
Artist Robot

With Stroke Imitation

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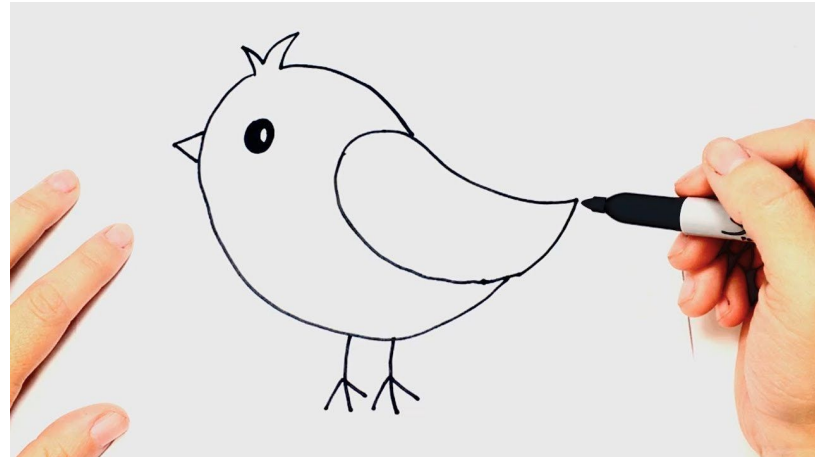
Outline

1. Objectives
2. State machine
3. Trajectory Generation
4. Control Strategies
5. World and Robot Platform
6. Challenges
7. Video Demo
8. Future Works

Objectives

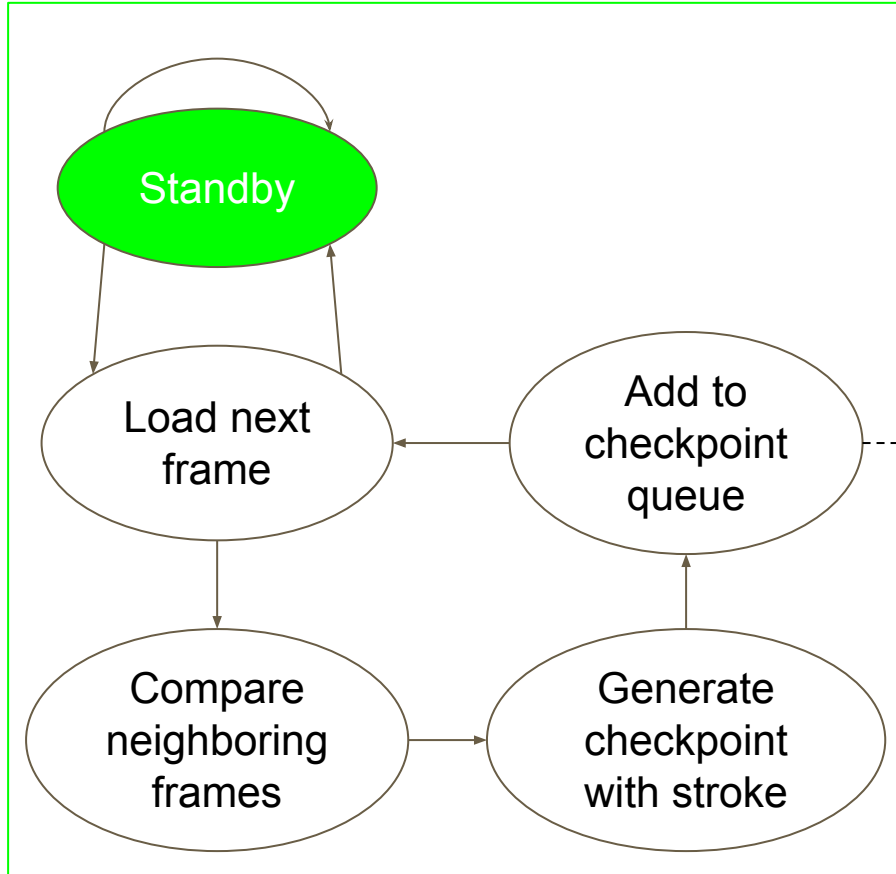
Robot imitates hand drawings

- Input: Video with hand drawing
- Online trajectory generation
- Output: 2d graph with different colors on canvas

