

Introduction

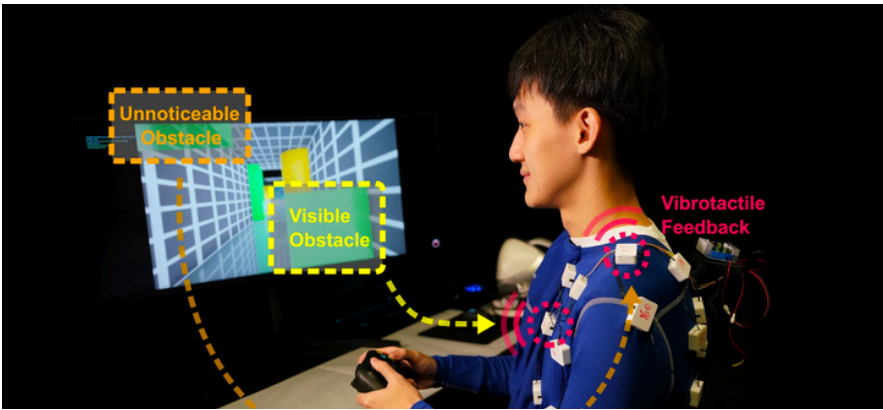
Drone Swarms: Collective Power Unleashed

Drone swarms—fleets of autonomous UAVs working in sync—are revolutionizing technology. From sweeping vast terrains in search and rescue to optimizing crops in agriculture, delivering aid in disasters, or bolstering defense surveillance, their coordinated precision and scalability redefine what's possible, pushing the boundaries of automation.



Haptics: Touching the Future

Haptics brings the power of touch to human-machine interaction, delivering tactile feedback that feels intuitive and natural. By simulating sensations like pressure or vibration, haptic systems allow users to "feel" digital environments, enhancing precision and immersion. In cutting-edge applications, haptics transforms complex control tasks into seamless, sensory-driven experiences.

