the derivative term too. I played with the values a bit to find the best combination. Then I applied that pid for translational equilibrium and tuned it too .
- 2) We are using a negative feedback as when the angle starts increasing the negative feedback causes a force to be applied in that direction to maintain its equilibrium. In case of positive feedback it led to instability as the angle kept on increasing due to the responsive force acting in the wrong direction.
- 3) In real world there is an introduction of lot of noise in data collection by sensors and also the non ideal environment leads to forces like friction and wear and tear , air resistance and mechanical flexibilities lead to discrepancy. This leads to iterative working on the control algorithms to ensure proper balancing of the bot in real world environment. Safety mechanisms are also introduced in the bot.