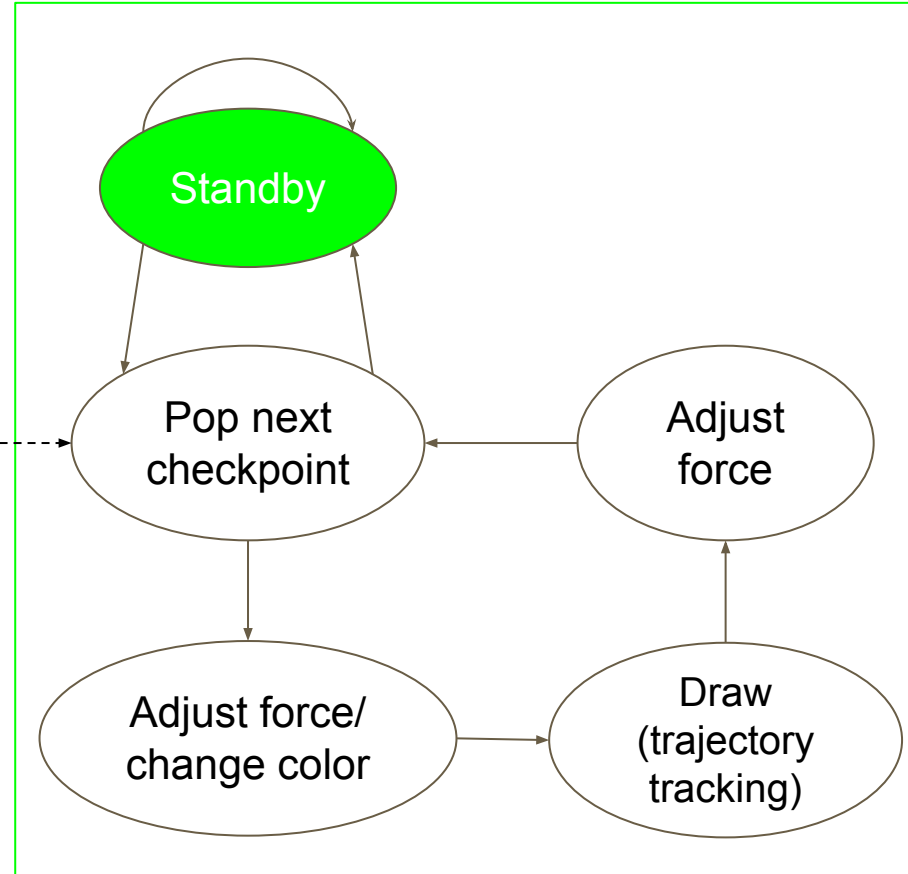


State Machine

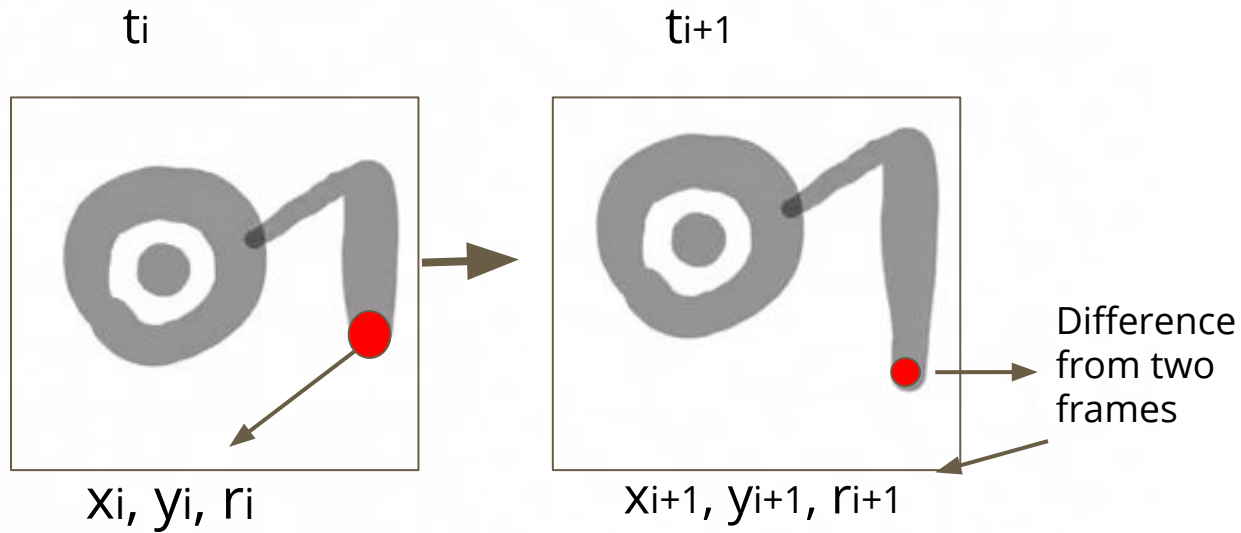