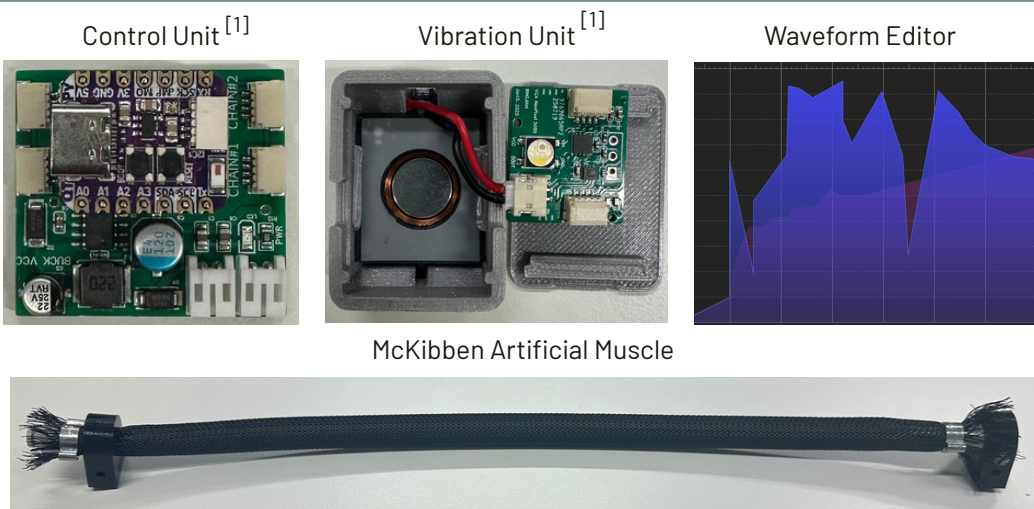


Haptics Meets Swarms: A Game-Changer

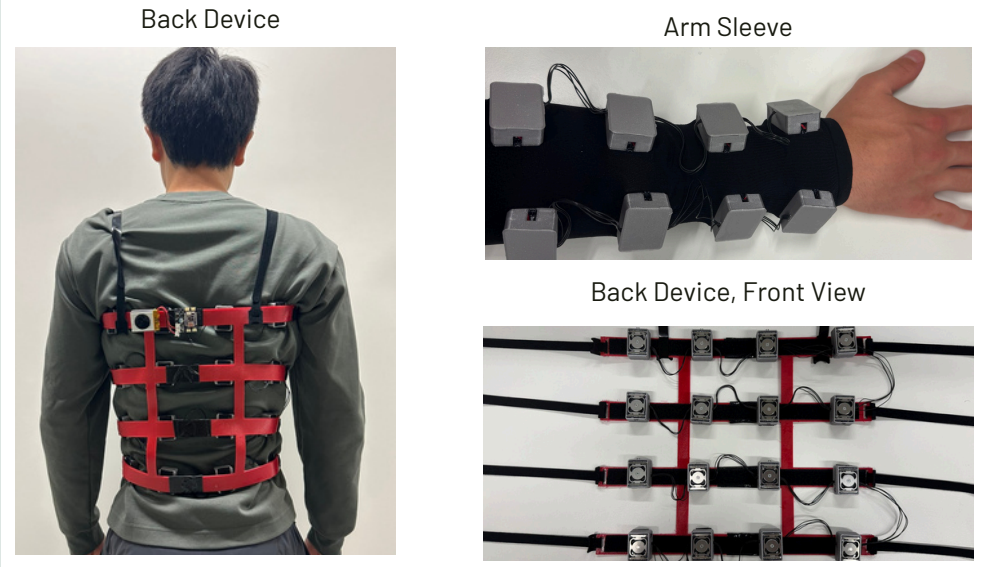
Combining haptics with drone swarms creates a groundbreaking synergy. Tactile feedback empowers operators to intuitively guide complex swarm behaviors, enhancing control in missions like search operations or tactical maneuvers. This fusion of touch and technology unlocks new levels of efficiency, precision, and impact across industries.



Devices



Wearable Devices



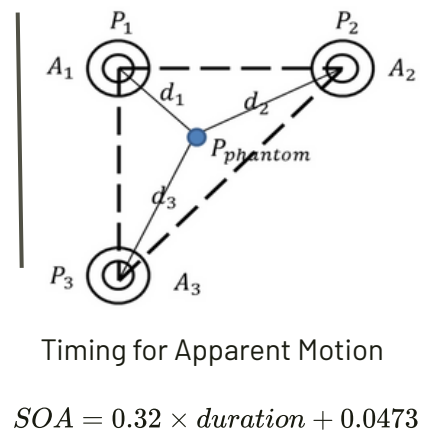
Study: Balancing Information Clarity and Complexity

Idea: Compare & Combine three pattern types

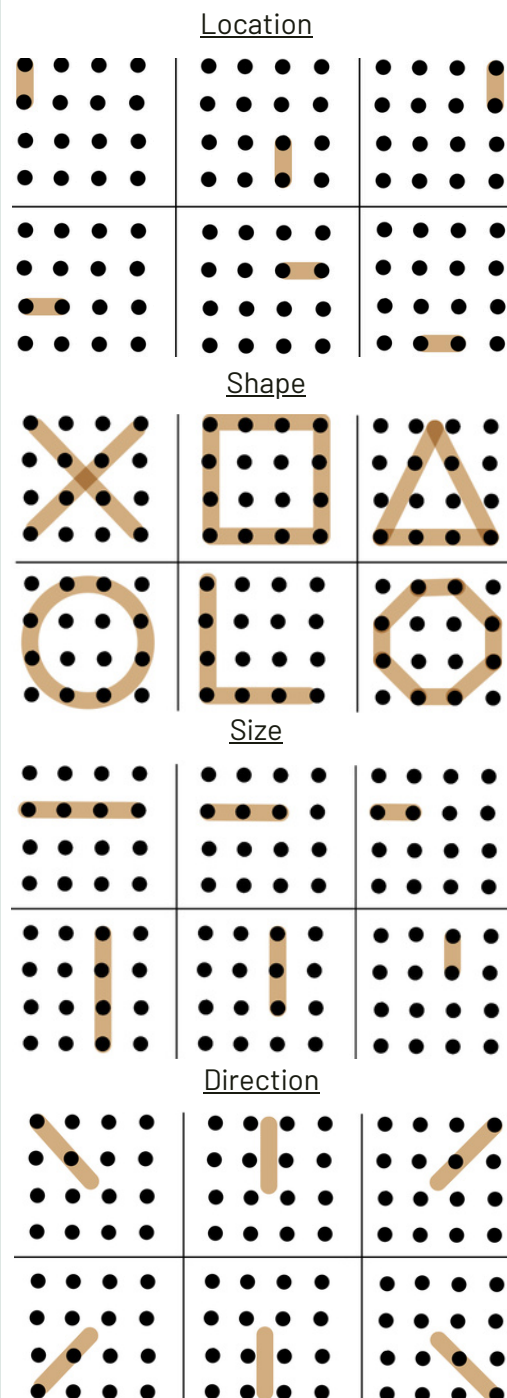
- Buzz: Constant Vibration
- Pulse: On/Off Pulsations
- Motion: Continuous Brush Sensation

