RBE 502 Project Deliverables – April 15

1. Introduction

1.1 Background of Project

Control engineering is one subject which is perceived as being the most theoretical and most difficult to understand. In our project we focused on PID controller, adaptive controller, and impedance controller design.

The PID controller is the most common form of feedback. It was an essential element of early governors and it became the standard tool when process control emerged in the 1940s. In process control today, more than 95% of the control loops are of PID type, most loops are actually PI control.

An adaptive control system measures a certain performance index (IP) of the control system using the inputs, the states, the outputs and the known disturbances. From the comparison of the measured performance index and a set of given ones, the adaptation mechanism modifies the parameters of the adjustable controller and/or generates an auxiliary control in order to maintain the performance index of the control system close to the set of given ones.

3-DOF Arm Model

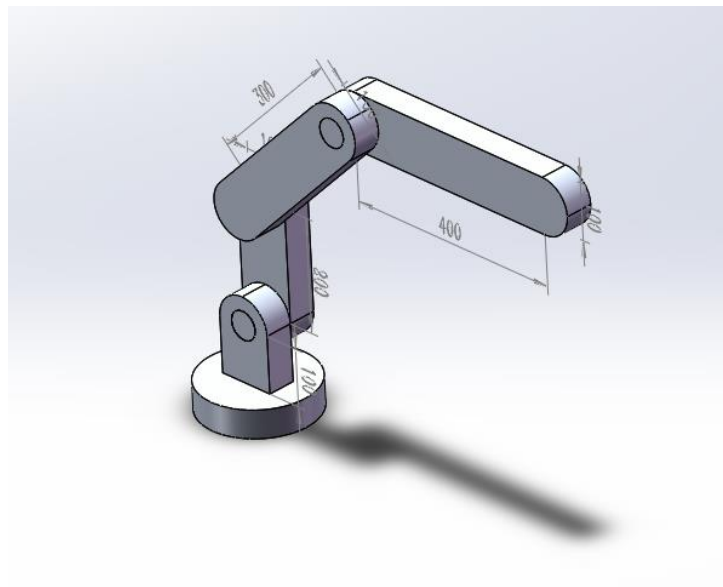We built a 3-DOF RRR robot arm in Solidworks. The initial configuration is shown as follows:

Figure 1 Initial configuration in Solidworks

Then we imported the xml file into SimMechanics in MATLAB, and obtained the original Simulink model as shown in Figure 2.
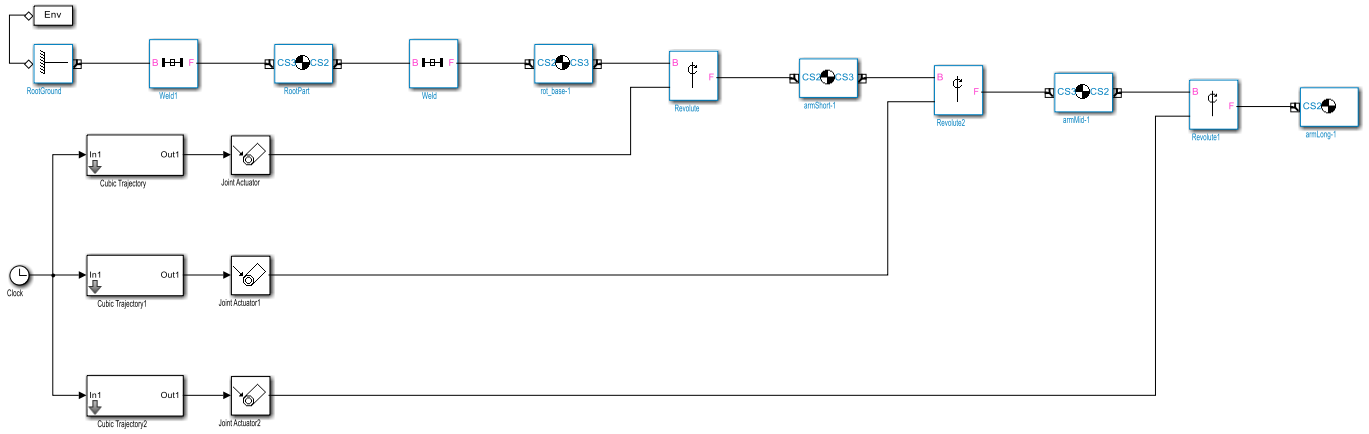
Figure 2. Original Simulink model

