

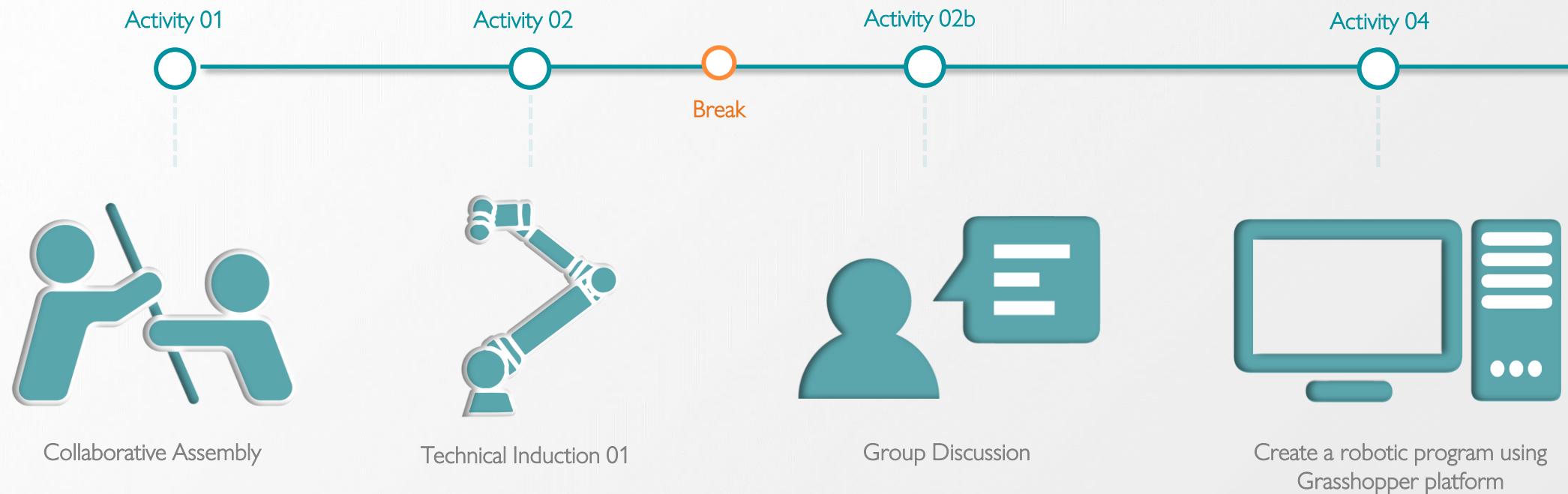
CAADRIA WORKSHOP DAY 01

Collaborative Assembly Tasks using AR-enabled HRC system



WORKSHOP SCHEDULE

CAADRIA 2024 – Day 01



WORKSHOP AGENDA

CAADRIA 2024 – Day 02

[Workshop Objectives]

Understand the **intricacies** surrounding collaborative assembly tasks.

Explore different methods to interact with cooperative robotic arm.



Image: Cooperative robotic arm control through machina plugin.
Source: Author, 2023.

ACTIVITY 01

Collaborative assembly activity (40 mins)

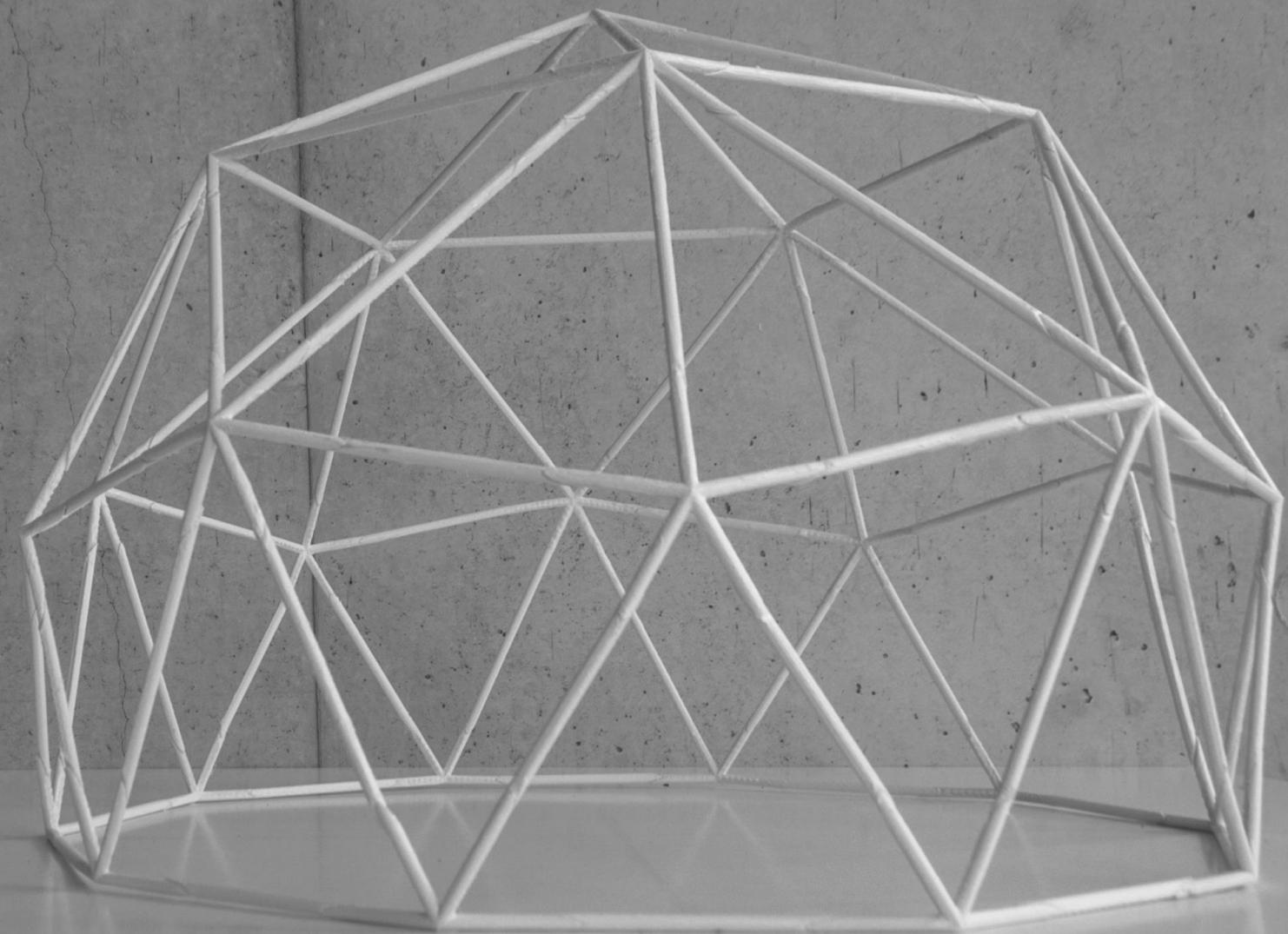


Image: Geo-desic dome / voronoi structure animation. Source: Author, 2023.

