

ROC - 2021



WE CERTIFY THAT THIS PROJECT WAS UNDERTAKEN BY US
FOR THE **ROBOANALYZER-BASED ONLINE COMPETITION** (ROC) AS
VIRTUAL SUMMER INTERNSHIP

CONDUCTED BY **DR. NAYAN M. KAKOTY** OF TEZPUR UNIVERSITY IN COLLABORATION WITH
PROF. S. K. SAHA OF IIT DELHI AND **MR. RAJEEVLOCHAN C. G.** OF
AMRITA VISHWA VIDYAPEETHAM, BENGALURU CAMPUS

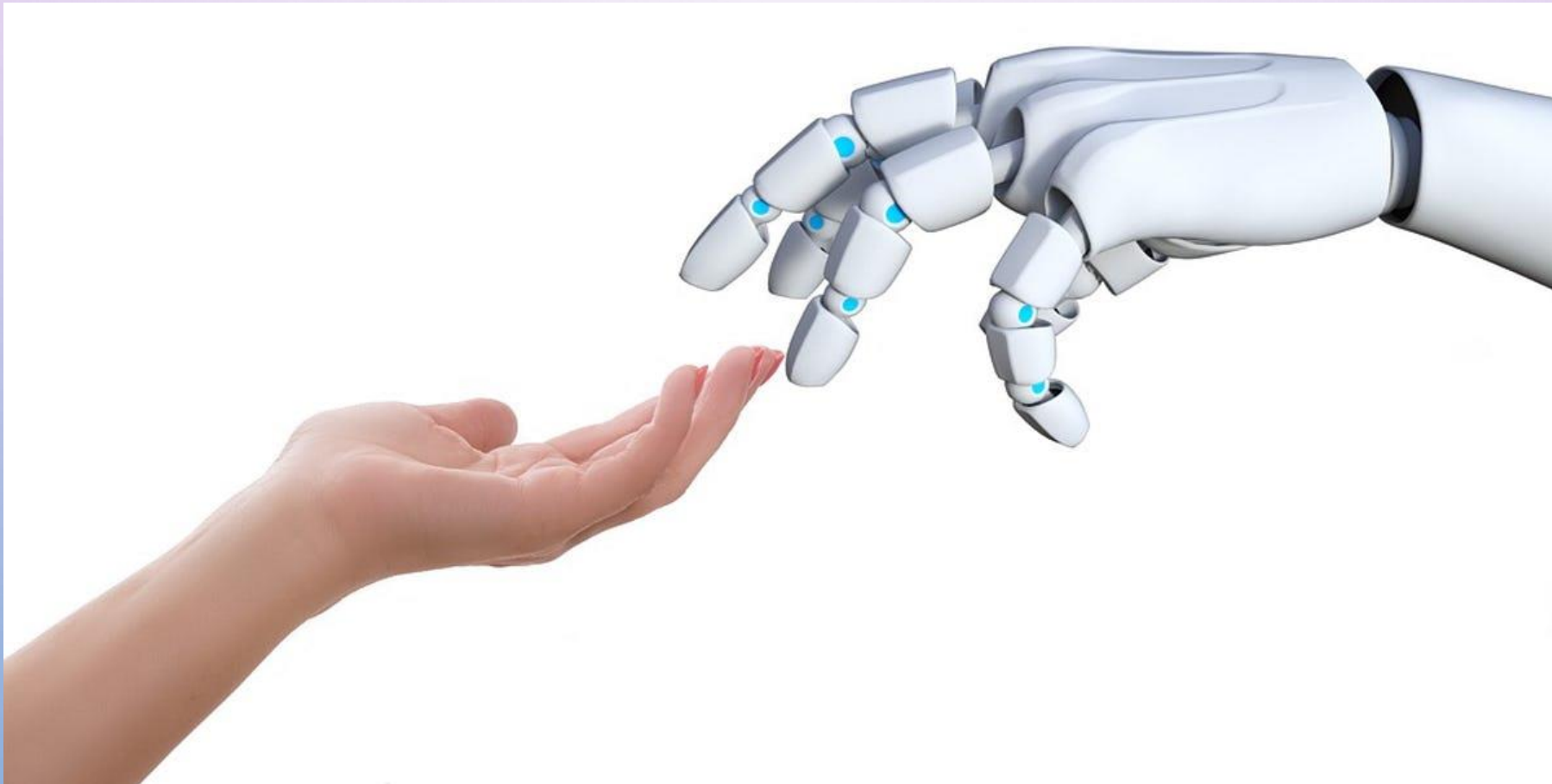
DURING ***1ST MAY, 2021 TO 27TH JUNE, 2021***

