

# Robotic Arm Control via Hand Gestures

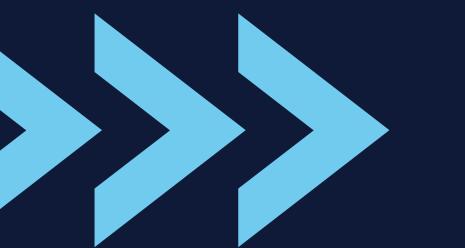
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By Willem Hueffed



# Imagine A World Where

- Robots are part of our daily life
- We could give them verbal instructions
- What about people who are speech impaired?



# Project Overview

## Hand Gesture Control

Sign Language for Robots

## Gesture Classifier

The vocabulary of the robot

## Camera Input

The robot needs eyes

## The Robotic Arm

It's what gets stuff done!



# Dependencies

## Packages

- RealSense SDK
- MediaPipe
- Trossen ROS2 Packages

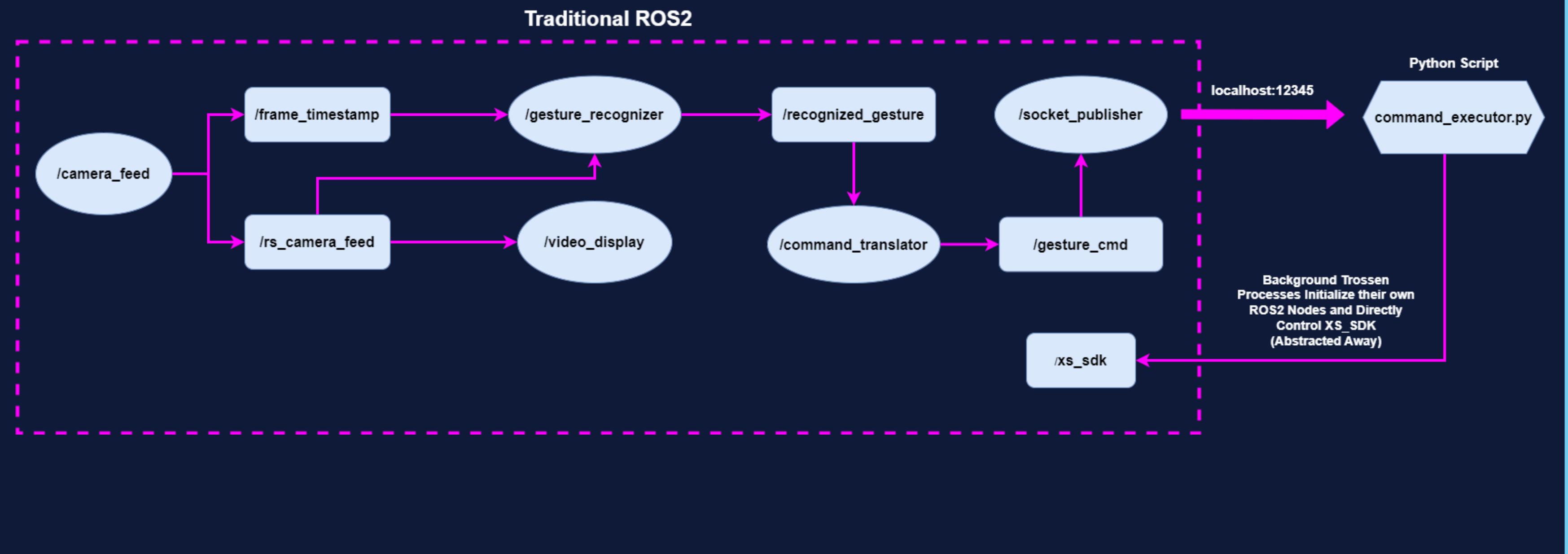
## Software

- Ubuntu 20.04 LTS
- ROS2 Galactic
- Git + GitHub
- Python 3
- C++

## Hardware

- Locobot WX250s
- Intel D435 RGBD

# Software Architecture



# Nodes & Scripts

## /camera\_feed

Wraps the RealSense  
Camera SDK

## /video\_display

Displays Video Via  
OpenCV

## /socket\_publisher

Pose Command -> Python  
API via Socket

## /gesture\_recognizer

Hand Gesture Recognition

## /command\_translator

Gesture -> Pose Command

## command\_executor.py

Runs Trossen Python API

## /xs\_sdk

Trossen's Servo Control



## Robot Hand Gesture Demonstration

Share





# Challenges

- Networking
  - Mobile Hotspot
- Movelt Interface
  - I'm still confused
- Trossen's Python API
  - Bugged
  - Runtime Error