ACTIVITY 01(a)

Collaborative Assembly – Small Scale – 20 mins

Spend up to 20 mins **working collaboratively** to build a Voronoi structure.

- Feel free to deviate from it!

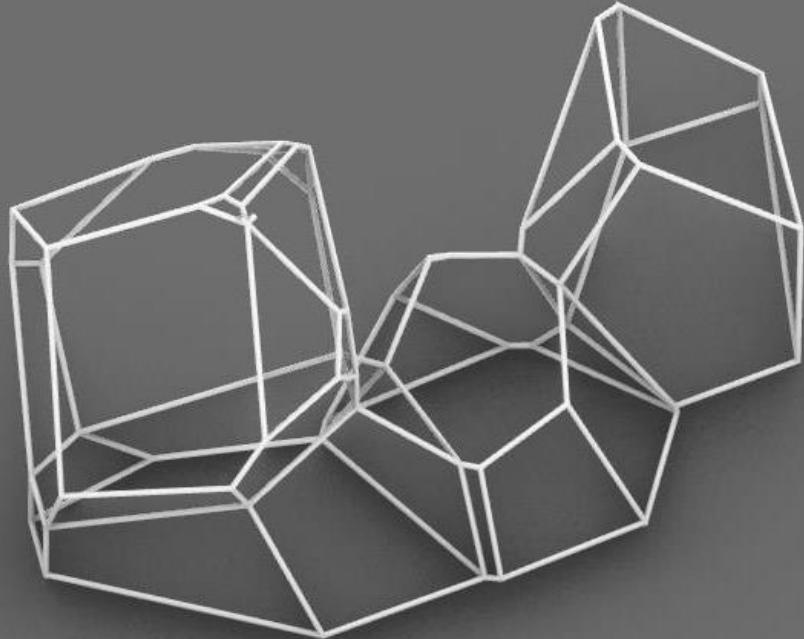


Image: Voronoi structure animation. Source: Author, 2023.

ACTIVITY 01(b)

Collaborative Assembly – Large Scale – 20 mins



Image: Medium scale build structure. Source: Author, 2024.

ACTIVITY 01(b)

Collaborative Assembly – Large Scale – 20 mins

3D Printed Peg Leg

Swivel Coupler

Allen Key

Wooden Dowel

Image: Voronoi structure animation. Source: Author, 2023.

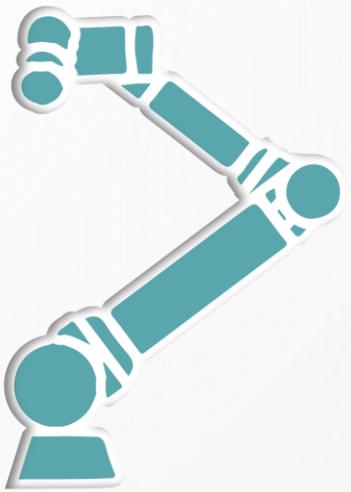
INDUCTION 01

With Cooperative Robotic Arm, UR10



INDUCTION 01

Methods of Controlling Robot - Analog



Freedrive Mode (Analog)

INDUCTION



Image: Control cooperative robotic arm via freedrive mode. Source: Author, 2024.

INDUCTION 01

Methods of Controlling Robot - Digital



Visual Programming (Digital)