#TEAM NUMBER - D4

TEAM MEMBERS -

MONIK TALAGATLA

SIRICHANDANA BARPATI



PROCEDURE

ROBOT USED : KUKAKR5_IND

In order to get the trajectory of the shapes drawn, we used GeoGebra geometry available at- <https://www.Geogebra.Org/geometry?Lang=en> and noted down the coordinates which were entered in the *MATLAB* program framed to perform the required operation.

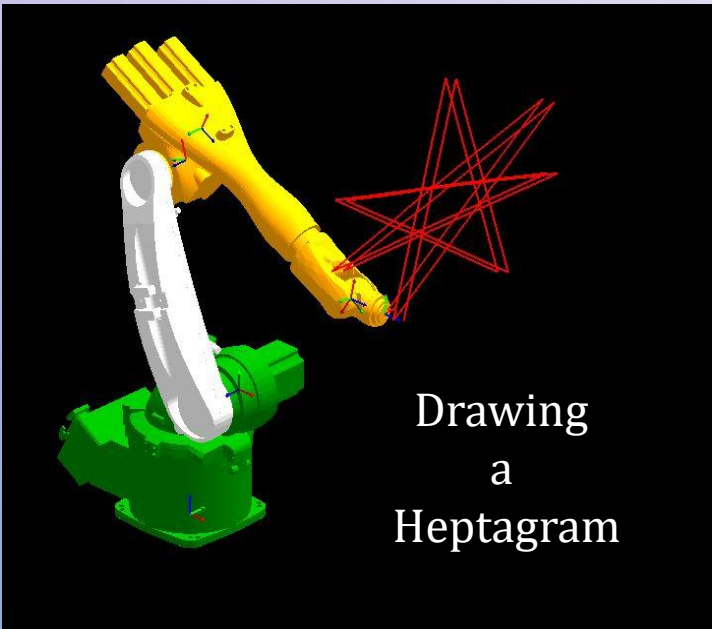
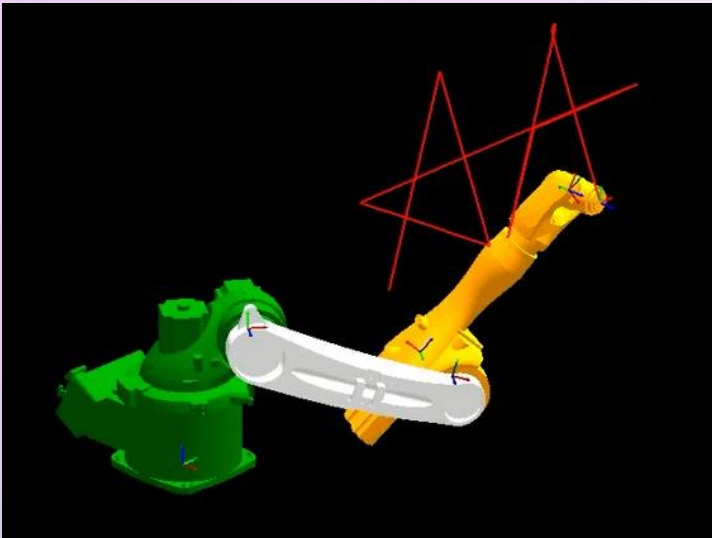
The performed operations gave necessary linear and circular paths. The values 'X', 'Y', and 'Z' are noted and saved in a *csv* file.

The file has been selected in the *RoboAnalyzer* software and run.

We made use of the 'Record' option available and saved the path executed.

