Robotics 204: Introduction to Human-Robot Systems
Winter 2025

Lab Title: User Interface Design for a Robotic Arm

Submission Type: Individual submission. *Each individual in your group should copy this document and record their answers*

Week 1

Part 1: Setup & Exploration

What kit does your group have?

Deliverable: Fill out the table to demonstrate your understanding of each control method.

Device	Discrete or Continuous or Both?	Limited or Infinite states?	Pros?	Cons?
Rotary Encoder				
Linear Potentiometer				
Button				
Switch				

Part 2: Design your UI

Deliverable: Paste an image of your team's UI and label the components

Part 3: Design Reflection

Deliverable: Answer the following questions in the space provided.

1. What control inputs did your group find the most useful? What were some of the factors that determined how you would bind the devices? Did your group only use only joint control, only end effector control, or a combination of both in your control scheme? Why did you choose the selected approach?

2. What control inputs did your group almost never use? Were there any controls that you didn't bind at all? If so, what were they, and why did your group make the decision to exclude these?

3. Consider the Gestalt and natural mapping principles. Did any of them influence the design phase for your UI? How could you use the Gestalt and natural mapping principles to improve the physical layout of your UI?

4. Consider how you used your depth perception to accurately place the boxes inside the goals. What were some visual cues that helped you place the boxes? What were some challenges you faced while trying to properly align the boxes?

Week 2

Part 4: UI Testing

Deliverable: Record your group's scores for the time trial for each UI design.

	Scores				
Group Number	Student 1	Student 2	Student 3	Student 4	Student 5
1					
2					
3					

Part 5: Testing Data Analysis

Deliverable: Paste a screenshot of your labeled bar chart. Include your observations of any emergent trends.

Brief Analysis: Describe any trends in the distribution of scores and analyze what may be causing them.

Part 6: Reflection Questions

Deliverable: Write your answers to the following questions in the space provided

1. Reflect on the process of trying to learn each groups' control scheme. Were there any control schemes that you picked up right away? What were some challenges when trying to learn other interfaces? How could designers make interfaces more easily learnable?

2. How did your group's design differ from other groups' designs? Did you lay out the controls in a different way? Did you have different bindings? Why do you think other groups chose to lay out their controls the way they did? Discuss at least three differences and explain the reasoning behind each difference.

3. What part of another group's design did you feel was the most intuitive? Did that part connect to Gestalt grouping principles or natural mapping principles? Reference some specific design choices in your answer.

4. Think about your mental model for controlling the robotic arm. How did the other group's design align with your mental model of the task? Did you prefer to use joint control or end effector for the same tasks as the other group did? How would the difficulty of the task change if there was a long time delay when controlling the robot arm?

5. Now that you have tested out other group's design's, is there anything that you would improve about your design? Why or why not? List at least three specific points of your design that you would keep or change, and explain your reasoning.

Grading Rubric

The following rubric will be used to grade your submission.

Week 1

Part	Required Deliverables	Points
Part 1	Filled out table	4 pts for completely filled out table
Part 2	Figure with the final UI layout selected. Picture from the figure is labeled	4 pts for figure (2 pts for picture, 2 pts for labels)
Part 3	Described what inputs were most useful and what determined how they bound the devices	6 pts for inputs that were used and why they selected them
	Described whether they used joint control, end effector control, or a combination of both	6 pts for describing what was controlled (joint, end effector, both) with reasoning
	Described what controls were least useful or not used and why	6 pts for inputs that were least used/not used and why
	Related Gestalt principles to the UI design	3 pts for introducing relevant Gestalt principles and relating them to the UI
	Described visual cues to help place boxes	3 pts for relating to visual cues
	Described challenges in placing the boxes with the given viewpoints	3 pts for describing challenges with viewpoints
	Total Points	35

Week 2

Part	Required Deliverables	Points
Part 4	Table is provided with task times for their team performing the task with their own UI, as well as two other group's UIs	4 pts for filled out table
Part 5	Labeled bar chart is provided with the average scores for the three UIs evaluated	3 pts for labeled bar chart
	Brief analysis of results	3 pts for analysis of trends seen in the results
Part 6	Discussion of using other team's UIs, including aspects that were easy and challenging.	4 pts for discussion of other team's UI (2 pts for each of the other teams)
	Provides a guideline that could support future designers.	2 pts for providing a guideline to support future designers

	Discussion of similarities and differences between the UIs evaluated (e.g., bindings used, control layout). Includes at least 3 differences. Connects other group's designs to Gestalt or natural mapping principles. Connects design of UI to mental models of task. Considers the difficulty/ease of time delay. Discussion of design iterations to improve their design. Includes at least 3 things that should be kept or changed with reasoning.	6 pts for discussing similarities and differences (2 pts per example) 3 pts for relating to Gestalt principles 2 pt for joint/end effector control 2 pts for time delay discussion 6 pts for discussing design iterations (2 pts per example)
	Total Points	35