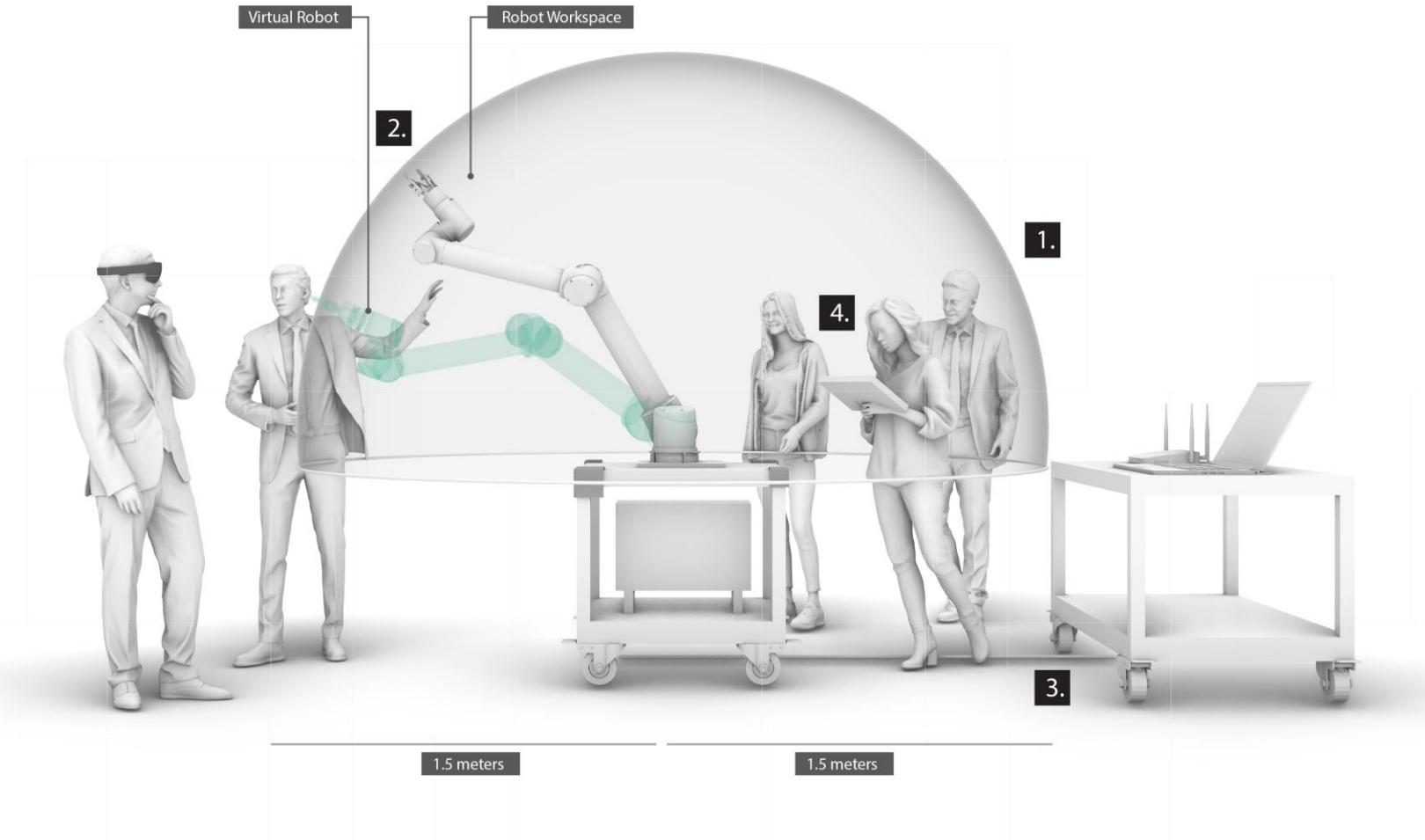


Image: Control cooperative robotic arm using Grasshopper. Source: Author, 2024.

UNIVERSAL ROBOT 10

Tech Induction 01

1. Keep a safe distance from the robot
2. Exercise caution with the mechanical gripper
3. Mind the cable management
4. Emergency stop procedure







BREAK & WILL BE BACK

60 minutes (make sure you have *stay hydrated*)

ACTIVITY 03

Group Discussion – 15 minutes

“How would you like the robotic system to support you in collaborative assembly tasks?”

Image: Group Discussion for Study 03. Source: Author, 2024.

ACTIVITY 04

Simple Collaborative Assembly using Grasshopper

GITHUB REPO

Workshop Resources

https://github.com/LoyWeiWin/AR-HRC_CAADRIA2024_Workshop.github.io

GITHUB REPO

Workshop Resources

The screenshot shows a GitHub repository page for 'AR-HRC_CAADRIA2024_Workshop'. The repository is public and has 1 branch and 0 tags. The main commit is by 'LoyWeiWin' titled 'RenameItem' with a green checkmark, made 3 days ago. Other commits include '01_WorkshopMaterial' (Renamed 3 days ago), '90_Images' (Updated TimeTable 3 weeks ago), and 'ReadMe.md' (Updated ReadMe.md 3 weeks ago). The README file contains the text: 'Workshop: Exploring AR-enabled Human-Robotic'. The repository has 2 forks and 0 stars. The 'About' section describes it as 'AR-enabled HRC for collaborative assembly tasks Workshop (CAADRIA 2024)' and provides a link to loyweiwin.github.io/AR-HRC_CAADRIA2024. It also lists tags: workshop, robotics, augmentedreality, and visualprogramming.

LoyWeiWin/AR-HRC_CAADRIA2024_Workshop

github.com/LoyWeiWin/AR-HRC_CAADRIA2024_Workshop

ResearchRabbit Grammarly Mural Board Ethics Application QuillBot HDR Candidature I... GitHub Gmail quthse.saasitau.com

LoyWeiWin / AR-HRC_CAADRIA2024_Workshop

Type ⌘ to search

Code Issues Pull requests Actions Projects 1 Wiki Security Insights Settings

AR-HRC_CAADRIA2024_Workshop Public

Pin Unwatch 2 Fork 0 Star 0

main 1 Branch 0 Tags Go to file Add file Code

LoyWeiWin RenameItem 3 days ago 35 Commits

01_WorkshopMaterial RenameItem 3 days ago

90_Images Update TimeTable 3 weeks ago

ReadMe.md Update ReadMe.md 3 weeks ago

README

Workshop: Exploring AR-enabled Human-Robotic

About

AR-enabled HRC for collaborative assembly tasks Workshop (CAADRIA 2024)

loyweiwin.github.io/AR-HRC_CAADRIA2024

workshop robotics augmentedreality

visualprogramming

Readme Activity 0 stars 2 watching 0 forks

FUNDAMENTALS

Launch Rhino > Grasshopper

The screenshot shows the Rhino application interface. At the top, there is a menu bar with tabs: 'New', 'Recent', 'Open...', and 'License'. Below the menu, a 'Templates:' section lists various template options. One template, 'Large Objects - Millimeters', is highlighted with a red border. This template is described as the 'Default Template' for building objects the size of a truck or larger. It specifies units as Millimeters, absolute tolerance as .01 mm, and display format as Decimal. To the right of the main window, a semi-transparent 'News:' overlay displays a list of recent events and articles.

Templates:

- Large Objects - Centimeters
- Large Objects - Feet, Feet Inches
- Large Objects - Feet
- Large Objects - Inches, Feet Inches
- Large Objects - Inches
- Large Objects - Meters
- Large Objects - Millimeters** (highlighted)
- Small Objects - Centimeters
- Small Objects - Feet, Feet Inches
- Small Objects - Feet
- Small Objects - Inches, Feet Inches
- Small Objects - Inches
- Small Objects - Meters
- Small Objects - Millimeters

Large Objects - Millimeters

Your Default Template.

Use this template file for building objects the size of a truck or larger.

Units: Millimeters
Absolute tolerance: .01 mm
Display format: Decimal

News:

- International Rhino User Meeting Wroclaw (June 7,
- Rhino3Dzine April 2024 issue
- Rhino at BILT Europe - Riga (Latvia) - May 2024
- Rhino at the Istanbul Jewelry Show - April 17-20, 2
- AA DLAB 2024
- Kit Crashing, parametric design and landscape arch
- NDAR Orca3D at Navalia trade show in Vigo, Spai
- Grasshopper UK UGM March 2024 – Meeting Note
- Steampunk: New History 3D Modeling Competitio
- AECtech+ Barcelona - Symposium, Workshops, Hac

