

A decorative graphic on the left side of the slide consisting of two overlapping parallelograms. The front one is blue and the back one is light green. They are positioned diagonally, with the blue one partially covering the green one.

ENPM662: Final Project

PaintBot

By

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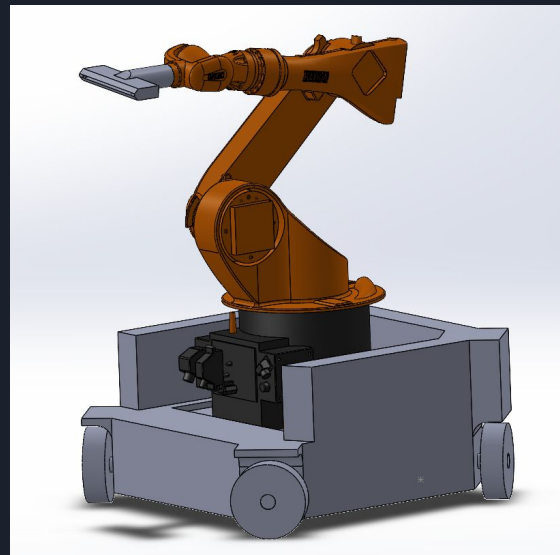


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Paintbot

Omnidirectional Painting Robot



Motivation

- Several construction tasks can be automated
- Intelligent solutions can mitigate construction-related injuries and fatalities.
- The traditional hand painting approach to painting new walls
 - Slow
 - Inconsistent
 - Inefficient
 - Hazardous.



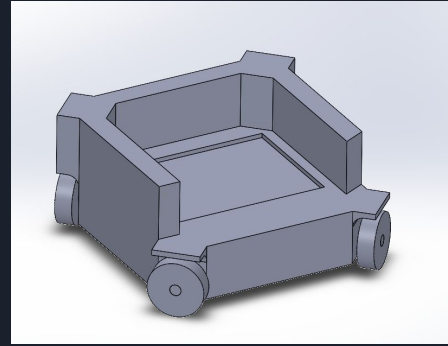
Proposed Solution

- **Three components:**

- Manipulator
- Chassis
- End-effector

- **Key Design Features**

- Kuka kr16 Manipulator- good reach
- Omnidirectional - more mobility in small spaces
- Paint spray nozzle
- Spacious Chassis to accommodate electronics, paint and the manipulator.



