# Touchless Performance in Non-Preferred Hands

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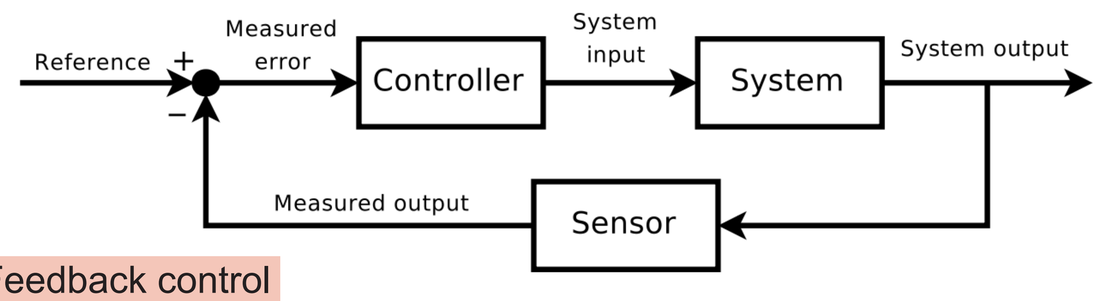
## Introduction

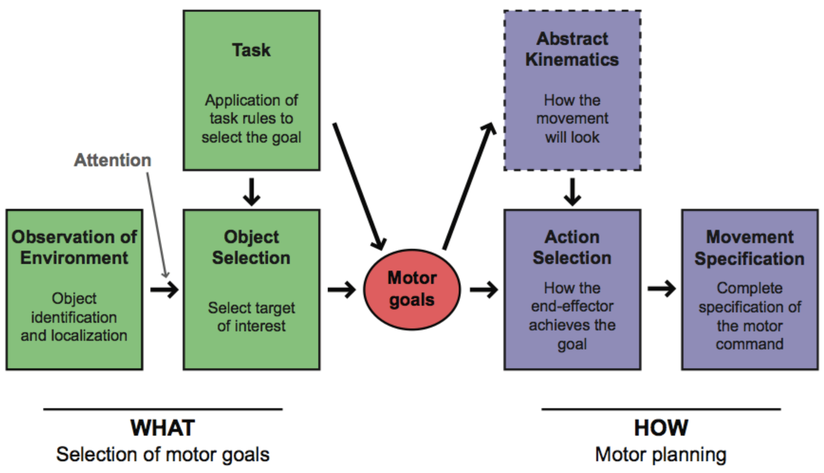
- To build computer interfaces that allow bimanual touchless interactions, we need to understand human performance.
- For instance, how does users' non-preferred hand perform in touchless interactions compared with other input devices and across different tasks.
- To investigate, we're exploring touchless performance in non-preferred hands, particularly motor control.

## Research Question

What kind of motor control is at play when interacting with touchless gestures: feedback control or pre-planned motor plans?



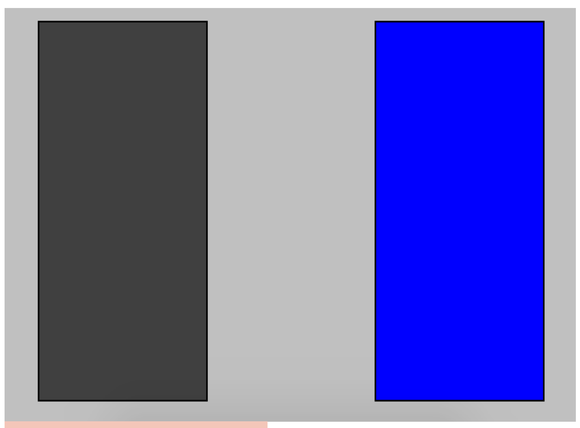

Feedback control




Motor Planning

## Hypothesis

Input requiring less feedback control (e.g., touchless gesture) will produce smaller differences between hands than input requiring greater feedback control (e.g., mouse, stylus).



Dragging Task

Pointing Task

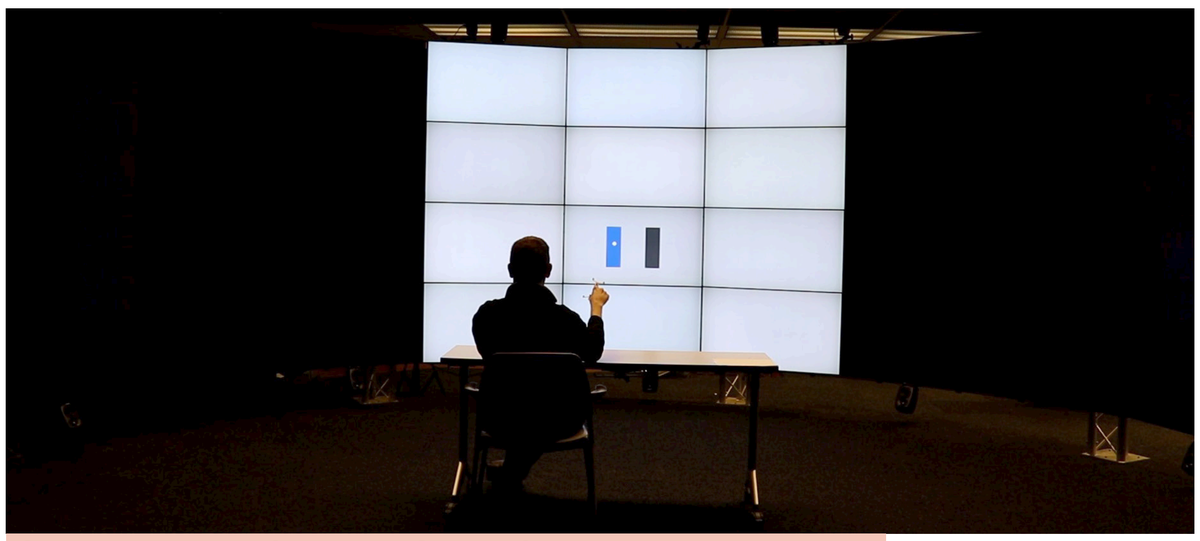
## Design of Experiment

We conducted controlled experiments with two tasks, Using Fitts's one-dimensional task (n = 20).

**Independent Variable**
- Task: Pointing and Dragging
- Interaction Modality: Mouse, Stylus, and Touchless
- Hand: Right and Left
- Index of Difficulty: 16 Level

**Dependent Variable**
- Movement Time
- Error Count
- Movement Path

**Setting**
CAVE2 setup, users in a sitting position, with the elbows resting on the table. Specification of the devices:
- Mouse - Logitech Wireless Mouse M185
- Tablets and stylus - Wacom Intuos Pro Medium
- Tracking Systems - VICON Motion Capture



Sample View of a User Study for Dragging Task

## Results

It is expected that our results will show the input modality requiring less feedback control (i.e., touchless) has smaller differences in terms of performance between hands compared with input modalities requiring greater feedback control such as mouse or stylus.

## Implications and Future Work

- Design of bimanual gesture-controlled applications for motor rehabilitation.
- Facilitating distal interactions with large displays.
- Designing gestural interacting techniques for virtual or augmented reality.
- Does mid-air haptics improve motor learning in VR/AR and help in rehabilitation?
- Using Bayesian decision theory to model C-D gain/imprecision in touchless interactions.

## References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