Stroke generation



Robot Operation



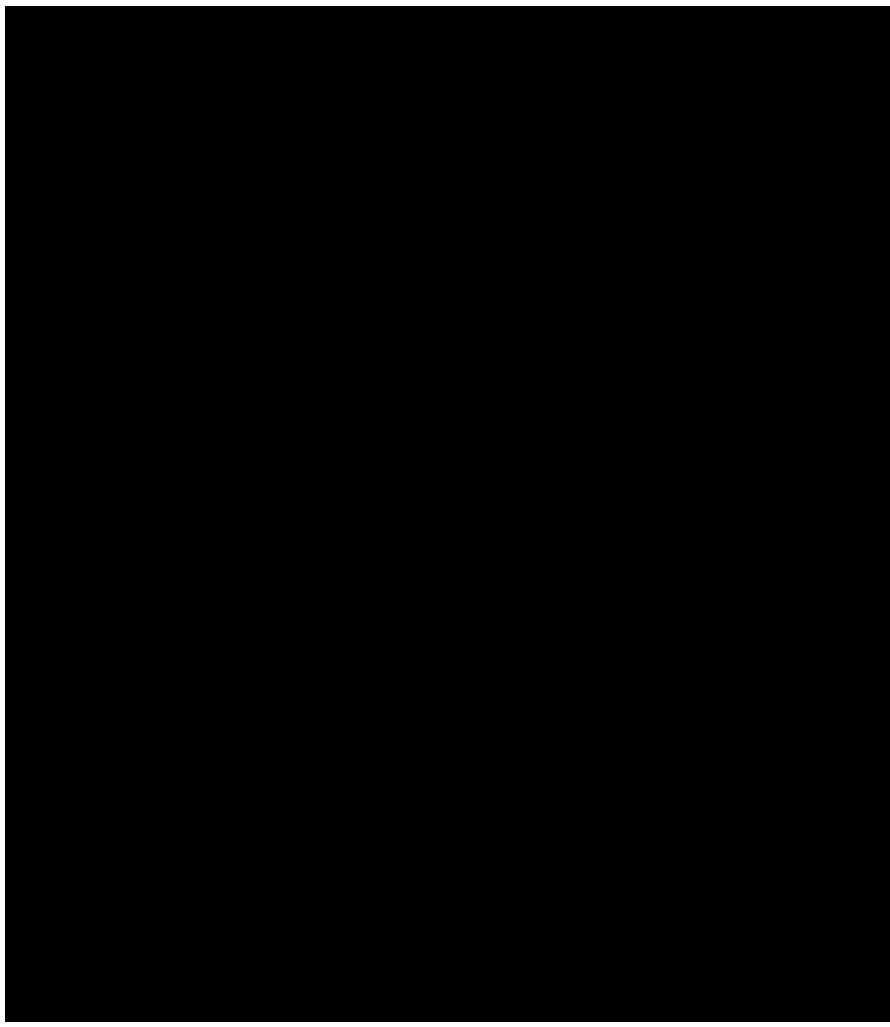
