

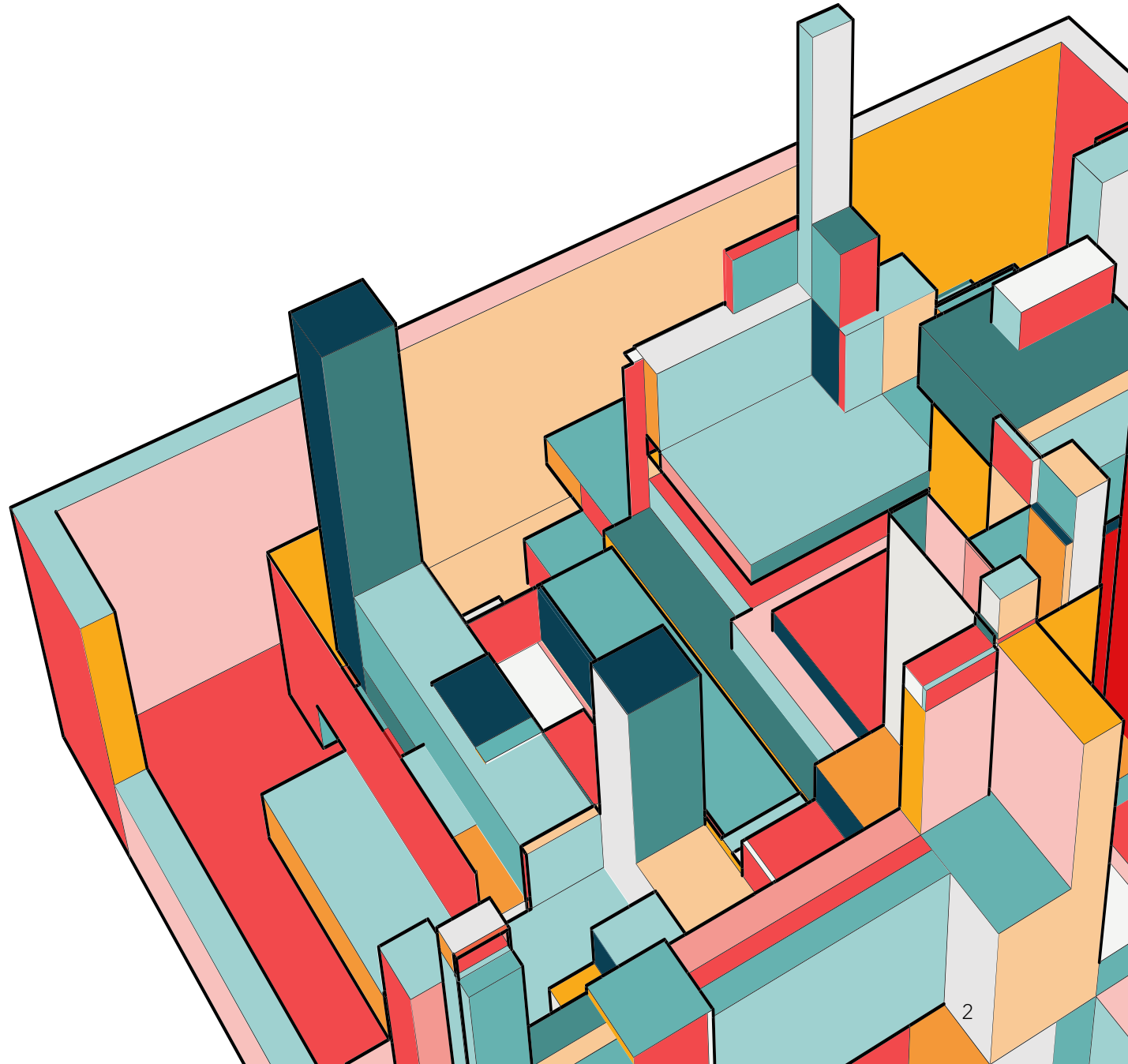


FRANKA PANDA TELEOPERATION SYSTEM – PICK AND PLACE

- A Modular Physics-Based Simulation in PyBullet
- Beyza Erdemir (500484)
Murat Tekin Ulunisan (500485)
- Robot Programming (Fall 2025)

PROBLEM & GOAL

- **Goal:** To develop a robust software architecture for controlling a 7-DOF robotic arm in a physics environment.
- **Problem:** Manual control of high-degree-of-freedom robots is complex due to kinematic redundancy and singularity issues.
- **Solution:** We implemented a custom Inverse Kinematics controller to map simple keyboard inputs to complex joint movements.