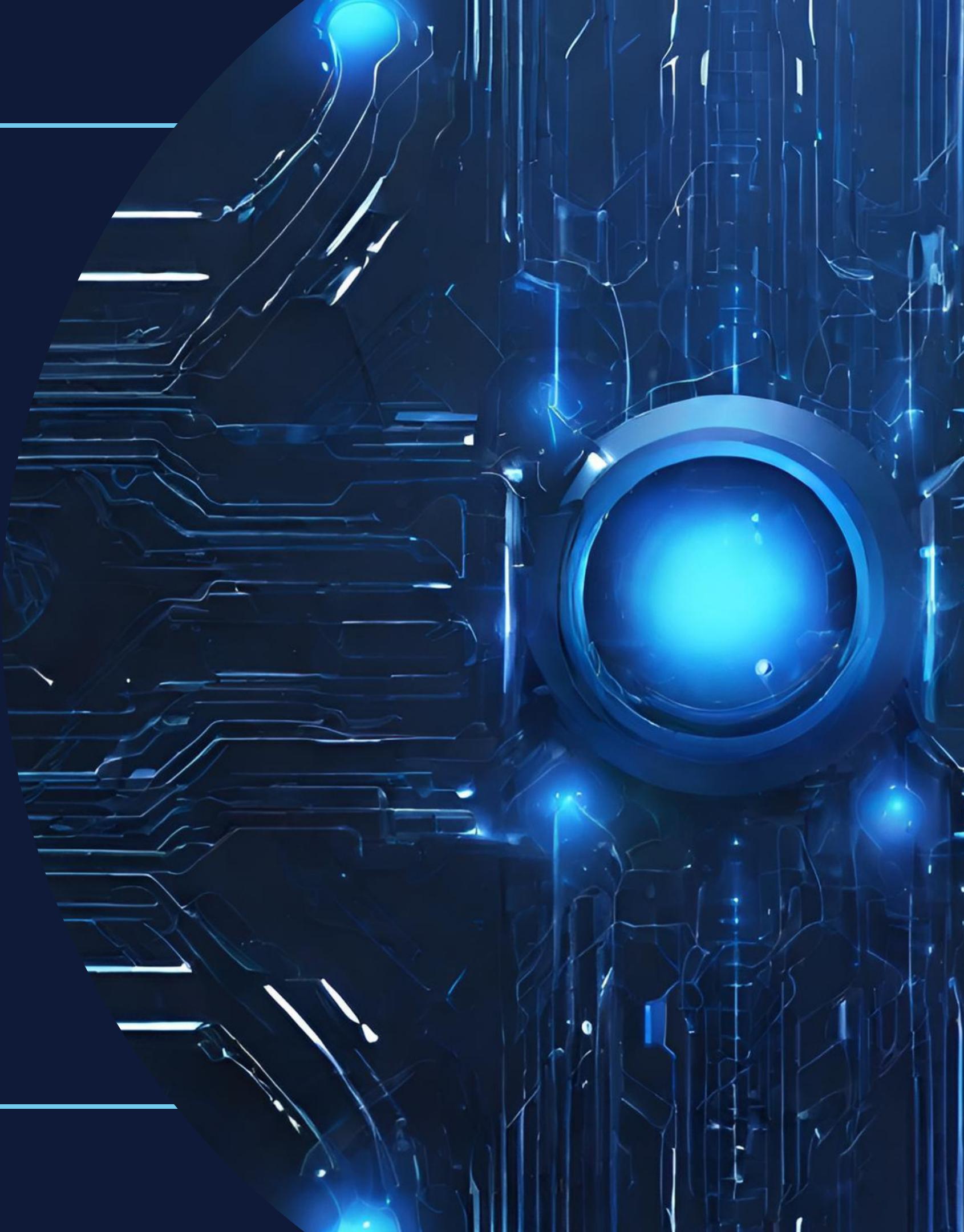
# Lessons Learned

- Grit
- Persistance
- Dealing with Hardware

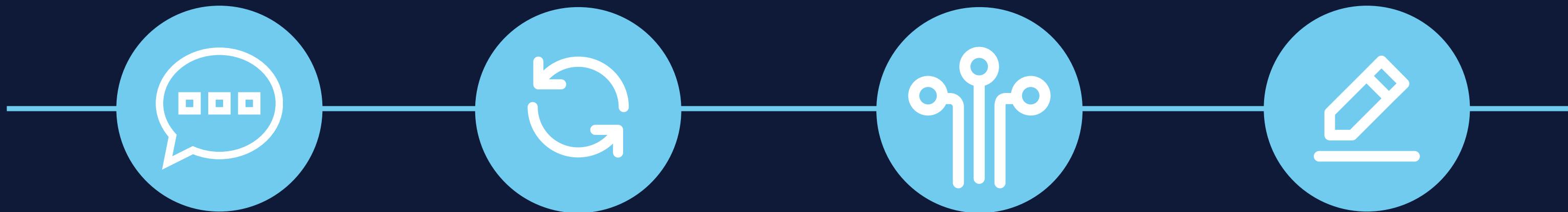


# Future Work

- Render Landmarks
  - MP Drawing Tools
- Display EE Coordinates
  - Tkinter?
- Extend The Model
  - Add More Gestures
- Extend Arm control
  - Add Base Rotation



# Advice For Past Me



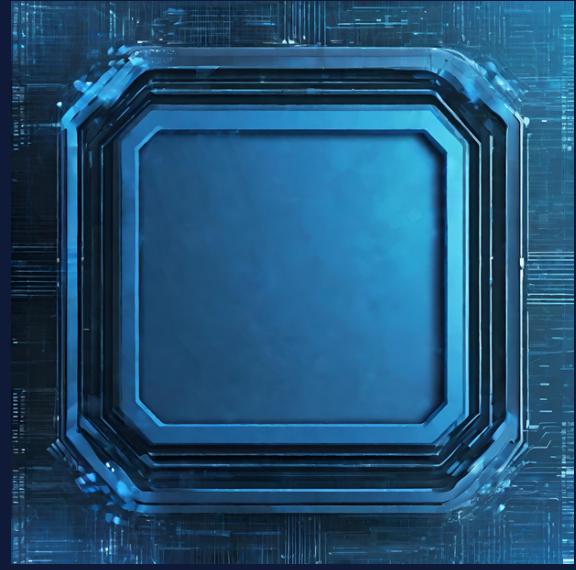
Take a Deep  
Breath  
Set It Down

Sucsess is  
Cyclical  
Highs & Lows

