Gaze Optimized Keyboard for Individuals with Severe Motor Impairments

Anusha Broekhuyse[1,2], Mahya Mirbagheri[1,3], Tom Chau[1,3]

1 Bloorview Research Institute, Holland Bloorview Kids Rehabilitation Hospital
2 Integrated Biomedical Engineering and Health Sciences, McMaster University
3 Institute of Biomedical Engineering, University of Toronto

Background

Limited Opportunities: Searching the internet and using a computer is an integral part of everyday life, however, individuals with severe motor disabilities cannot do this independently.
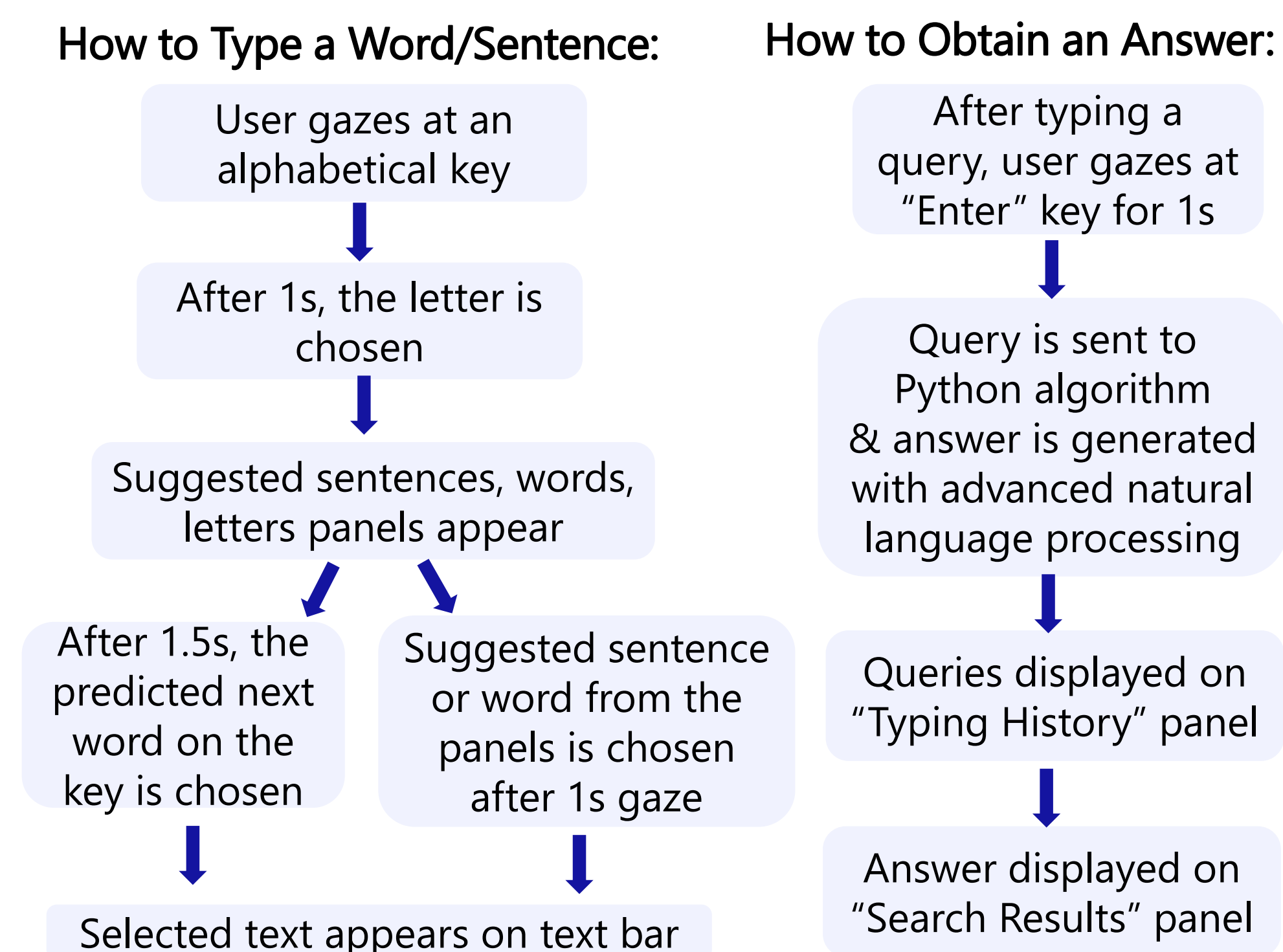
Microsoft Hololens2: Mixed reality (AR/VR) headset with eye-tracking software to enable user-environment interaction without the use of fine motor skills.

Augmented Reality (AR): Technology that overlays computed-generated images over a user's view of the real world.

Objective

Develop a user-friendly, AR keyboard that resembles the internet through a question/answer system and increases gaze-based typing speed (words per minute) and performance.

