Typing in Mixed Reality: Does Eye-Tracking Improve Performance?

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Goal: Enable 10-finger typing on virtual keyboards by using eye-tracking to reduce accidental collisions.

Introduction

The Microsoft HoloLens is a mixed-reality headset capable of superimposing virtual objects on the real world. Text entry on virtual keyboards is very different from typing on a physical keyboard, and so far, our research has only focused on typing using the index fingers. Our current goal is to explore what text-entry might look like when users can use all 10 fingers.

Problems

- HoloLens hand-tracking struggles to correctly track the ring and pinky fingers.
- When typing with 10 fingers, the lack of tactile feedback leads to accidental collisions with keys.

As a result, typing with 10 fingers tends to be slow, and users make a lot of mistakes when entering text.

Proposed Solution

By integrating the HoloLens eye-tracker into a virtual keyboard, we can choose to activate only those keys near where the user is looking. Since our gaze naturally seeks the key we intend to type, we anticipate that this will reduce or eliminate the eyestrain incurred by other keyboard implementations that require a dwell time. Our hypothesis is:

Our implementation of eye-tracking will reduce accidental collisions, increasing the speed with which users can type using 10 fingers.

Progress

12 Participants have completed the study, with our intention being to run through at least 12 more in the future.

Experiment

Participants are asked to type 10 sentences in four different counterbalanced conditions:

- Index fingers only, without eye-tracking
- Index fingers only, with eye-tracking
- 10 fingers, without eye-tracking
- 10 fingers, with eye-tracking


Virtual keyboard used in the experiment.
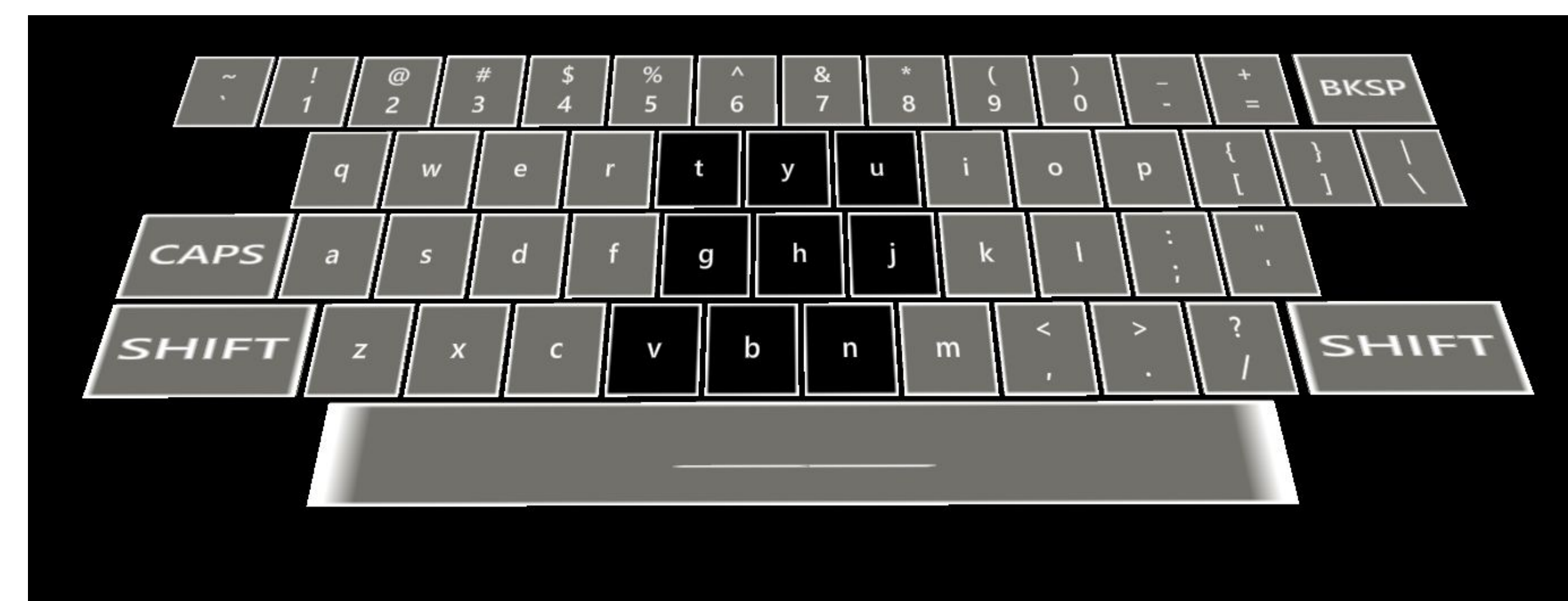
During conditions where eye-tracking was implemented, inactive keys would be grayed out, and only keys near the user's gaze position appear transparent.

