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Towards the Fusion of Gaze and Micro-Gestures

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Gaze as Input

- Eye gaze is fast, efficient, widely available in VR headsets, and typically aligns with user intent.
- Gaze must be combined with an interaction mechanism to be used as input (eg. dwell, blink, controller).

Micro-gestures as Input

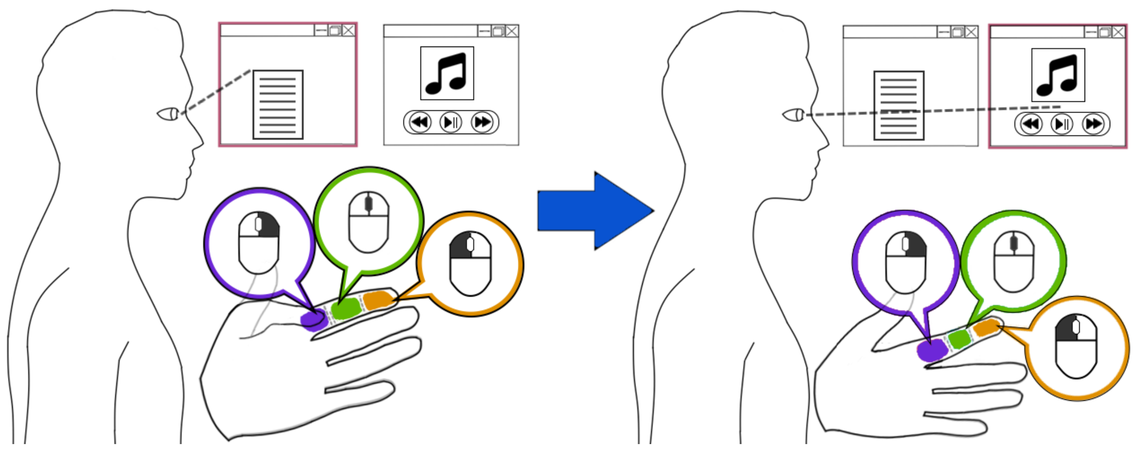
- Micro-gestures are subtle, available finger movements.
- A pinching gesture is a popular method to confirm a gaze selection.
- To perform more than one type of selection, we must introduce additional micro-gestures.

Combining Gaze and Micro-gestures

When combining gaze with multiple micro-gestures for input, we find two design approaches.

Statically defined micro-gestures

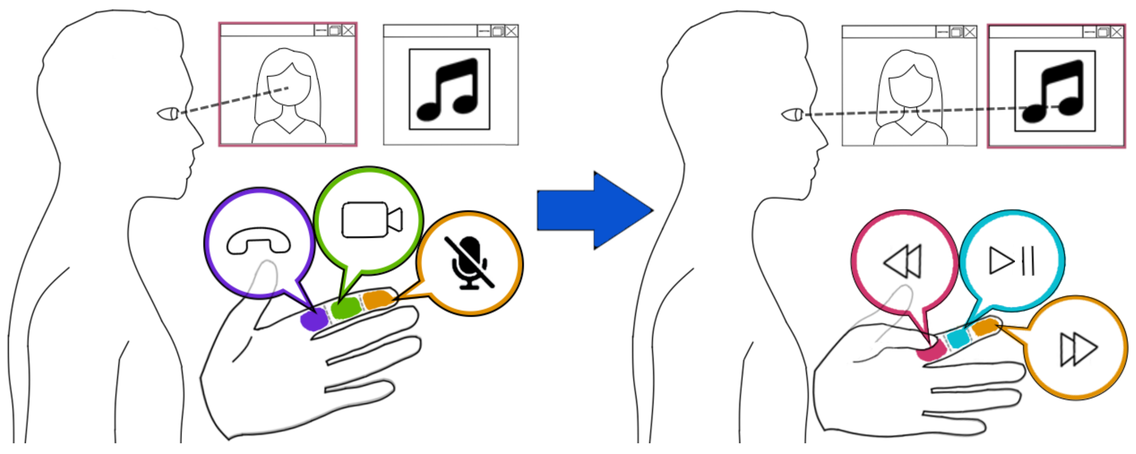
- Micro-gestures deliver set functionality to the precise gaze location.
- Mimics the functionality of a mouse; predefined actions are applied at the cursor's position.
- Effective at issuing generic commands across multiple objects and widgets.
- Employed in existing gaze and micro-gesture works.



1. The user presses the base of their finger. This summons a context menu at the gaze point.
2. Regardless of where the user looks, the functionality of the micro-gestures does not change.

Dynamically defined micro-gestures

- The function of a micro-gesture is defined by the gaze context.
- Micro-gestures execute functionality relevant to the application in focus.
- Analogous to function keys on a keyboard altering their roles depending on the application in focus.
- Allows application-specific functionality, modulated nearly instantaniously with gaze.



1. The user looks anywhere at a video call application. Pinching the finger segments now operates the video call.
2. The user glances to their music player. The micro-gestures now operate the music player.

Challenges

Thumb to Finger-Segment Tracking:
- Available optical trackers struggle to distinguish between fingers.
- Gloves and metal strips affect the tactile and haptic experience, and increase set-up time.

Mode Confusion:
- Effective feedback that does not disrupt interactions is needed. This could also improve discoverability.

Learnability & Memorability:
- Assignments should follow user profiles (novice/expert) and focus on frequently used tasks.

Always-on Input:
- Context-aware systems needed to avoid accidental gaze or micro-gesture inputs.

Future work

Unintrusive Feedback:
- How do we teach users new mappings? What happens when a user forgets what a gesture does?

User studies:
- Will users choose to use additional micro-gestures?
- Will additional micro-gestures introduce a significant task load?
- Will additional micro-gestures improve user experience?
- Can users transition between static and dynamic micro-gestures?

Customisation:
- How could we allow users to bind micro-gestures at runtime?

Implementation:
- **How can micro-gesture detection be made easy for researchers and users?**