Methods

How to Type a Word/Sentence:

- User gazes at an alphabetical key
- After 1s, the letter is chosen
- Suggested sentences, words, letters panels appear
- After 1.5s, the predicted next word on the key is chosen
- Suggested sentence or word from the panels is chosen after 1s gaze
- Selected text appears on text bar

How to Obtain an Answer:

- After typing a query, user gazes at "Enter" key for 1s
- Query is sent to Python algorithm & answer is generated with advanced natural language processing
- Queries displayed on "Typing History" panel
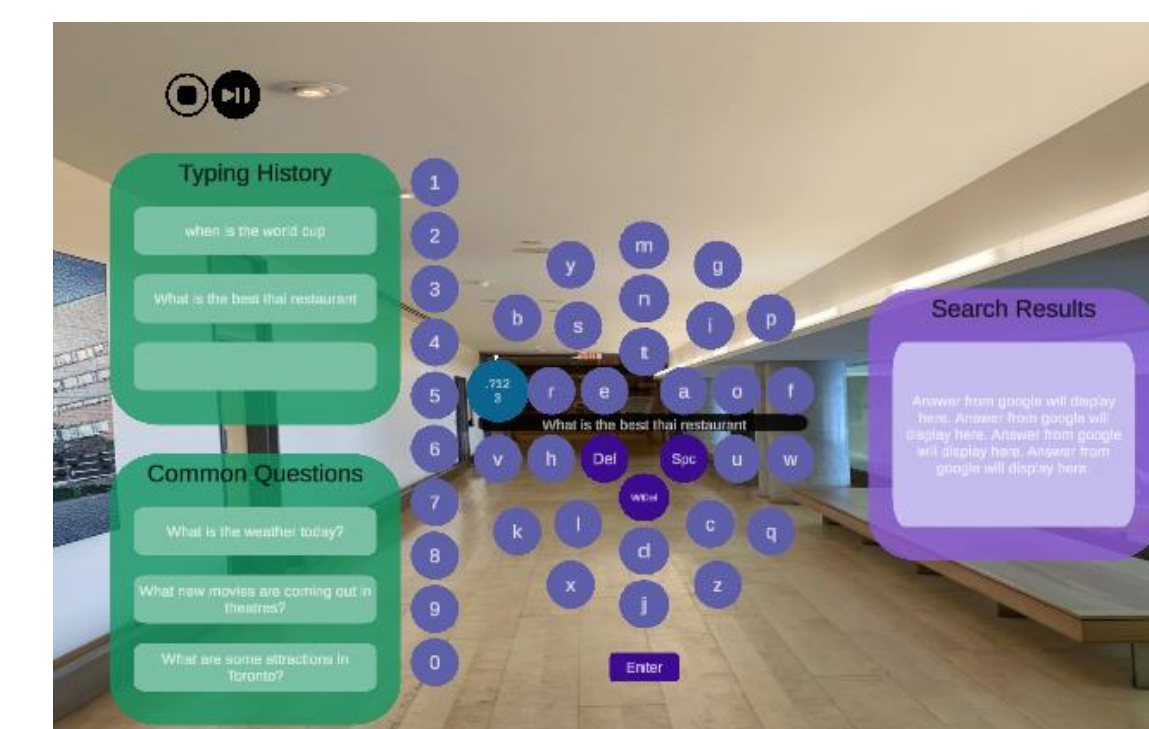- Answer displayed on "Search Results" panel

A User-Friendly, Gazed Based Augmented Reality Keyboard Application can Increase Gaze Based Typing Speed

Scan QR for a Project Demo

Gaze-Based Keyboard Interface

Overview of the Keyboard Features & Design Improvements

1. Numerical Keyboard; Typing History & Common Questions Panel
2. Word & Sentence Predictions
3. Visual Ring Timers
4. Next Word Predictions
5. Search Results Panel

Results

36 WPM

Pilot testing revealed that users can type at **36wpm** using the **new interface design** in comparison to **17.35wpm** with other gaze-based interfaces

17.35 WPM

Conclusion & Next Steps

The new structure of the interface provides a **faster method** of typing queries and obtaining answers. Next steps include obtaining **user-feedback** about the functionality of the interface and conducting a study to **measure typing speed (wpm)**
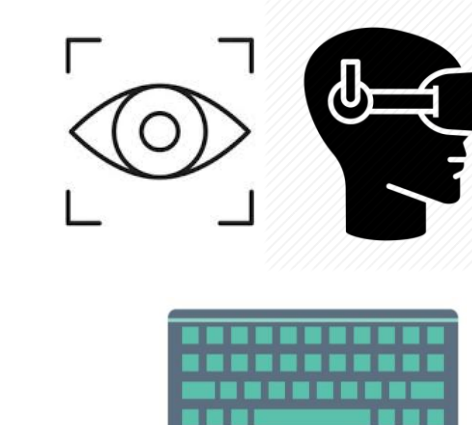
Relevance

Children (12+) & Adults with severe motor impairments will:

1. Experience **independence** while asking factual questions and receiving answers
2. **Exercise** their brains throughout the process of rehabilitation
3. Experience the **joy** of using technology

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