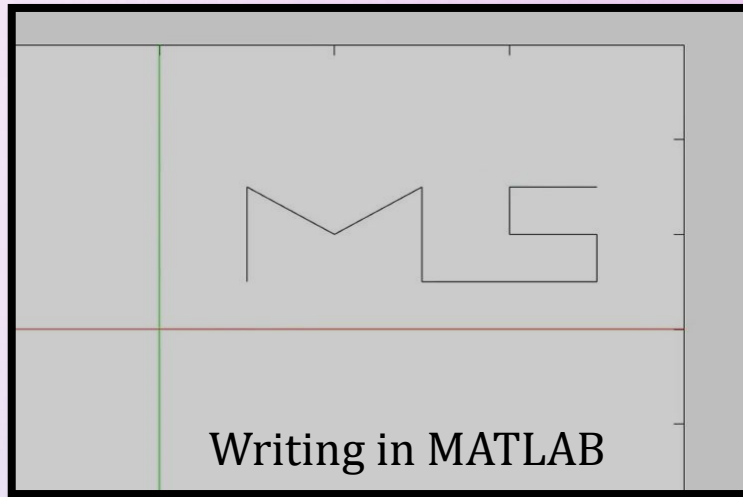
The main objective behind doing this task is to improve our skills and know much about the *RoboAnalyser* application which is really awesome.

WORK DONE



Drawing
a
Heptagram

Drawing
a
Star



ROC 2021 [Report (Task – 1)]

Team D4: Monik Talagatla, Siri Chandana

Robotics is the combination of science, engineering, and technology to produce machines, i.e., robots and gain intellectual mechanical capabilities. Also, it has many applications in our daily life. A Robot is defined with its Degrees of Freedom (DOF), which specify the location of all the links of the robot in space. DOF is basically the number of independent motions a system can have. For example, A point in 2D space has 2 DOF while in 3D has 3 DOF.

(x, y)

(x, y, z)

The 6 DOF are well divided in position and orientation to specify the rigid body in space.

- Roll – Rotation around the front-to-back axis.
- Pitch – Rotation around the side-to-side axis.
- Yaw – Rotation around the vertical axis.

Translation alone is commutative. Rotation is not commutative.

The Homogeneous Transformation Matrix (HTM) represents both the position and orientation of one frame w.r.t another.

For an axis (say (u, v, z)) which is drawn w.r.t with the original axis (x, y, z) , the HTM is given by:

$$T_{4x4} = \begin{bmatrix} R(3x3) & \begin{bmatrix} \Delta x \\ \Delta y \\ \Delta z \end{bmatrix} \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

Where R_{3x3} is Rotation matrix and $\Delta x, \Delta y, \Delta z$ are Position vectors.

1. Local Transformation – Post-Multiplication of HTM's

i) Initially (I)

ii) Rotate about z by 30° ($I * R_z$)

iii) Translate along x by 10 ($(I * R_z) * T_x$)

2. Global Transformation – Pre-Multiplication of HTM's

i) Initially (I)

ii) Translate along x by 10 ($T_x * I$)

iii) Rotate about z by 30° ($R_z * (T_x * I)$)

Denavit-Hartenber (DH) Parameters: They are the four parameters associated with a particular convention for attaching reference frames to links of robot manipulator.

i) Joint Offset (b)

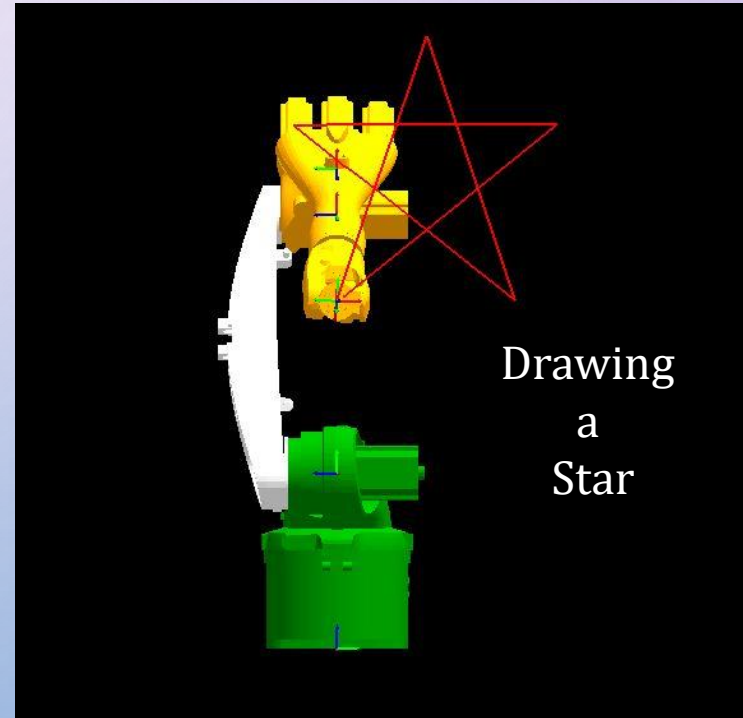
ii) Joint angle (θ)