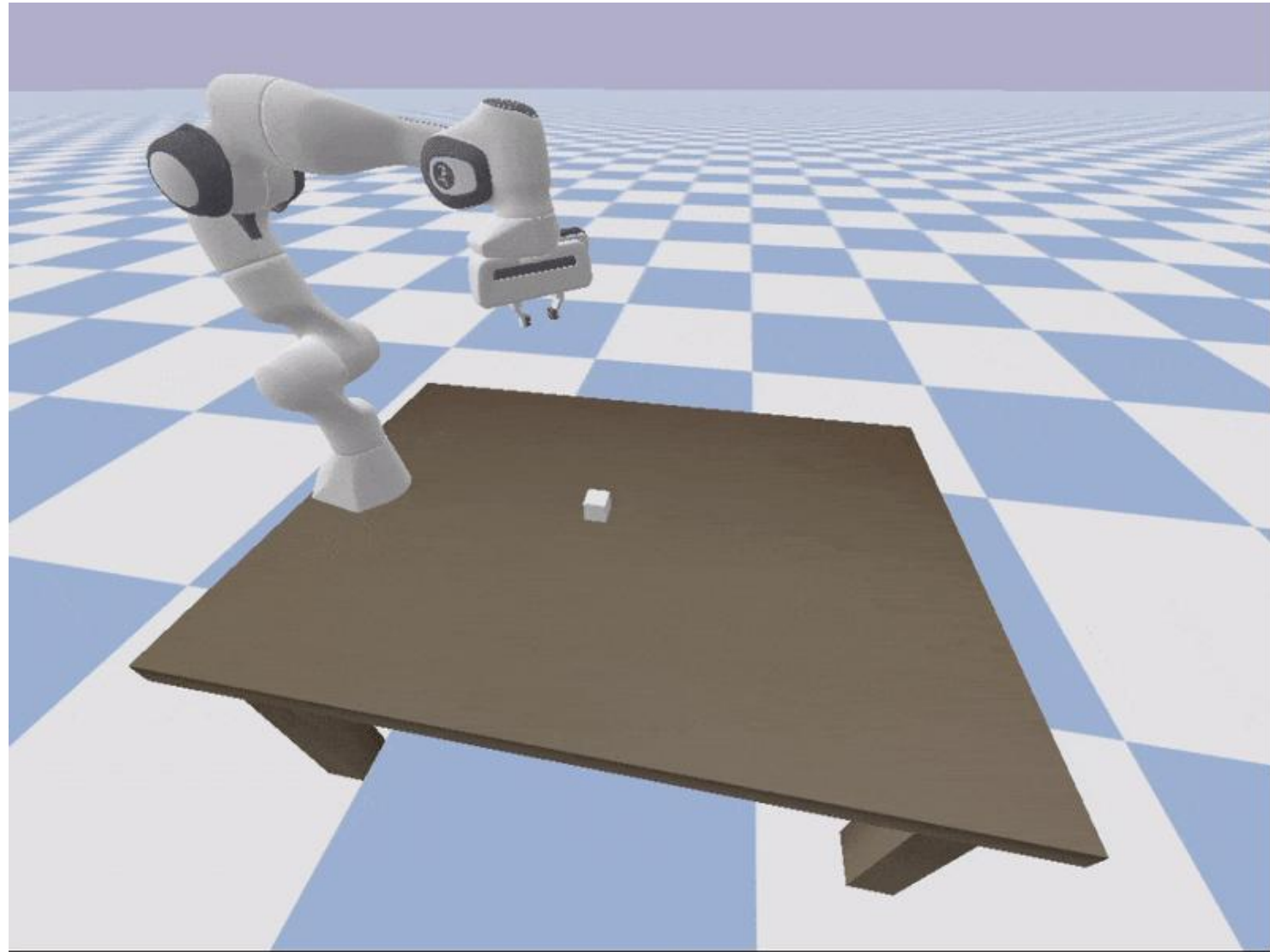


TECHNICAL APPROACH (ARCHITECTURE)

- **Tools:** Python 3.9, PyBullet, NumPy, Docker.
- **Software Principles:** The project strictly follows SOLID principles.
 - Modularity: Code is separated into control, simulation, and tasks packages.
 - Single Responsibility: Separate classes for Camera, Gripper, and IK logic.
- **Key Features:**
 - Real-time Jacobian-based IK Solver.
 - Multi-view Camera System (Main, Side, Eye-in-Hand).
 - Containerized environment via Docker.



DEMO



(Simulation demo video is available in the README file)

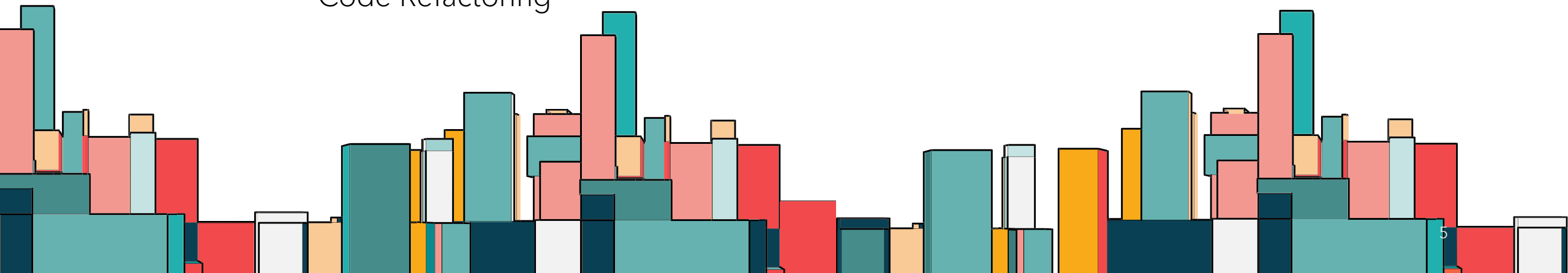
TEAM CONTRIBUTIONS

Beyza Erdemir (500484):

- Simulation Environment
- Inverse Kinematics Logic
- Robot Asset Configuration

Murat Tekin Ulunisan (500485):

- System Architecture
- Camera/Input Systems
- Code Refactoring



**THANK YOU FOR
LISTENING**