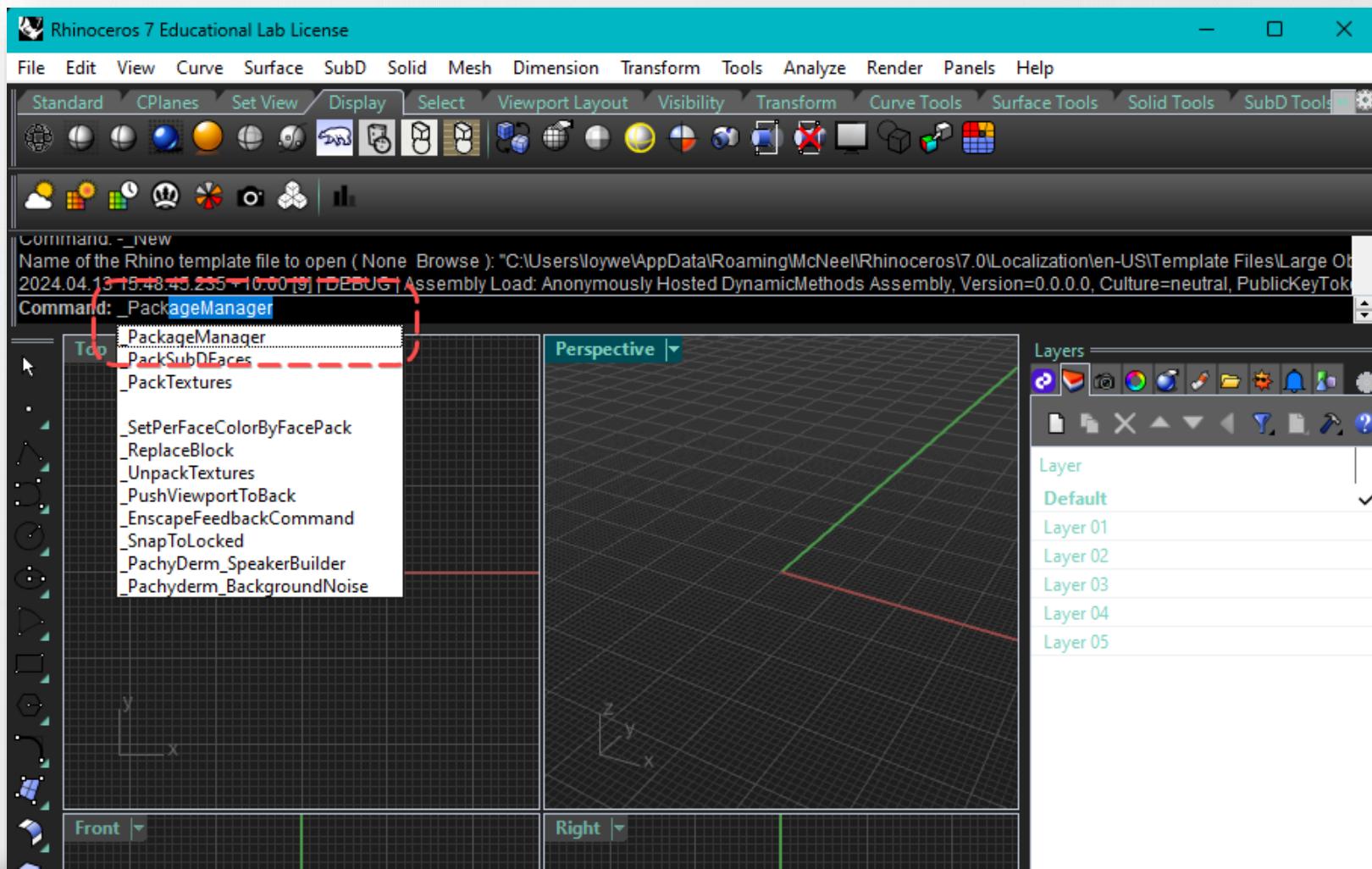
Tips:

- Rhino 8: Texture Mapping with the UV Editor
- Rhino 8: Learn the User Interface
- Rhino 8: Gumball updates
- Rhino 8: From Mesh to Solid
- New lighting features ... in Rhino 7
- Check out Block Attributes in Rhino 7
- Grasshopper Component Placeholders
- Clash detection, new in Rhino 7
- Getting Started Live - Rhino for Windows
- Gradient Hatch, new in Rhino 7

Version 7 SR36
(7.36.23346.16351, 2023-12-12)
Educational Lab License
SN: 6-1702-0104-1-*****_***
QUT, Queensland University of Technology

