ME729 Advanced Robotics - Homework #9

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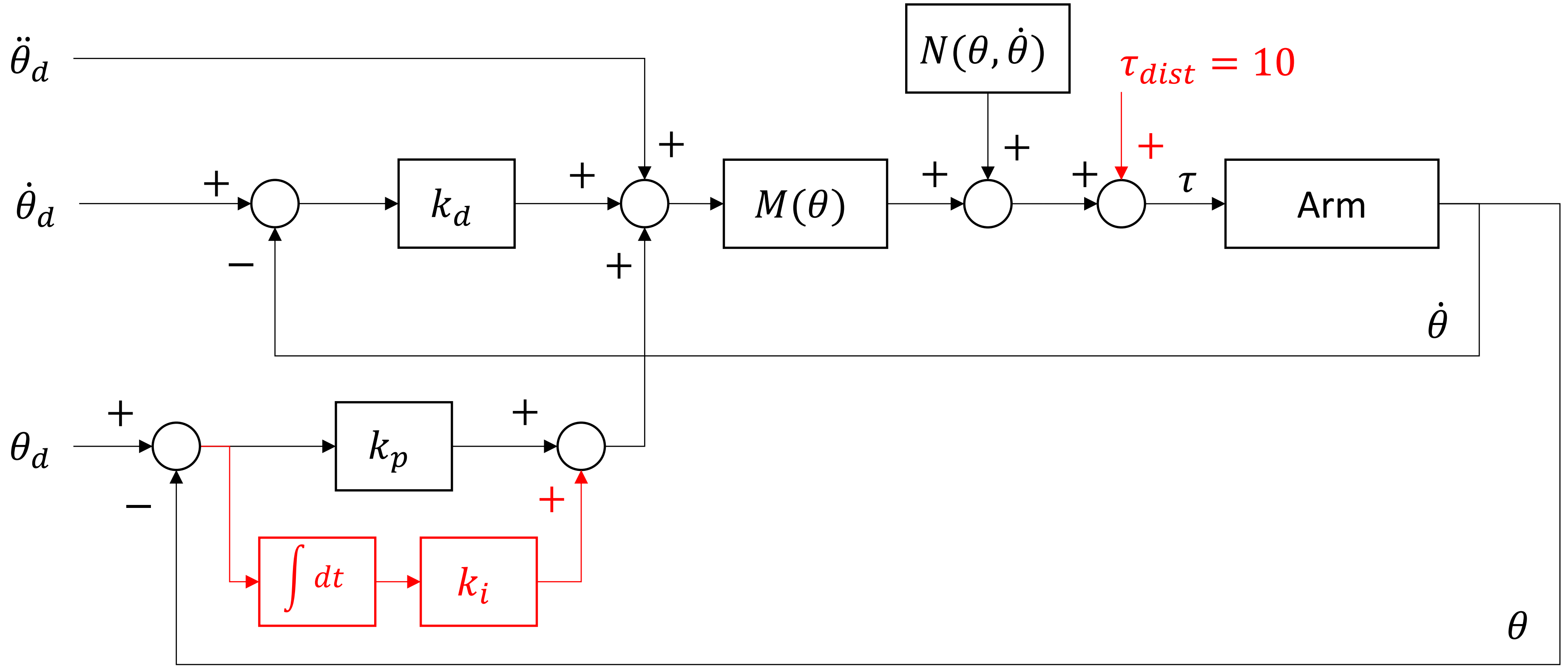
Email me *a pdf file* by next Monday 6 p.m.

1. Consider the two-link manipulator example given by the lecture. In our lecture, we dealt with the PD computed-torque controller. But there is torque disturbance, τ_{dist}. With reference to the lecture note and the Simulink blocks of the PD computed-torque controller, simulate the PID computed-torque controller. That is, **add the torque disturbance ($\tau_{dist} = 10$) and the integral controller. Then, find P, I, and D gain ($k_p, k_I,$ and k_d) to make a good response and eliminate steady-state error.** [5]



2. There is an inverted pendulum. Its equation of motion is

$$\tau = mL^2\ddot{\theta} - mgL\sin\theta \ \ or$$

$$\ddot{\theta} = \frac{1}{mL^2}(\tau + mgL\sin\theta)$$

The physical parameters are given as

$$m = 35\ kg, and\ L = 0.9m$$

Initial conditions are

$$\theta = 0\ and\ \dot{\theta} = 0.35\ rad/s$$

Control the system to keep it upright ($\theta_d = 0, \dot{\theta}_d = 0, and\ \ddot{\theta}_d = 0$)using the PID computed-torque controller, and tune the gains to make a good response. [5]