Homework AORC

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1

The strategy that leads to the smallest tracking error is the $tanh(2 * dq)$ method . The MSE value referred to various $KpKdKi$ are listed in Table below

The reason is the fact that the $tanh(2*dq)$ can combine the property of continuity and a good approximation of the step function that characterize the model of Coulomb friction. But that dependes on the range of frequency and velocity that we are working on: when velocitys are small and they remains near zero for "long" time we have an incorrect estimation of our Coulomb physical model and so the $tanh(2*dq)$ method generate and higher Tracking Error. In this situation the smallest Tracking error is generated by the sign function

2

The strategy that leads to the highest tracking error is the $tanh(0.01 * dq)$ method. The reason is probably that it approximate badly the fisical Coulomb model inducing error in the vicinity of $\dot{q} = 0$ at a more higher rate of the $tanh(2 * dq)$ method.

3

the main problem is that the sign is a discontinous function so in the proximity of zero it have a infinite derivative. close to this points an small error in the retrive the position/velocity can lead to instantaneous change in the torque value applied and generate oscillation and vibration.

4

First of all we have to consider the range of velocity that we are going to use. a robot that is going to use small torque and velocity can work better with a sign method even if it has a discontinuity ... Maybe