Motion Rules: [2]

Energy Summation $A_v^2 = \sum_{i=1}^3 A_i^2$ Intensity for Phantom Sensation $A_i = \sqrt{\frac{\frac{1}{d_i}}{\sum_{j=1}^3 \frac{1}{d_j}}} A_v$



Phase A: Single pattern comparison

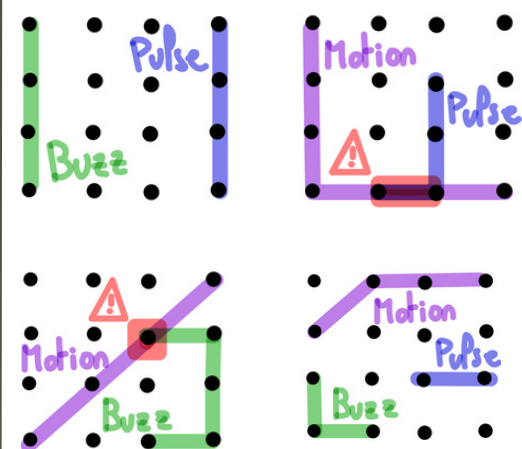


Outcome:

- Best Pattern Type for each events
- Measurements of Information Transmission per pattern

Phase B: Pattern combination

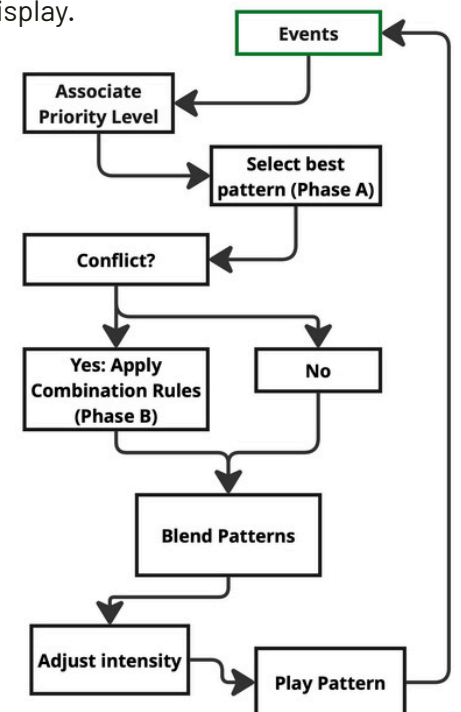
Idea: Run multiple patterns simultaneously, including conflict zones, to study their interactions



Outcome: Pattern Combination rules

Phase C: Adaptive Haptic Orchestrator

Idea: Combine Phase A & B rules into a priority-based algorithm to optimize pattern combinations for multi-info display.



[1] Huang et al. - VibraForge: A Scalable Prototyping Toolkit For Creating Spatialized Vibrotactile Feedback Systems

[2] Park et al. - Rendering Moving Tactile Stroke on the Palm Using a Sparse 2D Array