1. PID Controller Design

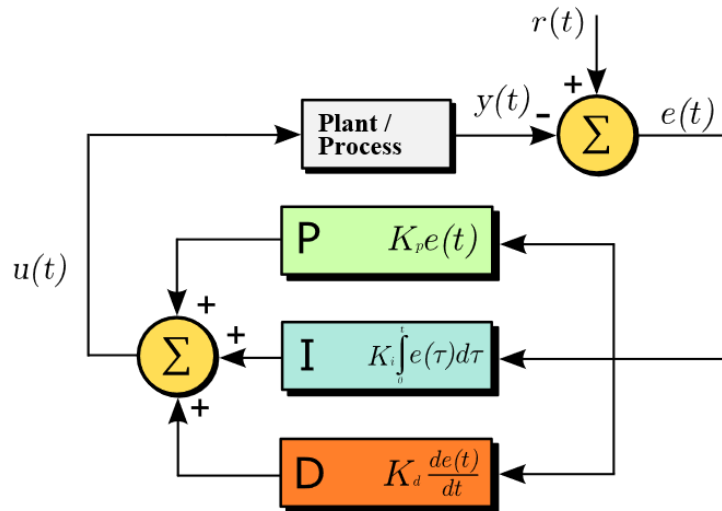A block diagram of a PID controller is as follows:

Figure 3. PID controller block diagram

Using the PID block in Simulink we can build the Simulink model with PID control of each joints. The model is shown as follows.
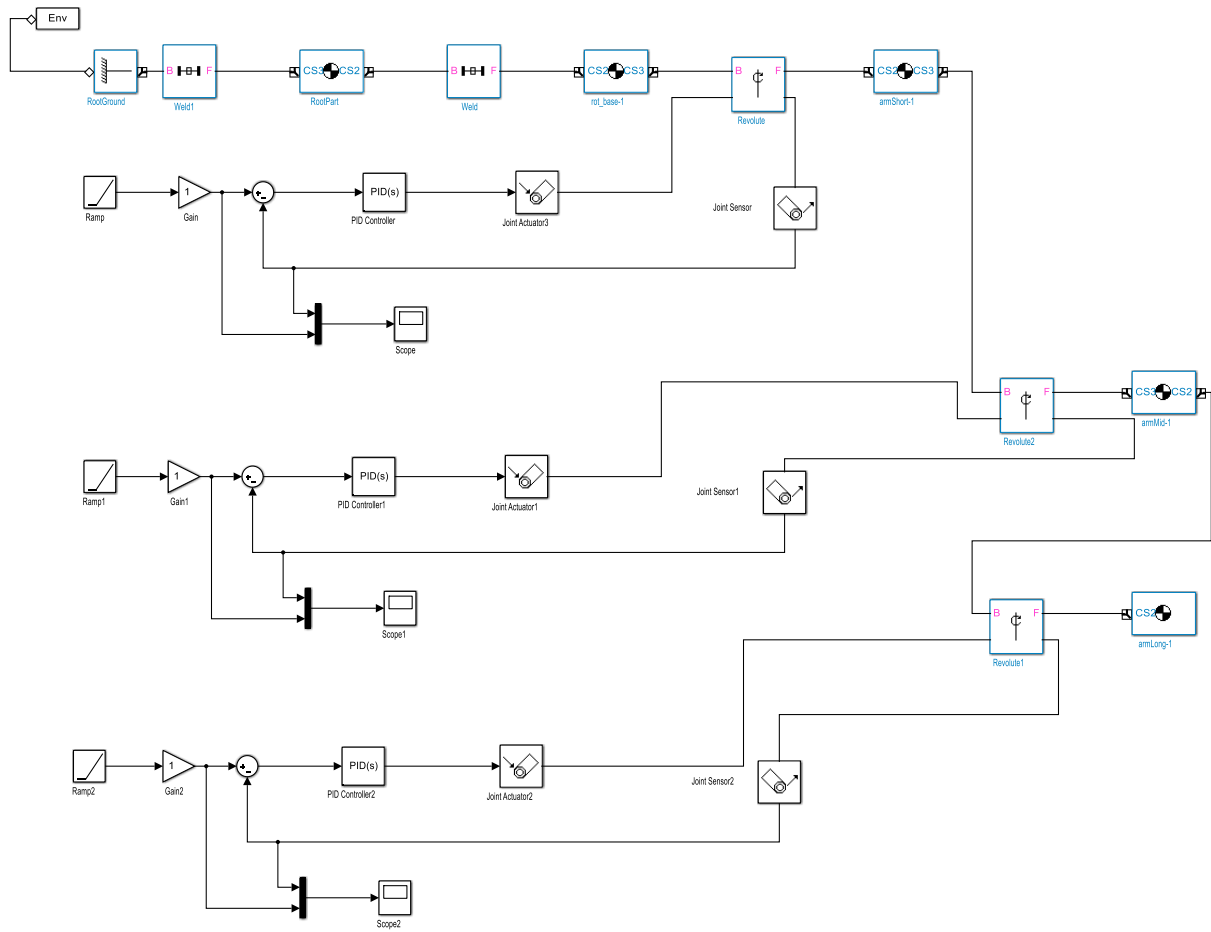
Figure 4. PID controller design in Simulink

1.1 PID control of Joint 1