# Foundations of Robotics – Project 3 Report

Chinmay Prashanth

cp3873

A picture containing text, sky, map, outdoor

Description automatically generated

The Manipulator parameters are,

Text

Description automatically generated

The frames are depicted into the figure and the DH parameters are,

Table

Description automatically generated

Part 1:-

Methodology:

Here, in this part we’ve used Matlab/Simulink algorithm to obtain accelaration of the given manipulator .

To find the accelaration we’ve considered the following,



Depending on te characteristics, we can represent the length travelled as,

Text, letter

Description automatically generated

Where,

Diagram, schematic

Description automatically generated

For computing path on operation space,

Diagram, schematic

Description automatically generated

Where Position of each point is,

Diagram, schematic

Description automatically generated

For J = 1,2…….,N.

**Result:**

1. 3D generated Trajectory:

Chart

Description automatically generated

1. Position:

Chart, box and whisker chart

Description automatically generated

1. Velocity:

Engineering drawing, line chart

Description automatically generated

1. Acceleration:

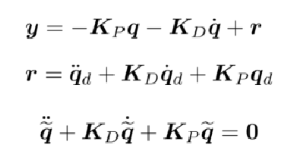
Chart, line chart

Description automatically generated

**Part 2:**

**Methodology:**

The Inverse Dynamic control approach is achieved by the idea to find a control vector, as system of state which can realize the input/output relationship of linear type. It is defined as follows,



The Dynamics of the manipulator is found by using Lagrangian of the mechanical system and it is defined as,



Here,  it contains the configuration dependent terms g, which represents the moment generated at the joint axis of the manipulator and is the 4X4 matrix in the current configuration. F denotes the matrix of viscous frictional forces in motor. g(q) is the potential energy in the manipulator.

Diagram

Description automatically generated

**Results:**

1. **Joint Position:**

**Chart, line chart

Description automatically generated**

1. **Joint Position Error:**

**Diagram, engineering drawing

Description automatically generated**

1. **Joint Velocity Error:**

**Diagram

Description automatically generated with low confidence**