Following each condition, participants are asked to complete a questionnaire to gather their opinion. Quantitative data such as WPM, error rate, and eye-tracking information is also recorded by the HoloLens.
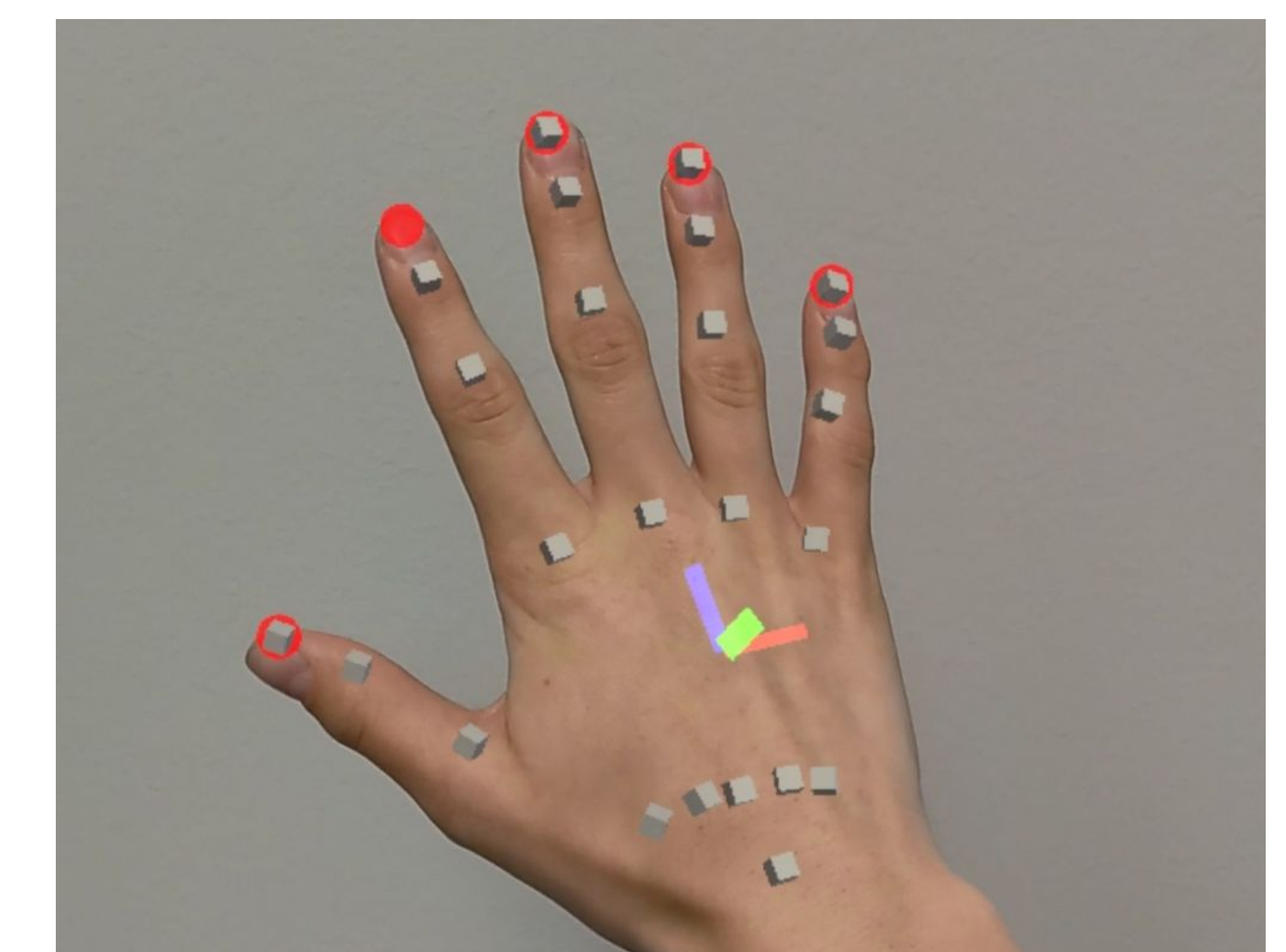
Throughout the experiment, "active" fingers that the user is allowed to use are highlighted with a red sphere that follows the fingertip.