Chassis FootPrint
= 1m x 1m

DOF: 2

Height: 0.5 m



Reach: 1.611 m

Payload: 16kg

DOF: 6

Weight: 235kg

Footprint: 0.5m x 0.5m



The Process

Dynamics

DH Table

Forward Kinematics

Inverse Kinematics

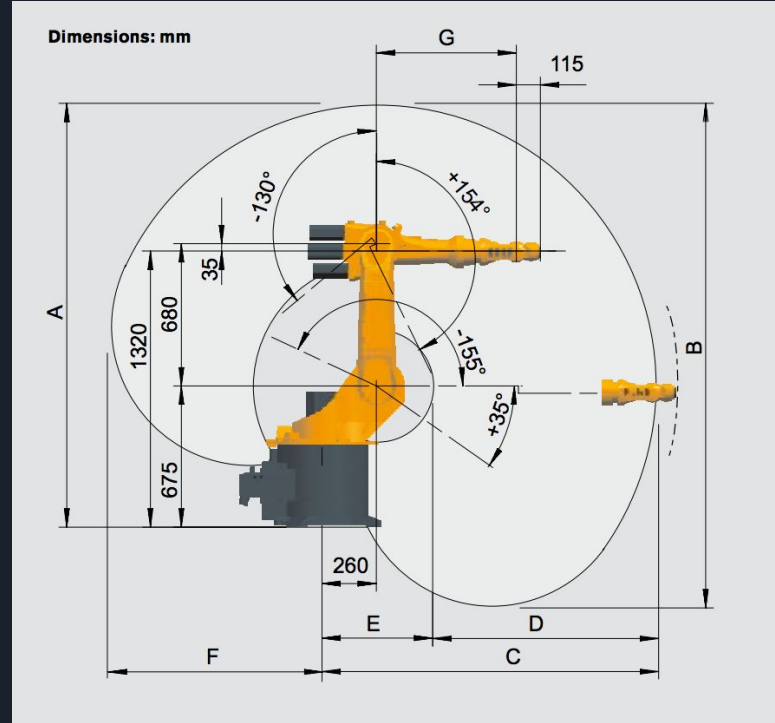
Simulation

Solidworks

URDF

Gazebo/RViz

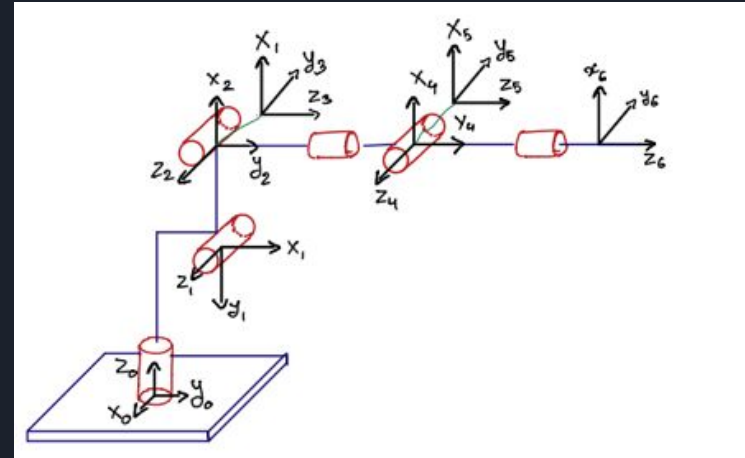
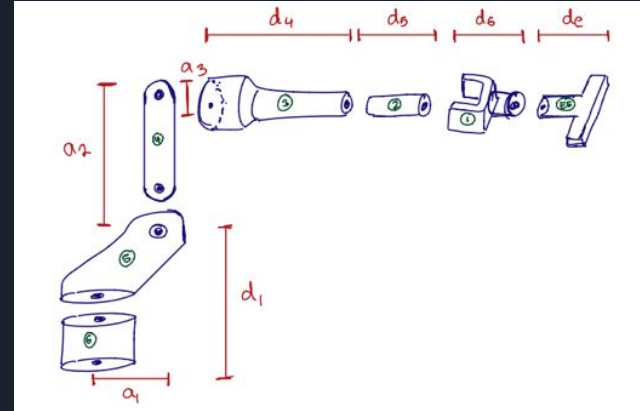
TeleOp



DH Parameters

Joint #	α_i	d_i	a_i	θ_i
1	$-\pi/2$	d_1	a_1	q_1
2	0	0	a_2	q_2
3	$-\pi/2$	0	$-a_3$	$q_3 - 90$
4	$\pi/2$	d_4	0	q_4
5	$-\pi/2$	0	0	q_5
6	0	d_6	0	q_6
7	0	d_7	0	q_7

$$\begin{aligned}
 d_1 &= 675 \text{ mm} & a_1 &= 260 \text{ mm} \\
 d_4 &= 670 \text{ mm} & a_2 &= 680 \text{ mm} \\
 d_6 &= 115 \text{ mm} & a_3 &= -35 \text{ mm}
 \end{aligned}$$



Forward/Inverse Kinematics

Goal:

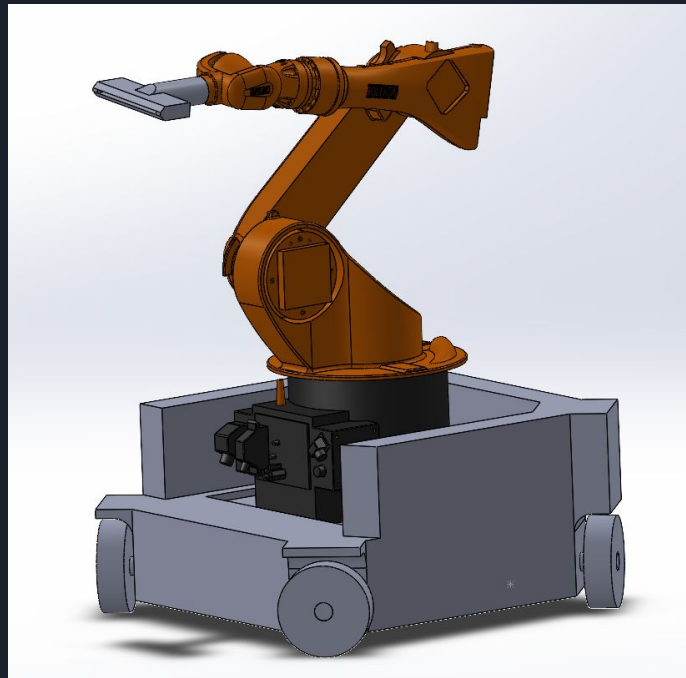
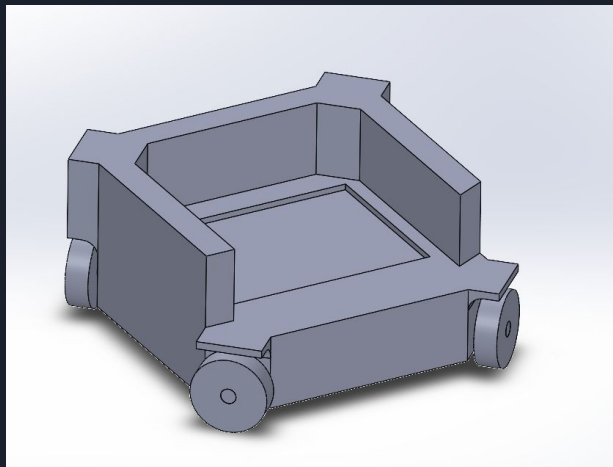
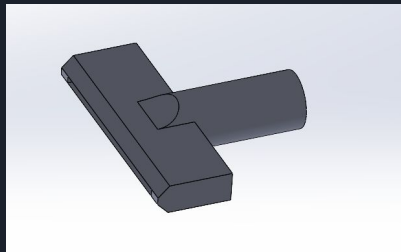
To have the end-effector move in a linear motion along a wall, replicating the task of painting a wall.

