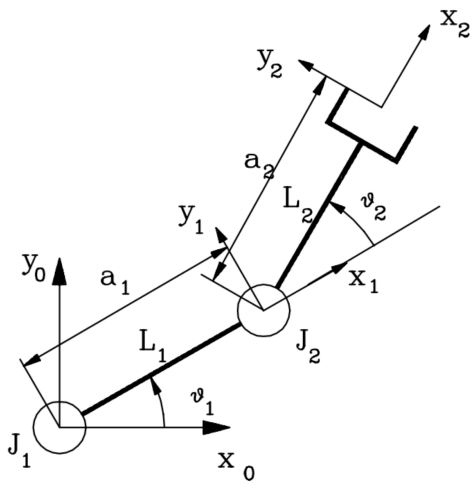
Problem 1

Consider the twolink robotic arm (not a planar):



Using the provided matlab code for a two-link arm manipulator.
Let $\mathbf{q} = [q_1, q_2]^\intercal$ where $q_1 = \theta_1$ and $q_2 = \theta_2$. The dynamic model of the system is given by

$$M(\mathbf{q}, \dot{\mathbf{q}})\ddot{\mathbf{q}} + C(\mathbf{q}, \dot{\mathbf{q}})\dot{\mathbf{q}} + N(\mathbf{q}) = \tau$$

Using the provided matlab code, which include the symbolic expressions for matrices $M(\cdot)$, $C(\cdot)$, $N(\cdot)$. Implement:

1. A PD+gravity compensation control for set point tracking.
2. An iterative learning control for set point tracking (assuming no knowledge about the robot dynamics).

You are expected to implement: ode functions for simulating the system dynamics under the closed loop control and demonstrate the performance of controllers. Please submit your published result (using matlab publish) along with matlab codes.
NOTE: The following codes in matlab are provided:

- TwoLinkArm.m: main file.
- ode2linkPD.m: An example of ode file to simulate the closed loop system (incomplete and need to be modified based on the control design methods.) Please use this to implement two ode functions: PD control and iterative learning with gravity compensation.