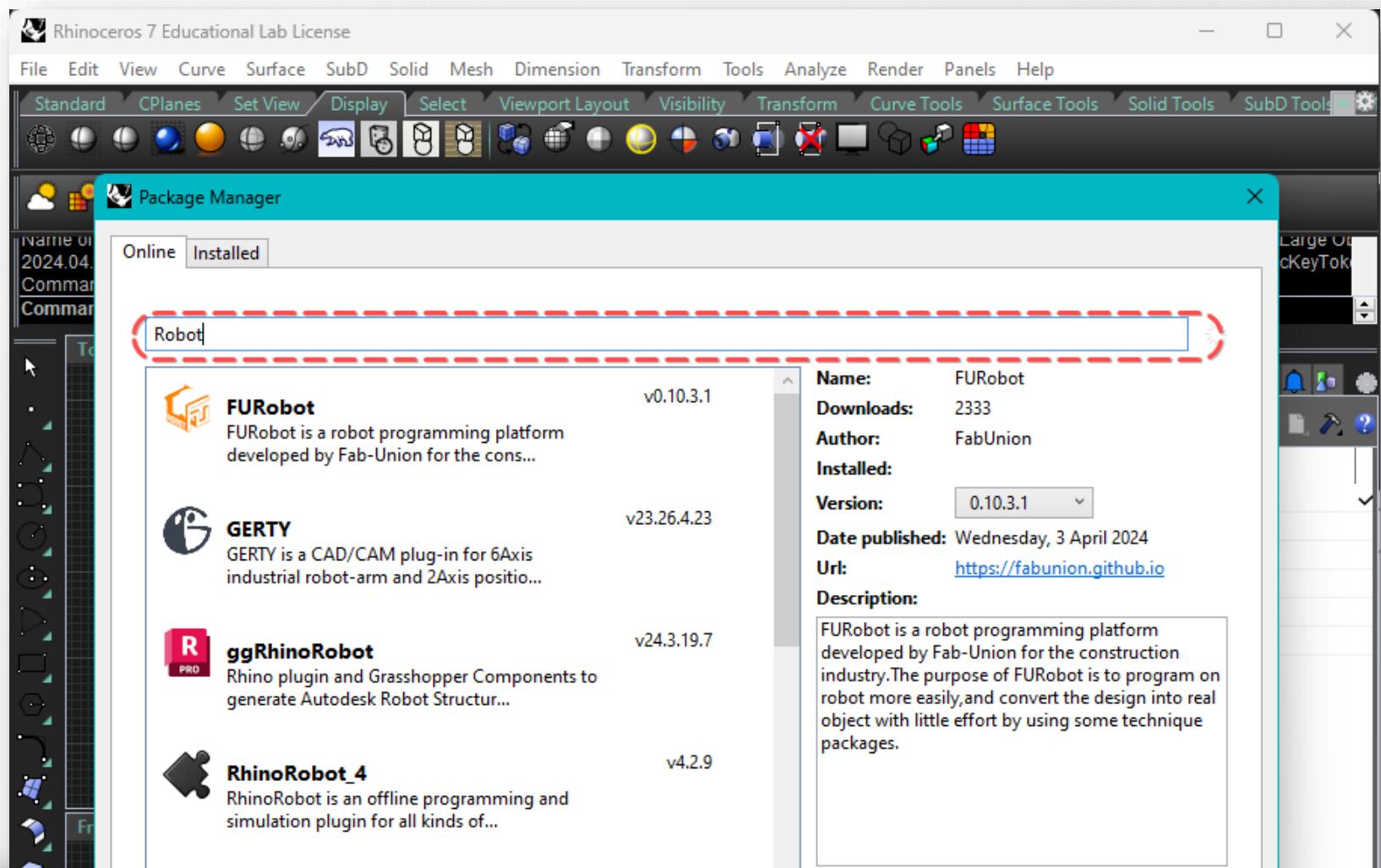
FUNDAMENTALS

Install “robot” plugins into grasshopper



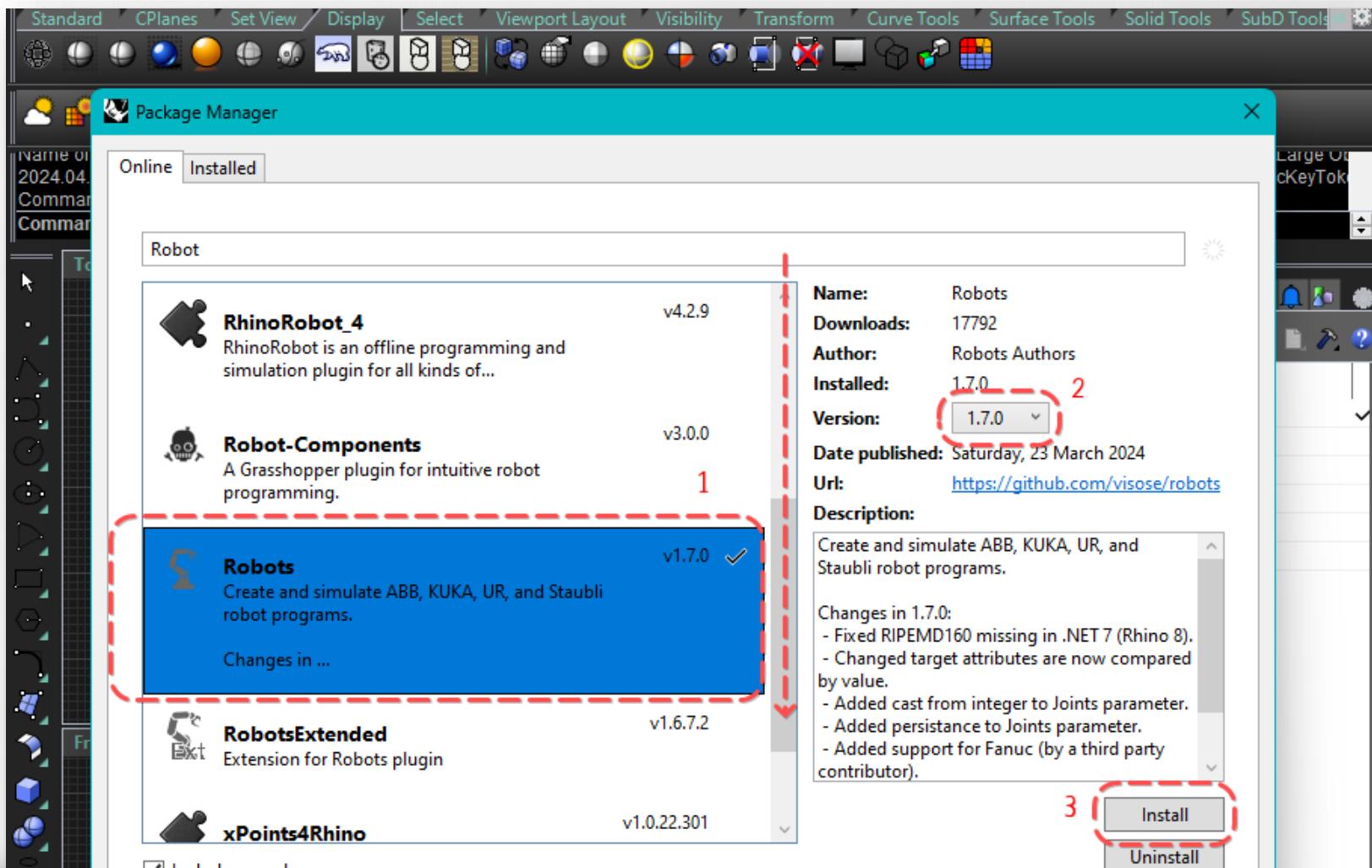
FUNDAMENTALS