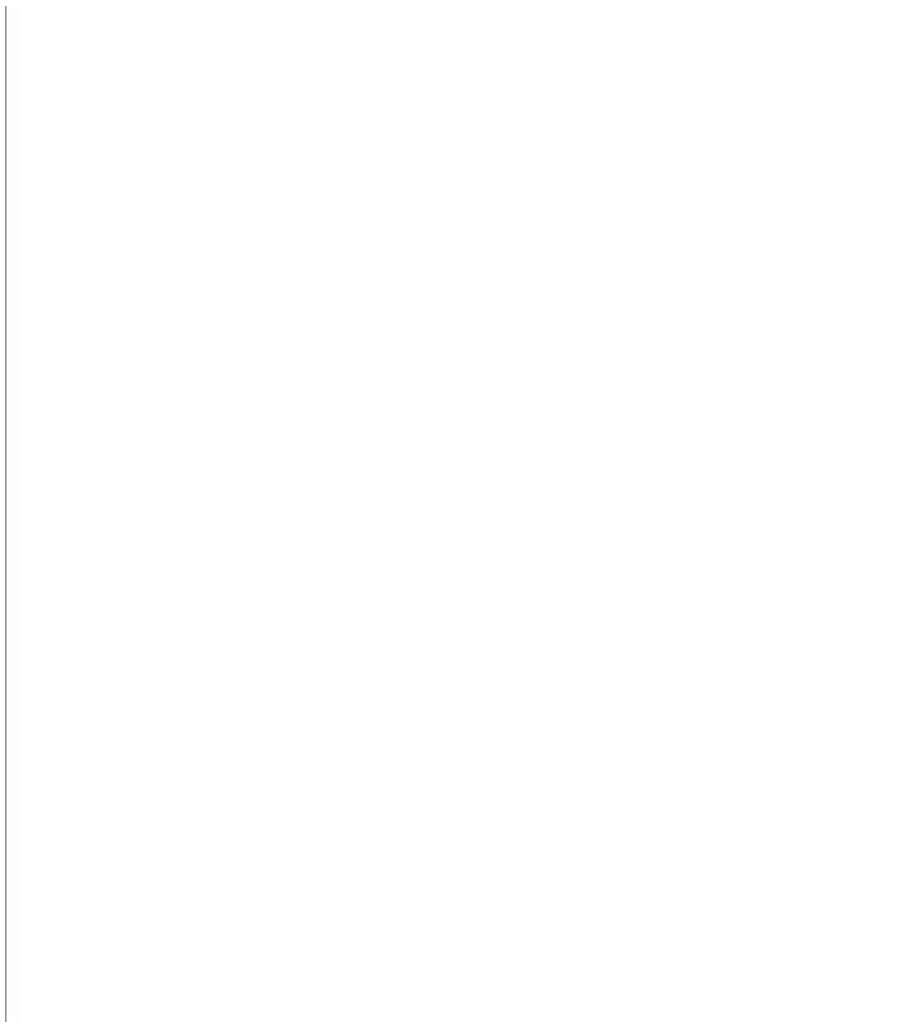
Trajectory Generation