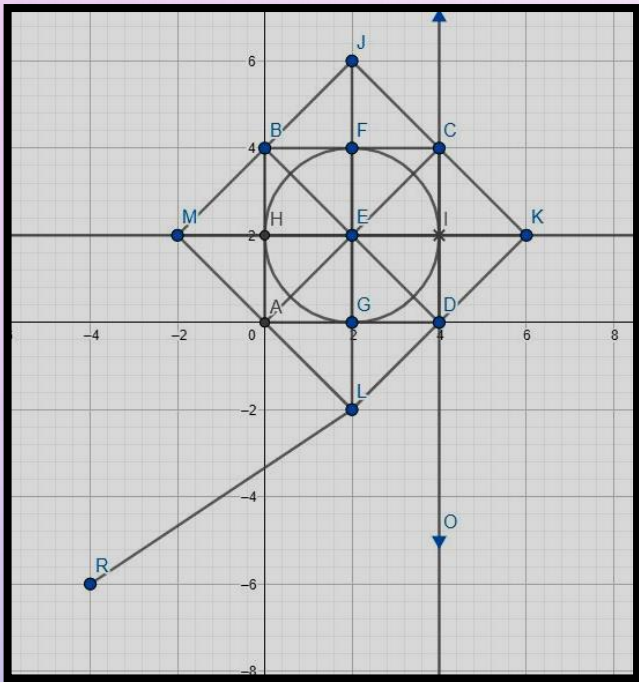
iii) Link Length (a)

iv) Twist Angle (α)

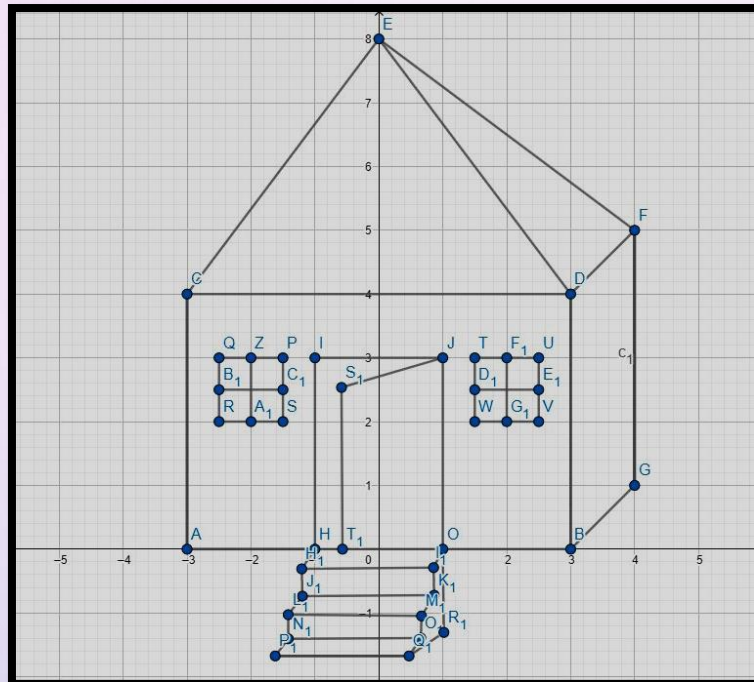
Serial Manipulators are the most common industrial robots and they are designed as a series of links connected by motor-actuated joints that extend from a base to an end effector. A manipulator is a much clever way of handling robots.