Install “robot” plugins into grasshopper



FUNDAMENTALS

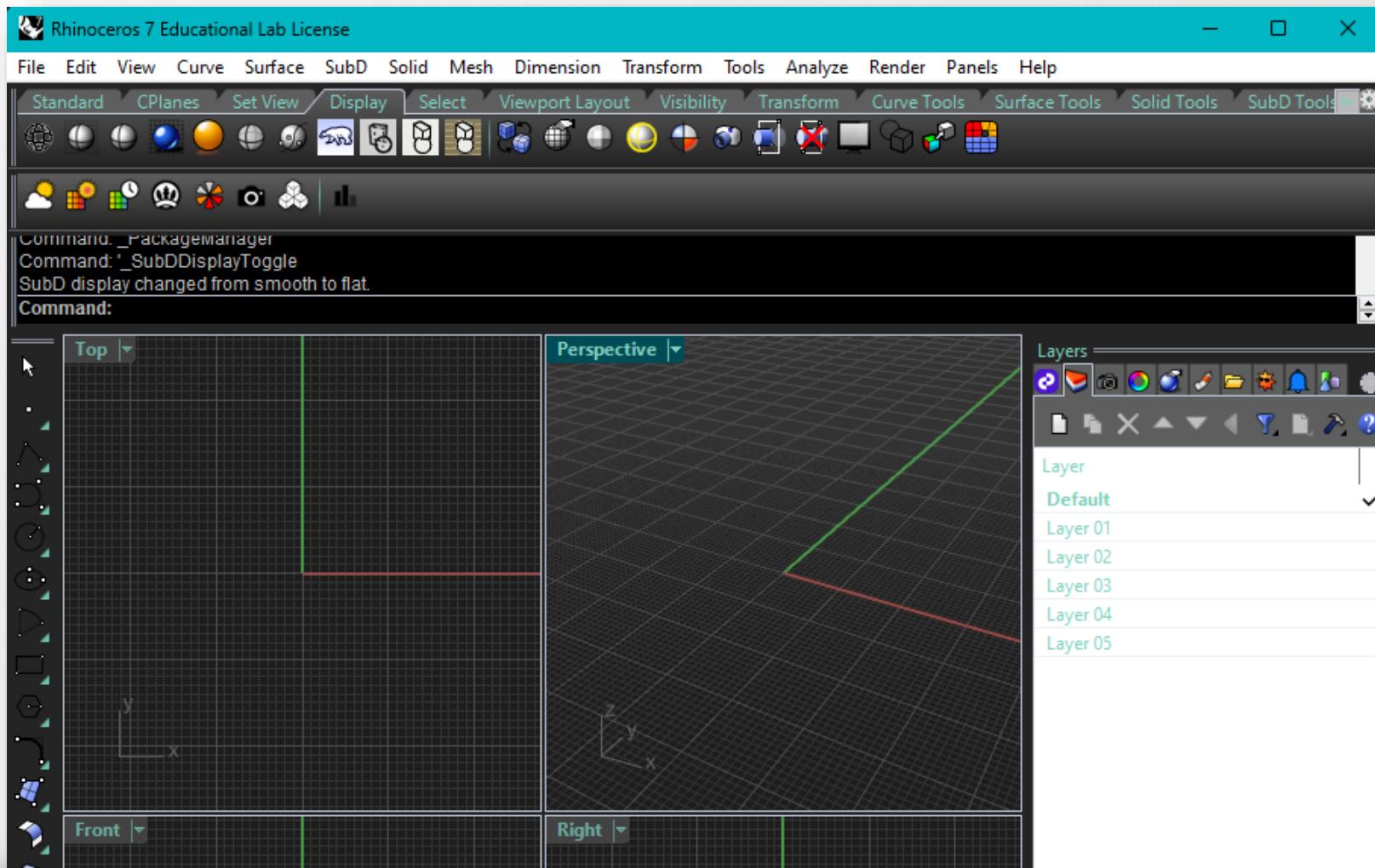
Install “robot” plugins into grasshopper