$$F = kr$$

↓

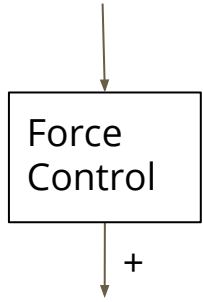
Constant



Control Strategies

Open-Loop Force Control + Trajectory Tracking

$$F = k * r$$

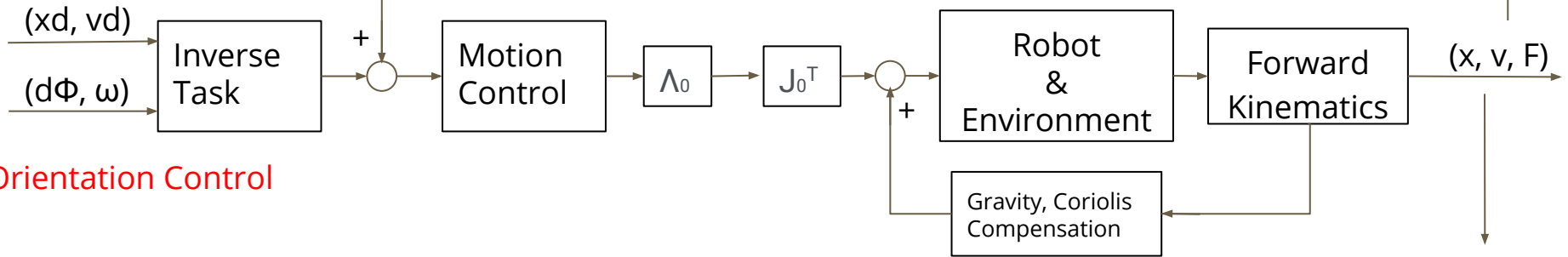


Open Loop Force Control

$x_d += K_f * F$
in direction perpendicular to canvas

Operational Space PD control

Joint Space
Null Space Posture Control



$$r = F/k$$

Simulation

Stroke



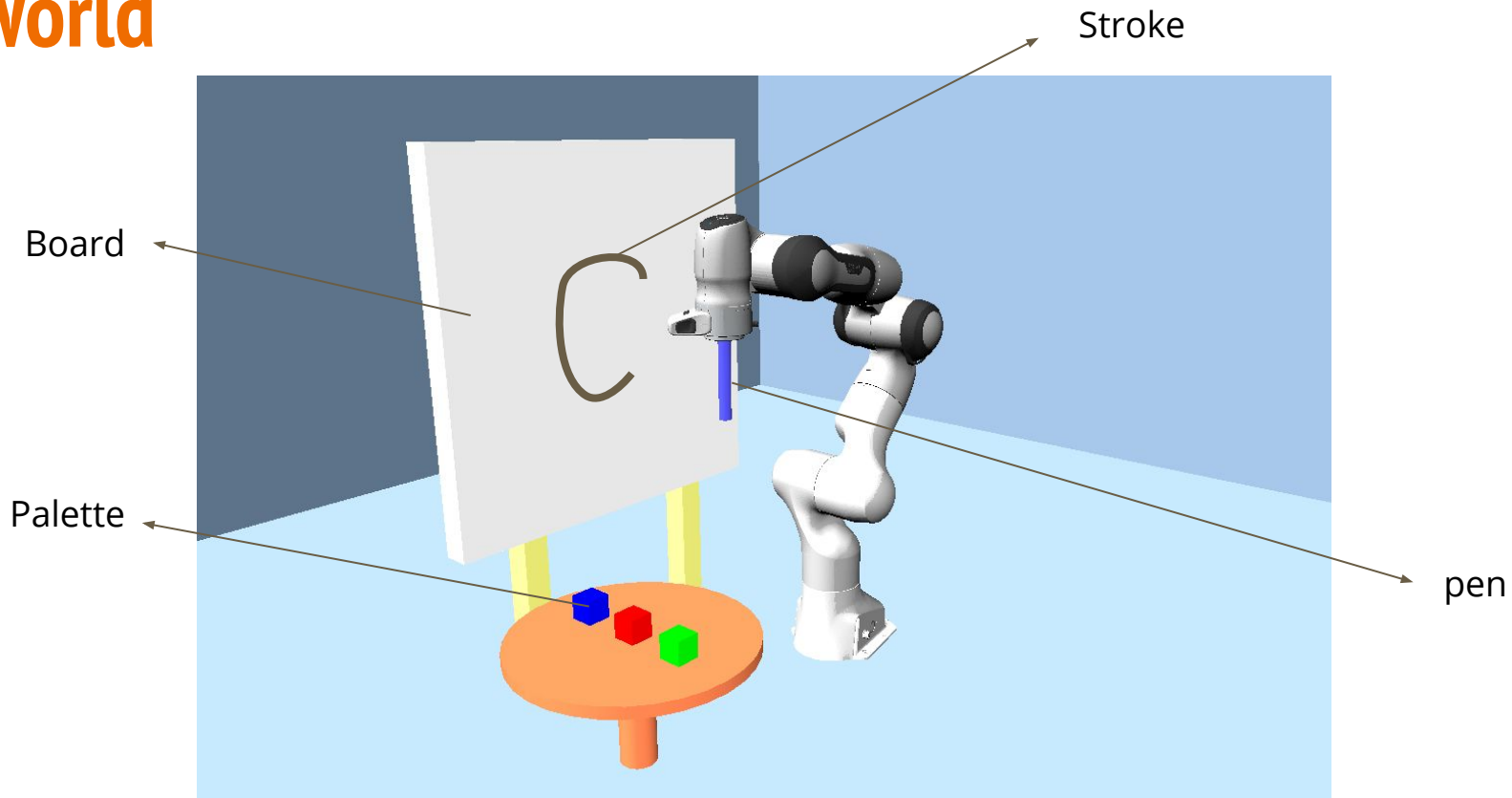
Input



Output

World and Robot Platform

World



Robot Platform

Panda arm + pen

Redis used to transform data:

controller (expected x, y, z, r) \rightarrow simulator

simulator(actual force, x, y, z, r) \rightarrow controller

Challenge

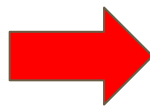
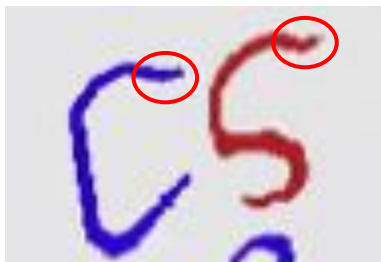
Challenge

1. Stroke simulation in world:

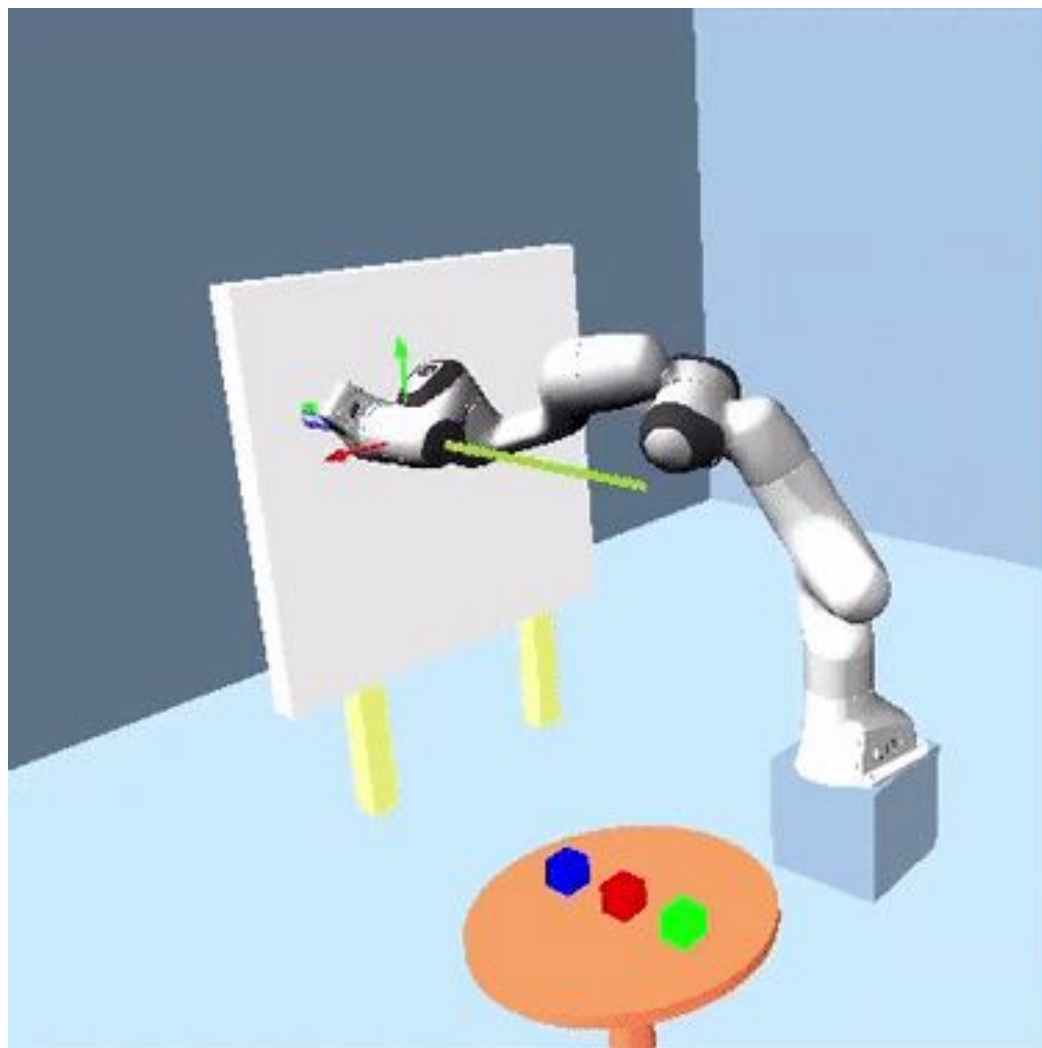
-----Create many cylinders on board

2. Steady state error when touch the board

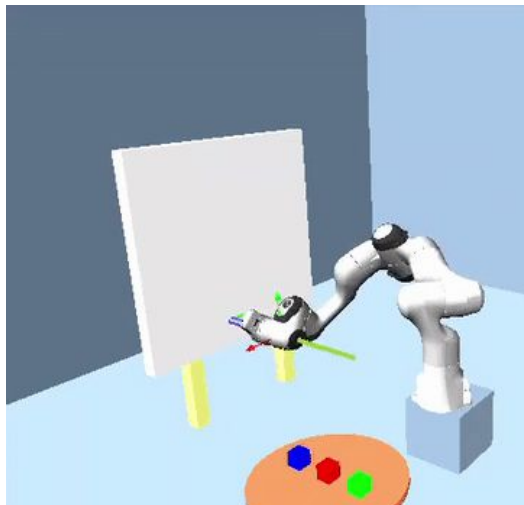