Application Used:

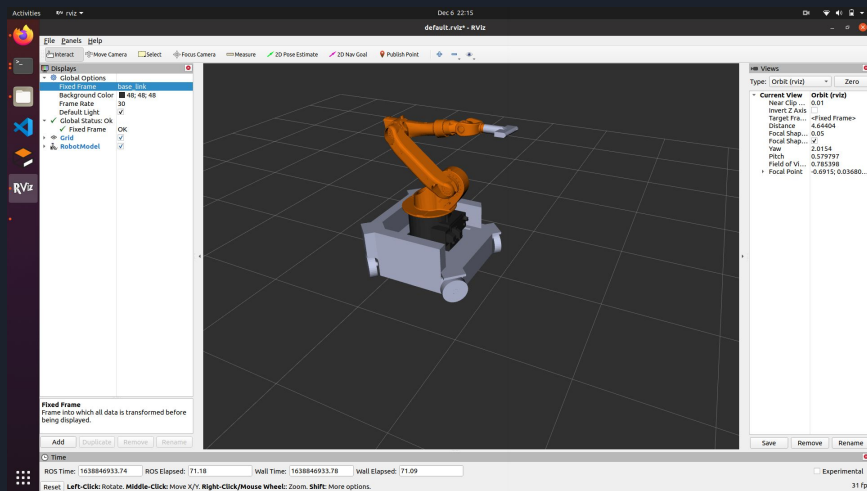
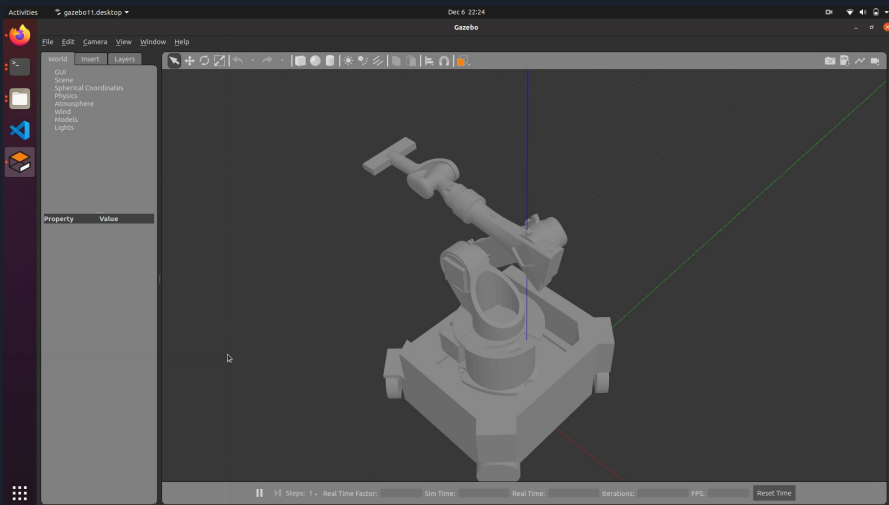
- Google Colab
- Python



Solidworks/URDF



Gazebo & Rviz



Thank You