RESTART YOUR RHINO

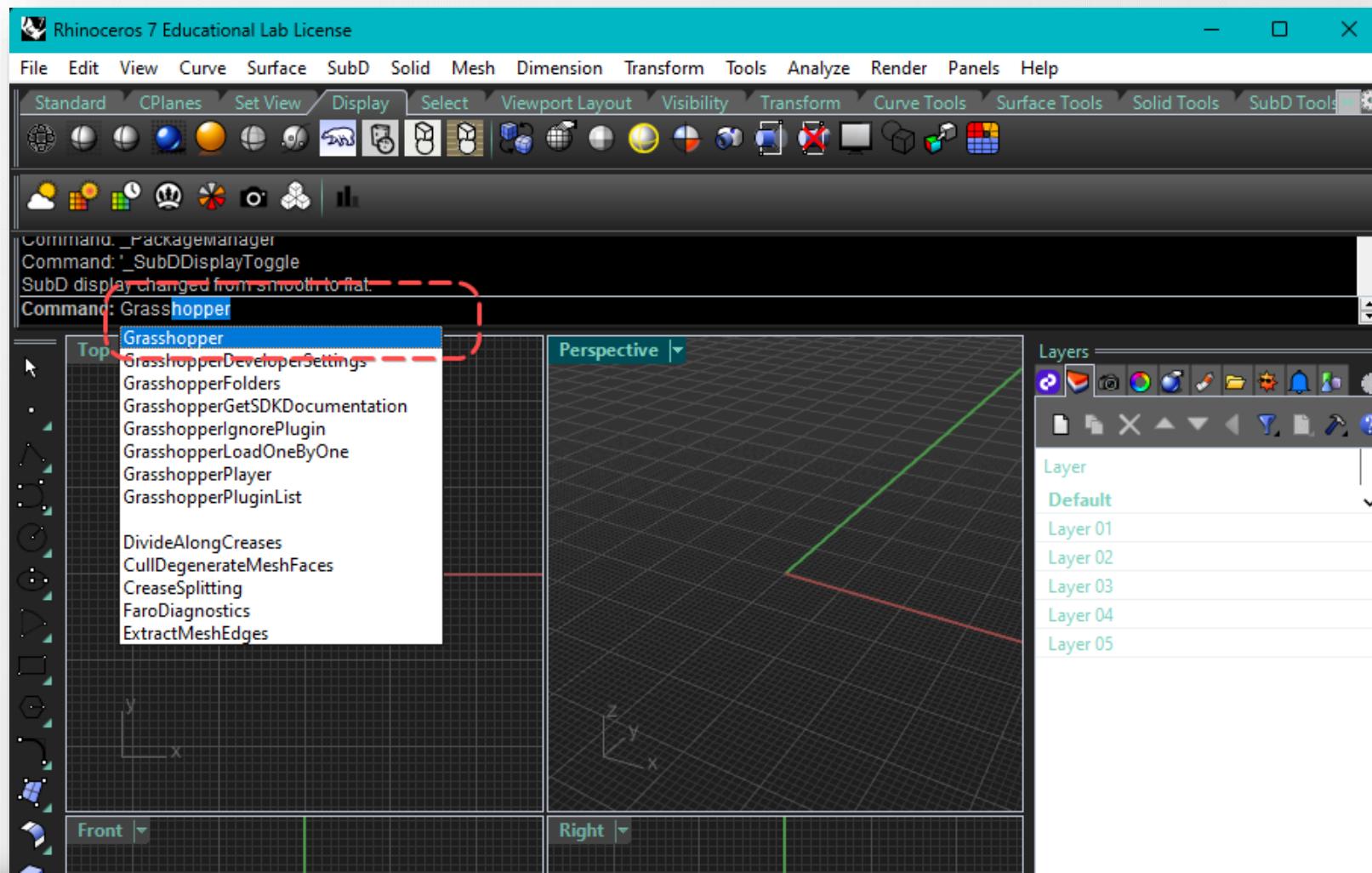
FUNDAMENTALS

Launch grasshopper in rhino



FUNDAMENTALS

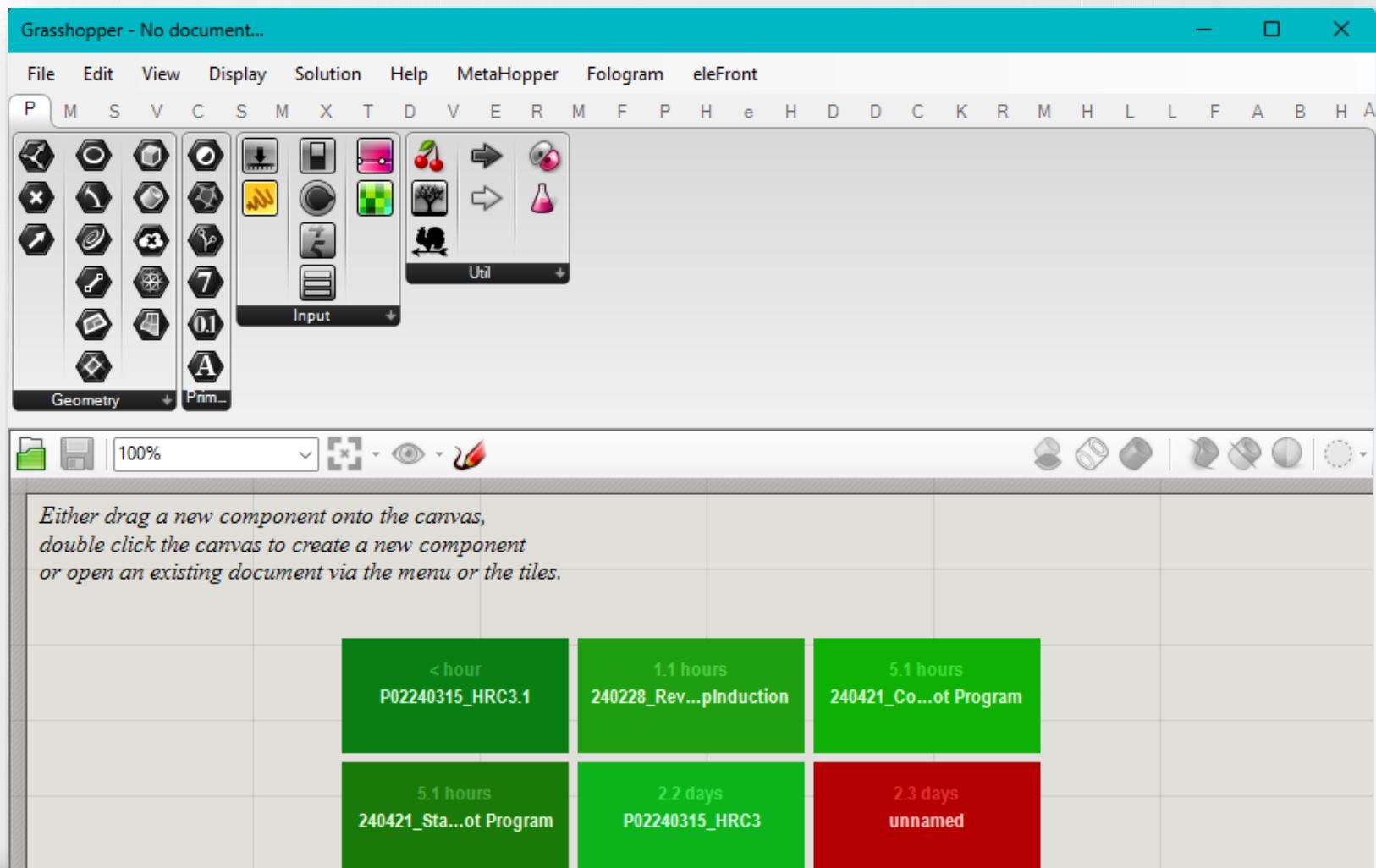
Launch grasshopper in rhino



animation. Source: Author, 2023.