-----Only decrease depth-direction gain



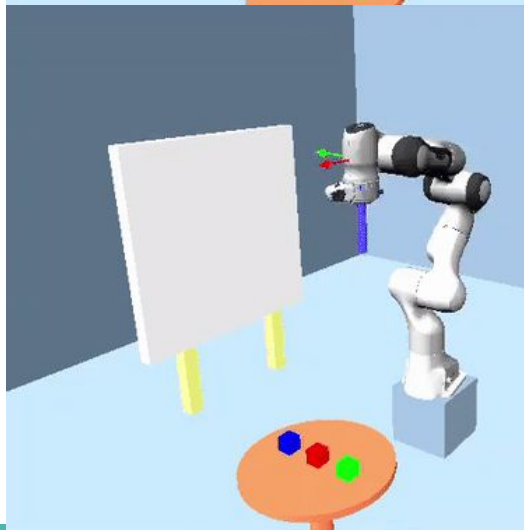
Video Demo



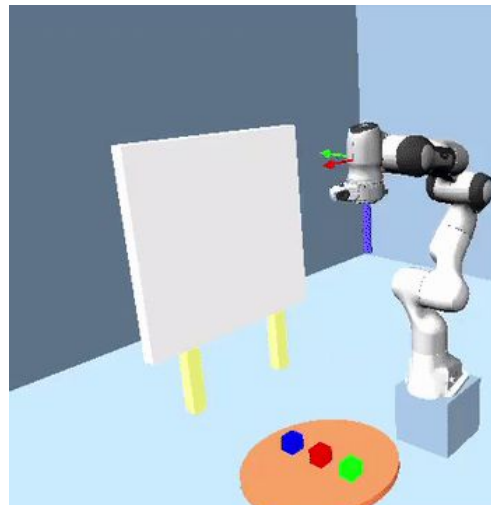
Art Gallery



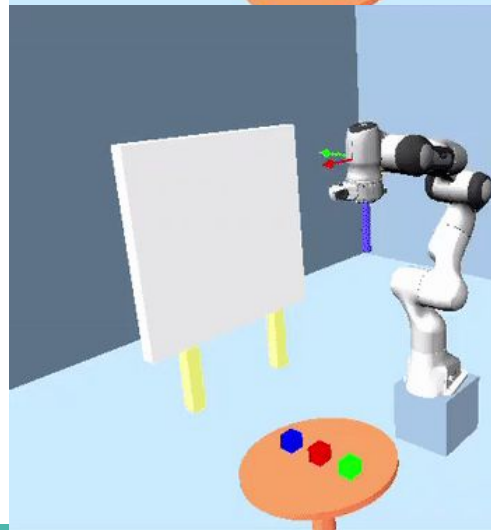
Halloween
Smile



Name Initials
of Members



CS225A



Happy
2021

Future Works

Improve perception module for smoother lines and higher accuracy

Try better force feedback control

Online trajectory tracking and drawing