# ROC

## RoboAnalyzer based Online Competition (ROC) as Virtual Summer Intern

## (May–July 2021)

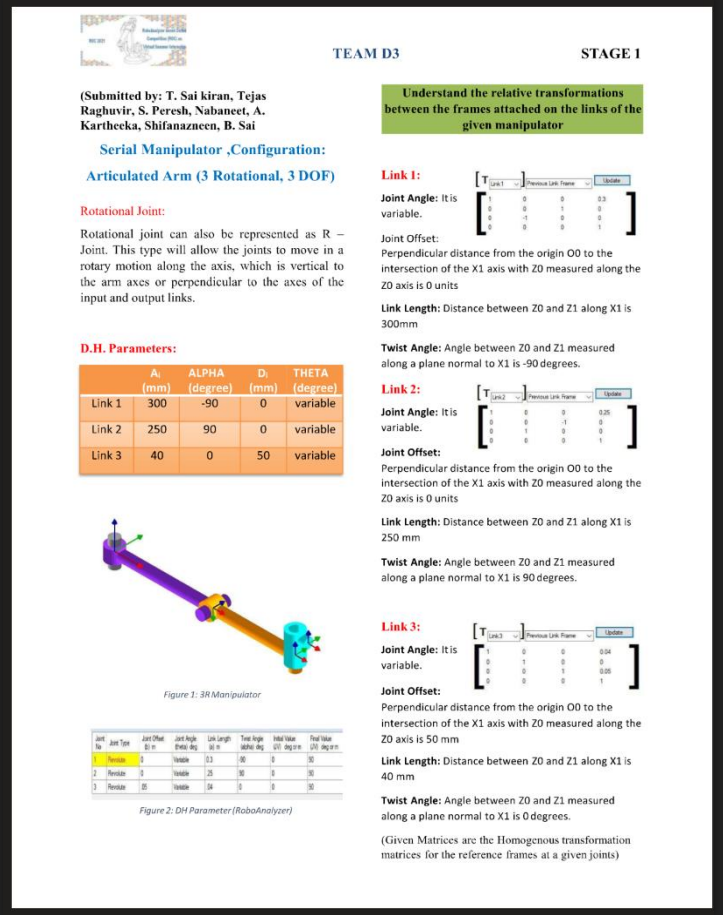
Organizing Team

- Dr. Nayan M Kakoty, Tezpur University, Assam
- Dr. Zahnupriya Kalita, Tezpur University, Assam
- Mr. Abhijit Boruah, Dibrugarh University, Assam
- Mr. Shiv Kumar Verma, Tezpur University, Assam
- Mr. Rajeevlochana C. G., Amrita Vishwa Vidyapeetham, Bengaluru Campus
- Prof. Subir K. Saha, IIT Delhi, New Delhi

Team – D3 | Mr. Tejas Raghuvir Lele

| Hope Foundation's Finolex Academy Of Management and Technology

# About Experience/..



TEAM D3 STAGE 1

(Submitted by: T. Sai kiran, Tejas Raghuvir, S. Peresh, Nabaneet, A. Kartheeka, Shifanazneen, B. Sai

**Serial Manipulator ,Configuration:**

**Articulated Arm (3 Rotational, 3 DOF)**

Rotational Joint:

Rotational joint can also be represented as R – Joint. This type will allow the joints to move in a rotary motion along the axis, which is vertical to the arm axes or perpendicular to the axes of the input and output links.

**D.H. Parameters:**

| | $A_i$ (mm) | ALPHA (degree) | $D_i$ (mm) | THETA (degree) |
|---|---|---|---|---|
| Link 1 | 300 | -90 | 0 | variable |
| Link 2 | 250 | 90 | 0 | variable |
| Link 3 | 40 | 0 | 50 | variable |

Figure 1: 3R Manipulator

Figure 2: DH Parameter (RoboAnalyzer)

**Understand the relative transformations between the frames attached on the links of the given manipulator**

**Link 1:**

**Joint Angle:** It is variable.

Joint Offset:
Perpendicular distance from the origin O0 to the intersection of the X1 axis with Z0 measured along the Z0 axis is 0 units

**Link Length:** Distance between Z0 and Z1 along X1 is 300mm

**Twist Angle:** Angle between Z0 and Z1 measured along a plane normal to X1 is -90 degrees.

**Link 2:**

**Joint Angle:** It is variable.

**Joint Offset:**
Perpendicular distance from the origin O0 to the intersection of the X1 axis with Z0 measured along the Z0 axis is 0 units

**Link Length:** Distance between Z0 and Z1 along X1 is 250 mm

**Twist Angle:** Angle between Z0 and Z1 measured along a plane normal to X1 is 90 degrees.

**Link 3:**

**Joint Angle:** It is variable.

**Joint Offset:**
Perpendicular distance from the origin O0 to the intersection of the X1 axis with Z0 measured along the Z0 axis is 50 mm

**Link Length:** Distance between Z0 and Z1 along X1 is 40 mm

**Twist Angle:** Angle between Z0 and Z1 measured along a plane normal to X1 is 0 degrees.

(Given Matrices are the Homogenous transformation matrices for the reference frames at a given joints)

## (Task 1) to (Task 4)

Hello, as per the ROC 2021 Virtual Summer Internship we learned a lot of things that we have not learned ever. Software's like Roboanalyser, Mechanalyser, MATLAB basics. with that some other skills like Analytical Calculations, or Problem Solving, Team Work, Self Driven, Time Management, Tasks Priority, Leadership, and much more. we faced a lot of challenges like required skills for MATLAB, Mathematical Problem Solving, Analysis of end effector in VRM, and some other. But we did it and finally we are going for submission.

So, we got great experience over this internship and I personally enjoyed it. Thanks Team ROC for this Opportunity.

# MATLAB Experience/..

MATLAB toolboxes have been useful to learn without the need of the physical system. Especially in robotics field, using simulations avoids the considerable cost of full robot manipulator.

In MATLAB, we learned and performed Mindset as per following Sub Chapters -

- Transformation Of Co-ordinate system
- MATLAB Program for Forward and Inverse Kinematics for 2R & 3R Planar Manipulator
- Dynamics
- Basic Study of Co-ordinate axis
- DH – Parameters
- Motion planning for 2R AND 3R Planar Manipulator

# Virtual Robot Module ( VRM )

Virtual Robot Module (VRM), which is one of the useful and most analytical feature of Roboanalyser software itself. VRM is used to manipulate robot arm in 3 dimensional system by 3d virtual designed robots in roboanalyser.

In VRM Module, we learned and performed Mindset as per following Sub Chapters –

- Joint and Cartesian Jogging In VRM
- Arm or End Effector Motion or Cartesian Motion
- Record and Playback Motion of Robot In VRM by Giving file.
- MATLAB Program for End Effector Motion and Import In VRM

# VRM Work Video Link for more information

D3_T3.mp4 - Google Drive

# Thanks to Team ROC and Developer Team

Thanks for this great opportunity. We will work hard with the new norm for learning

*-Self-driven*

*-Self-learning*

*-Self-evaluating*