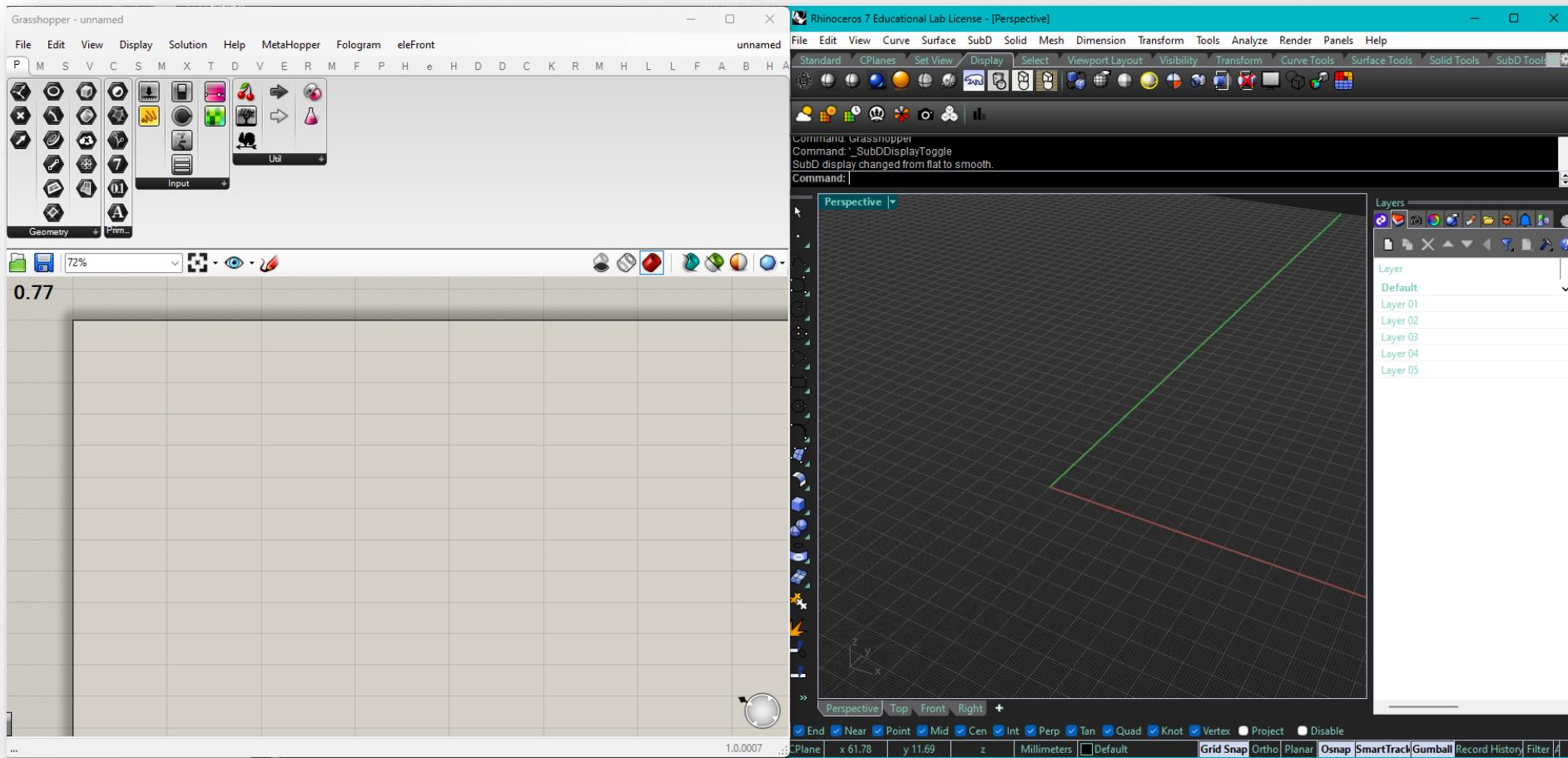
FUNDAMENTALS

Launch grasshopper in rhino



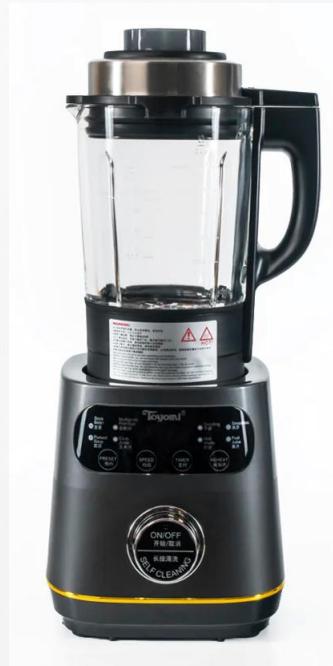
BEST PRACTICE

Using grasshopper and rhino (side-by-side)



GRASSHOPPER BASIC

How grasshopper / visual programming works?



INPUT

FUNCTION
(to process input)

GOAL / OUTPUT

CHEAT SHEET

How to create grasshopper definition to control cooperative robotic arm

Stage 01: Planning

What type of robot will we be using?

What route will the robot follow?

What is the speed of the robot?

Stage 02: Compiling

Create Program

Stage 03: Crisis Management

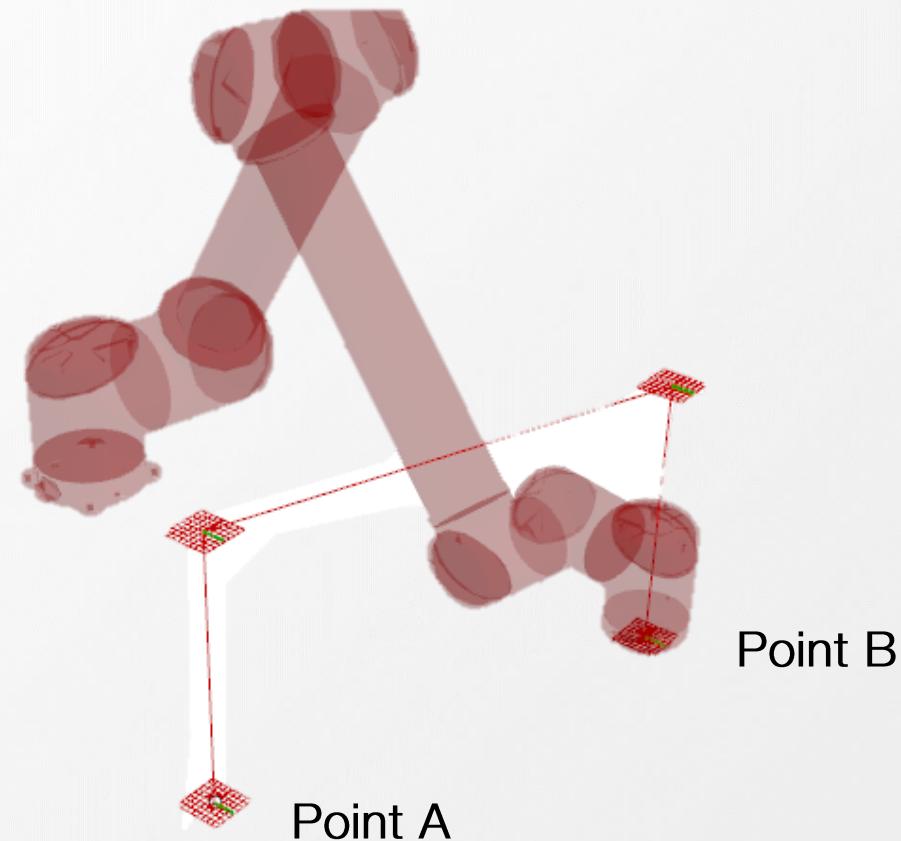
Visualise robot motion

Stage 04: Execution

Execute robot command

PLANNING

What do you want the robot to do?



WORKSHOP SERVER



Make sure using the same internet server.

Wifi : TP-Link_31E5
Password : 81819515
Internet Protocol (IP) : 192.168.137.102



THANK YOU

Any question? Thank you so much for participating and feel free to reach out if there is an opportunity for collaboration