Initialization.m:

Initialization.m file contains the initialization parameters for the Simulink files. You should run this file before running the Simulink files. The initial values for the manipulator's joint variables $(q_0, \dot{q}_0)$ and the simulation parameters (simulation time and the time-step for the solver) can be set in this file.

Manipulator.slx:

The function of dynamic model of the manipulator is embedded in Manipulator Dynamic block. The input variables of this block are the vector of control torques $(tau: \tau \in R^3)$ and the vector of the external torques $(tau\_e: \tau_e \in R^3)$ which is due to the interaction of manipulator with the environment. The outputs of this block are the vector of joint coordinates $(q = [q_1 \quad q_2 \quad q_3]^T \in R^3)$ and the vector of joint velocities $(dq: \dot{q} = [\dot{q}_1 \quad \dot{q}_2 \quad \dot{q}_3]^T \in R^3)$. Note that tau, tau_e, and dq are the notations used in the Simulink file.

FWDKinematics.slx:

FWDKinematics.slx file contains a block for the manipulator forward kinematics. With this block you can convert the manipulator's joint space parameters to its end-effector task space parameters. The input of this block is the vector of joint coordinates $(q = [q_1 \quad q_2 \quad q_3]^T \in R^3)$ and its output is the vector of the end-effector position in task space $(X = [x \quad y \quad z]^T \in R^3)$.

INVKinematics.slx:

INVKinematics.slx file contains a block for the manipulator inverse kinematics. With this block you can find the joint space parameters from the robot end-effector parameters. The input of this block is the vector of the end-effector position in task space $(X = [x \quad y \quad z]^T \in R^3)$ and its output is the vector of joint coordinates $(q = [q_1 \quad q_2 \quad q_3]^T \in R^3)$.

Manipulator_PDControl.slx:

Manipulator_PDControl.slx is a sample for PD+gravity compensation controller defined in joint space. The desired trajectory is assumed to be $q_d = \left[\frac{\pi}{4} \; 0 \; 0\right]^T$. It is also assumed that the robot has not any contact with the environment $(\tau_e = [0 \; 0 \; 0]^T)$. The parameters for the PD controller are considered as $K_p = \begin{bmatrix} 20 & 0 & 0 \\ 0 & 10 & 0 \\ 0 & 0 & 10 \end{bmatrix}$ and $K_d = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ which can be changed in "Controller" block in the Simulink file.