Initial Configuration

1. The default initial cube position in world frame is:

$$T_{sc,initial} = \begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0.025 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

2. The default final cube position in world frame is:

$$T_{sc,goal} = \begin{bmatrix} 0 & 1 & 0 & 0 \\ -1 & 0 & 0 & -1 \\ 0 & 0 & 1 & 0.025 \\ 0 & 0 & 0 & 1 \end{bmatrix}.$$

The initial configuration of the robot is: [0.0, 0.2, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]

Results

The best results were obtained by tuning the proportional gain(Kp) to 3.0 and the integral gain(Ki) to 0.01.
As seen from the error plot there is a tiny error in the middle around the 12.5 second mark but converges after that. The video shows the robot following the reference trajectory and correcting itself due to the PI gains, picks up the block and places it at the final location.
The Xerror plot is shown below:

X error with time with Kp= 3.0 and Ki= 0.01