Denavit-Hartenber (DH) Parameters





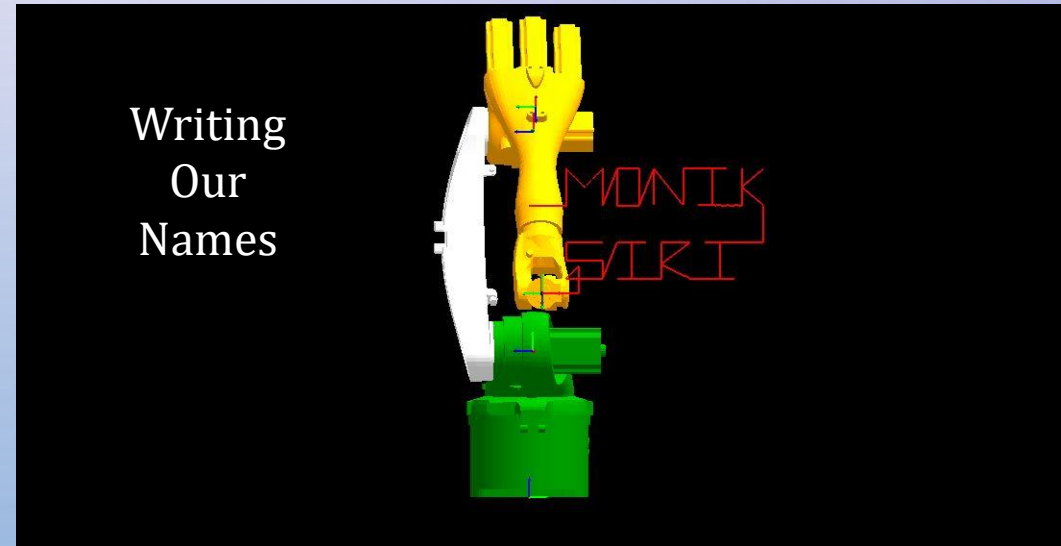
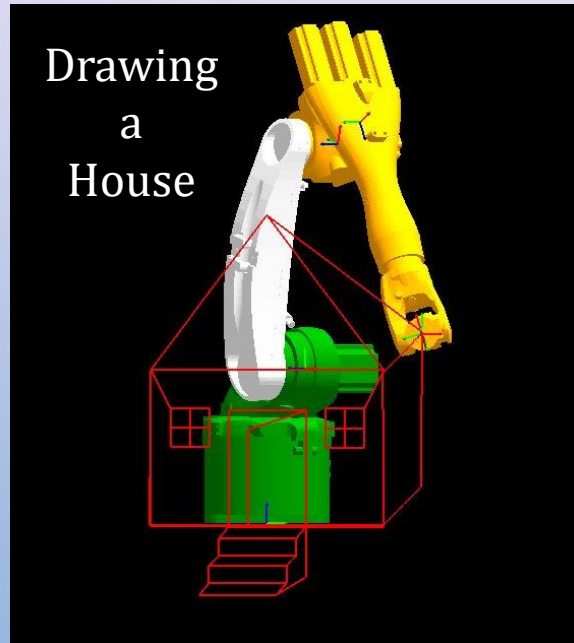
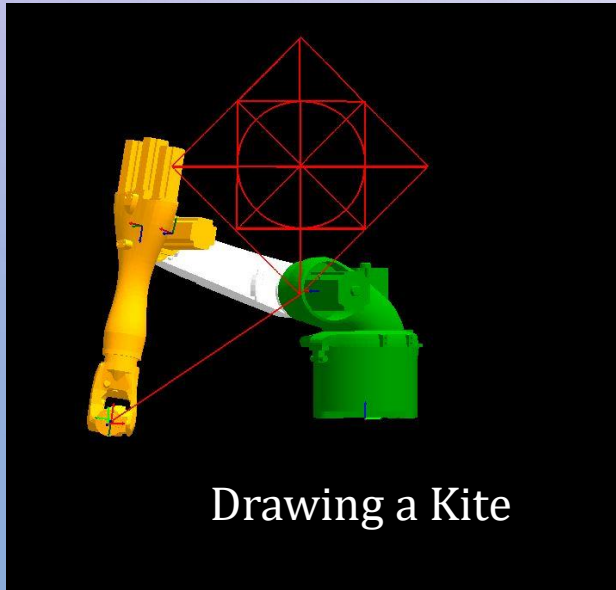
Sketch of Kite in GeoGebra