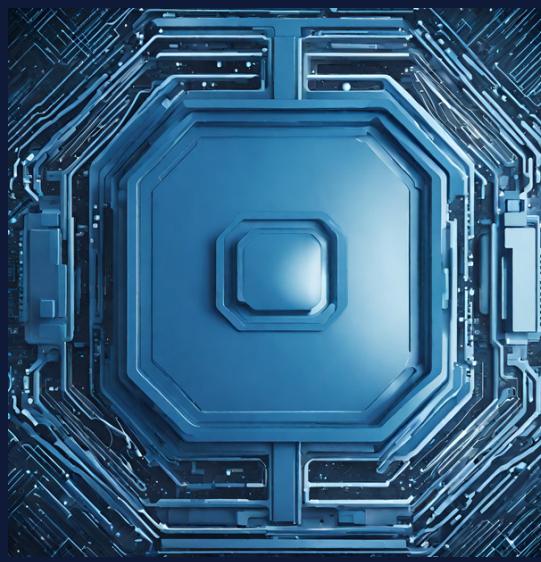
Don't Be Afraid to  
Pivot  
TurtleSim

Document  
Everything  
Commit History  
Isn't Enough

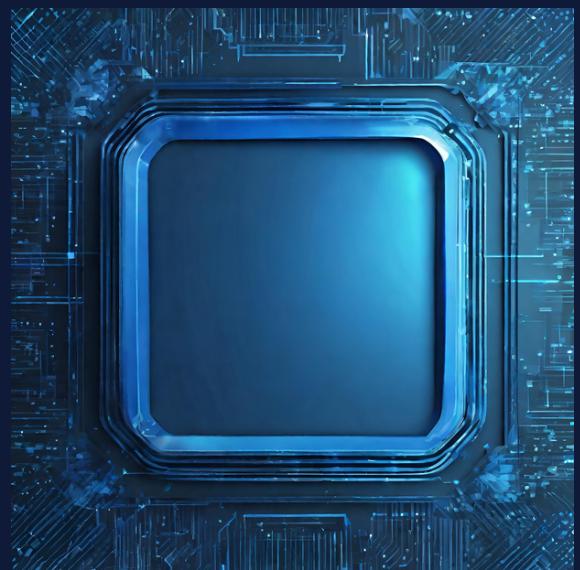
# Recap



**Gesture Control  
Of Robot**



**Implications for  
Human Robot  
Interaction**



**Relative Success  
Given Challenges**

# Thank You!

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🌐 [https://github.com/WillemHueffed/  
SU\\_Robotics](https://github.com/WillemHueffed/SU_Robotics)

