# Control Algorithms

The control algorithms is discrete time software implementation. The control algorithm is implemented using Simulink models cross compiled onto the target microcontroller. The control algorithm used is a proportional integral derivative controller using one input signal. This input signal is the position setpoint minus the feedback signal from the cylinder. Figure 1 shows the Simulink model for a whole leg using an upper and lower cylinder PID.

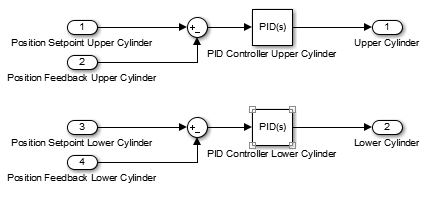


Figure 7: PID model for a single leg

# State Machine

It was determined that the behavior of the robot would be dictated utilizing a state machine. Using a state machine, based on the physical condition of the robot and the user input, the robot moves from different states and behaves occurring to how those states are defined within the state machine. Currently an initial state machine has been developed that has two states. The first state is a stand-by state in which the robot is determined to be functioning correctly and is awaiting user input. The second state is a stop state in which the robot, after some input which forces the robot into this state, completely stops ongoing motion in the robot and moves the robot into a stable position. Figure 8 shows a state machine flowchart in which various states are represented. States include forward and backward motion states in the robot, turning states and a stop state. The full state machine needs to be implemented in the next phase of the project for robot operation.



Figure 8: Flowchart representation of the state machine architecture.