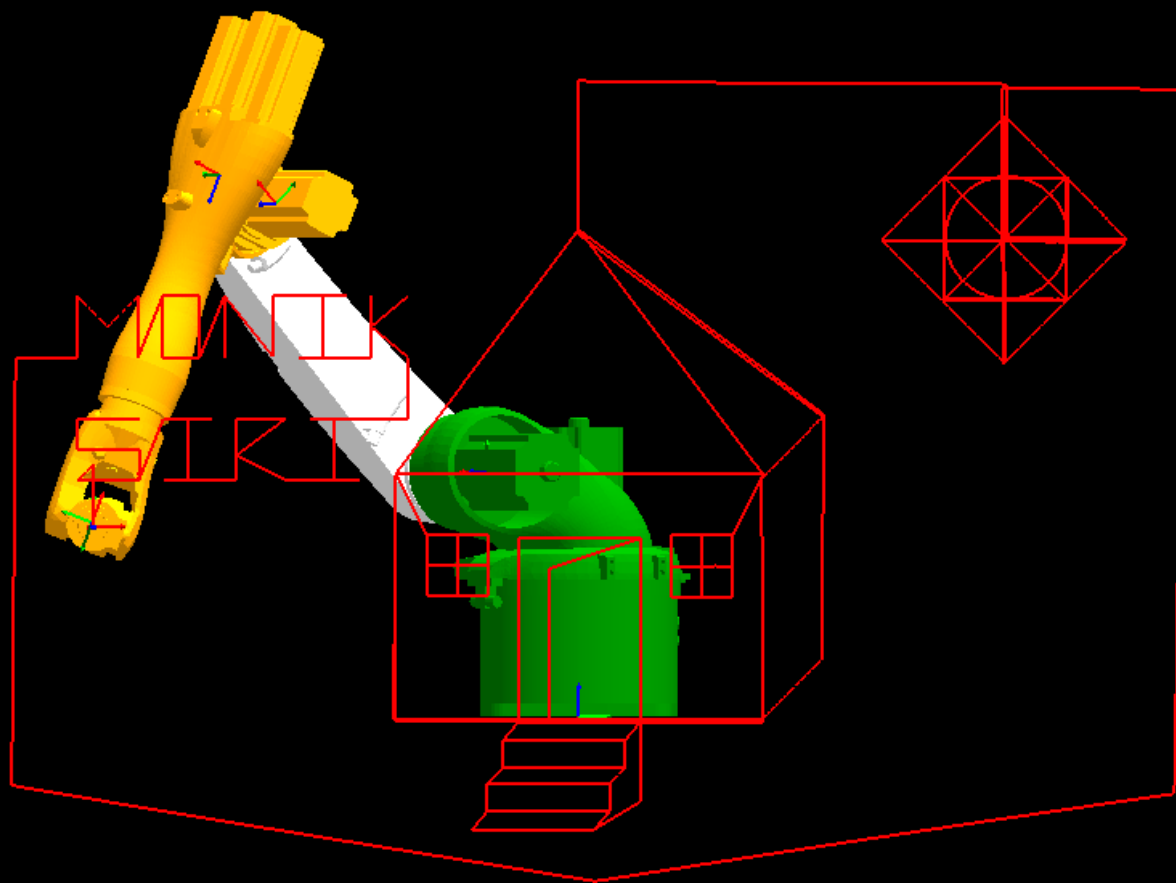


Sketch of House in GeoGebra

A	B	C	D	E	F
800	0	800	90	0	90
800	-7.69231	789.7436	90	0	90
800	-15.3846	779.4872	90	0	90
800	-23.0769	769.2308	90	0	90
800	-30.7692	758.9744	90	0	90
800	-38.4615	748.7179	90	0	90
800	-46.1538	738.4615	90	0	90
800	-53.8462	728.2051	90	0	90
800	-61.5385	717.9487	90	0	90
800	-69.2308	707.6923	90	0	90
800	-76.9231	697.4359	90	0	90
800	-84.6154	687.1795	90	0	90
800	-92.3077	676.9231	90	0	90
800	-100	666.6667	90	0	90
800	-107.692	656.4103	90	0	90
800	-115.385	646.1538	90	0	90
800	-123.077	635.8974	90	0	90
800	-130.769	625.641	90	0	90
800	-138.462	615.3846	90	0	90
800	-146.154	605.1282	90	0	90
800	-153.846	594.8718	90	0	90
800	-161.538	584.6154	90	0	90
800	-169.231	574.359	90	0	90
800	-176.923	564.1026	90	0	90
800	-184.615	553.8462	90	0	90

CSV File





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