



MTE 432

Selected Topics in Robotics

Spring 2024

**Assignment (1): Design and Modeling of 2 DOF
Robotic Arm**

Submitted by

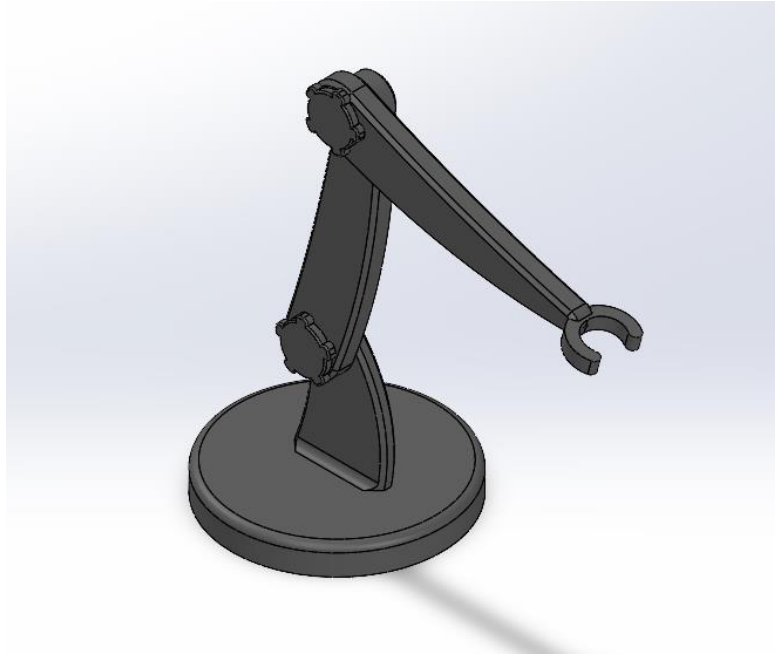
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To

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1. SolidWorks Model



2. Kinematic Model

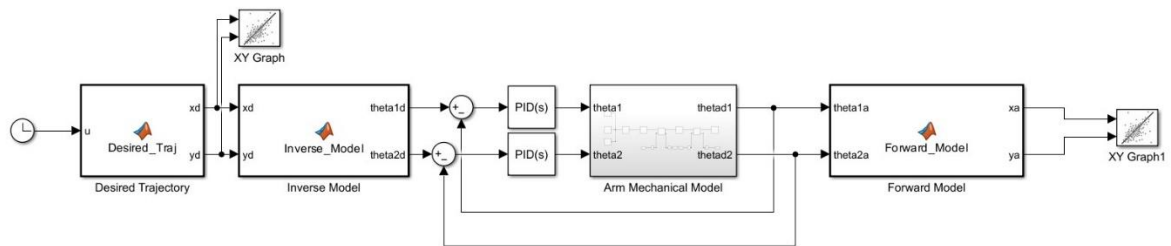
2.1. Inverse Model:

```
function [theta1d,theta2d] = Inverse_Model(xd,yd)
l1 = 1;
l2 = 1;
theta2d = acos((xd^2+yd^2-l1^2-l2^2)/(2*l1*l2));
theta1d = atan(yd/xd)-atan((l2*sin(theta2d))/(l1+l2*cos(theta2d)));
```

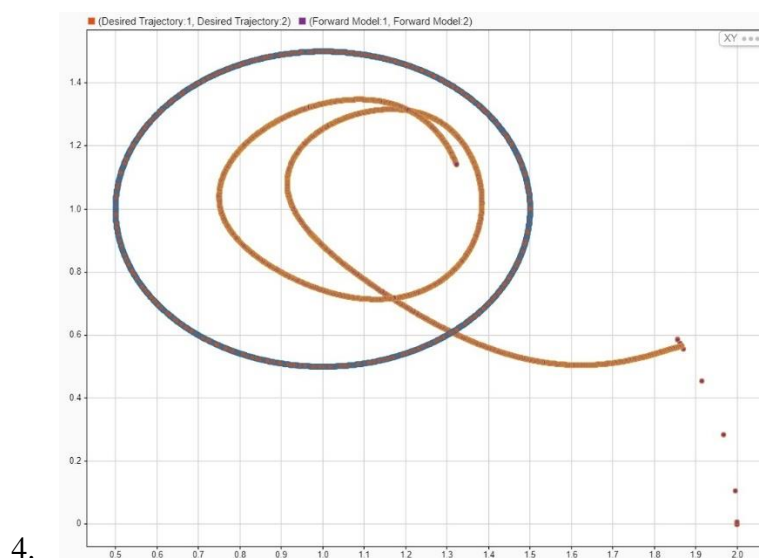
2.2. Forward Model

```
function [xa,ya] = Forward_Model(theta1a,theta2a)
l1 = 1;
l2 = 1;
xa = l1*cos(theta1a)+l2*cos(theta1a+theta2a);
ya = l1*sin(theta1a)+l2*sin(theta1a+theta2a);
```

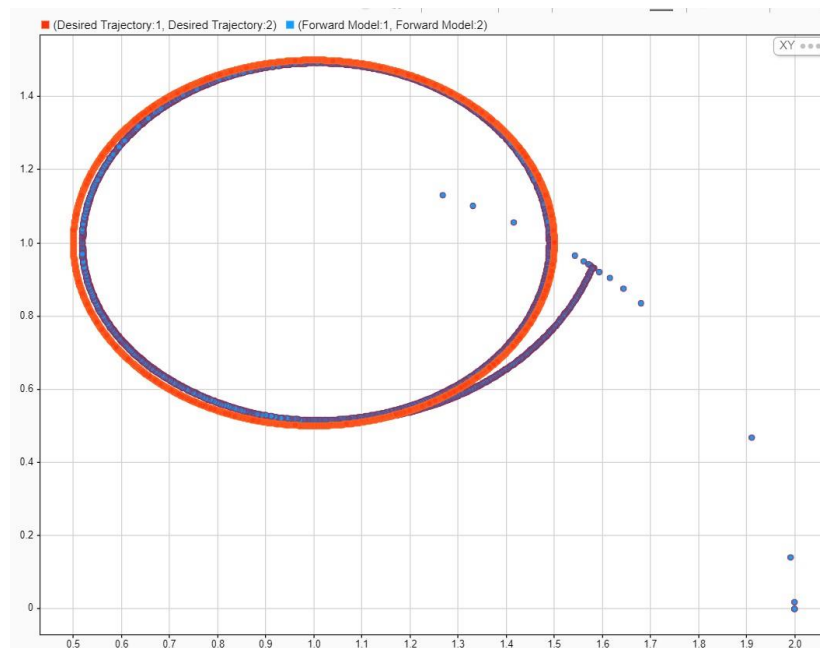
3. Simscape Multibody Implementation



3.1. Before Adding Controller



3.2. After Adding PID Controller: Tuning Manually



3.3. After Adding PID Controller: Tuning Using Auto-Tune

