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Using Eye Gaze for Interactive Computing

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Using Eye Gaze for Interactive Computing

ABSTRACT

User input to desktop and laptop computers is largely via the keyboard, pointing devices such as a mouse/trackpad, and to some extent, the touchscreen. Thus far, using eye gaze as an input, based on data from on-device cameras (e.g., laptop or desktop cameras) requires calibration steps; even so, since such cameras are relatively far from the user, the resulting input lacks precision. This disclosure describes techniques for human-computer interaction based on eye gaze derived from the user's smart glasses. With user permission, the user's eye movements, as captured by the camera on the user's smart glasses, provides an additional interactive channel to the user's other devices (e.g., laptop, desktop, etc.) to enable eye-gaze based actions such as scroll focus, text focus, notifications dismissal, window focus, auto-scrolling of text, etc.

KEYWORDS

- Eye gaze
- Gaze tracking
- Smart glasses
- Augmented reality
- Human-computer interaction (HCI)
- Input mechanism
- Interactive computing
- Visual context detection

BACKGROUND

User input to desktop and laptop computers is largely via the mouse (or other pointing devices such as a trackpad) and the keyboard, and to some extent, the touchscreen. The use of large monitors has led to an increase in the amount of mouse movement required, which has led to users increasing the mouse sensitivity. Thus far, using eye gaze as an input, based on data from on-device cameras (e.g., laptop or desktop cameras) requires calibration steps; even so, since such cameras are relatively far from the user, the resulting input lacks precision.

DESCRIPTION

This disclosure describes techniques for human-computer interaction (HCI) based on eye gaze derived from the user's smart glasses. The camera on the user's smart glasses focuses on the user's eye movements to provide an additional interactive channel.

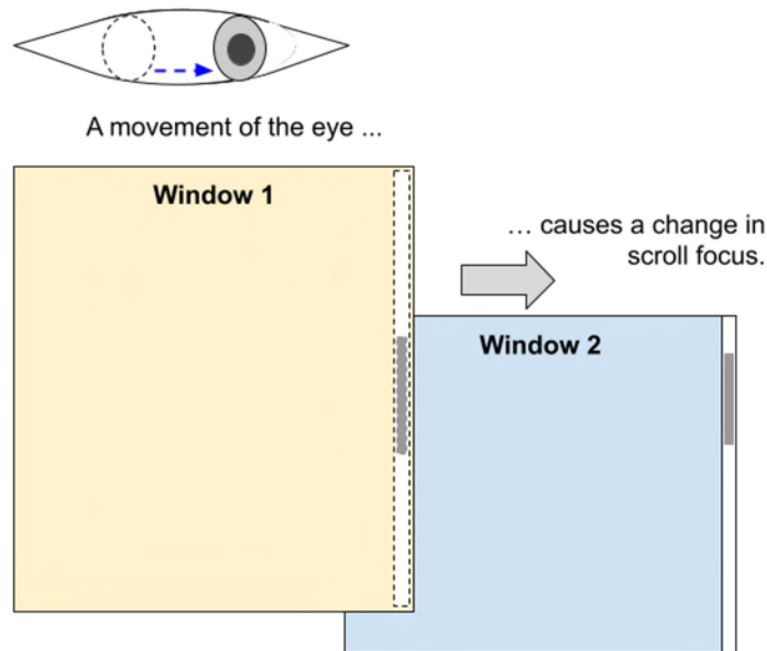


Fig. 1: Moving the scroll focus between windows

With user permission, computer vision techniques are applied to identify a computer screen in front of the user. Eye-gaze tracking techniques on the smart glasses enable a number of cross-device use cases, such as:

- **Moving scroll focus between different windows:** Conventionally, operating systems can change scroll focus, but with a mouse, e.g., with a mouse-over that lacks a down-click. As illustrated in Fig. 1, using eye-gaze input, when the user looks at a particular window on the screen, the scroll focus moves to the window. A turn of the mouse wheel

(or two-finger scrolling on a touchpad) causes the scroll-focused window to scroll as opposed to the active window.

- **Moving the active focus between text fields:** The user looks at a particular string of text, and a mouse click or click-and-drag highlights that piece of text.
- **Dismissing notifications:** The user looks at a notification and, when it is detected using eye-gaze tracking that the user has finished reading the notification, the notification is automatically dismissed. The notification is dismissed after, not before, it has been read. Currently, the dismissal of notifications requires user intervention or the expiry of a timer.
- **Auto-scrolling a large area of text:** As the user reaches the bottom of the screen while reading, the screen auto-scrolls upwards.
- **Intelligently displaying alignment guides in graphics programs:** Spreadsheets, sketching applications, word processors, presentation programs, etc. have invisible, grid-like alignment guides that become visible when an object is being moved. Currently, alignment guides are made visible based on the proximity of objects, or against all targets on screen; there are times when the user cannot see the sought-after alignment guide. Using eye-gaze tracking, alignment guides can be made visible based on the object that the user is actively manipulating with the mouse and a second target that the user is looking at.
- **Displaying a user-invoked pop-up at the most appropriate location of the screen:** A pop-up invoked by the user, e.g., an OS-wide search field triggered by a keyboard shortcut, can be displayed directly where the user happens to be actively looking.

- **Enabling voice actions** to interpret what the user utterance “this” means based on the user's active gaze.

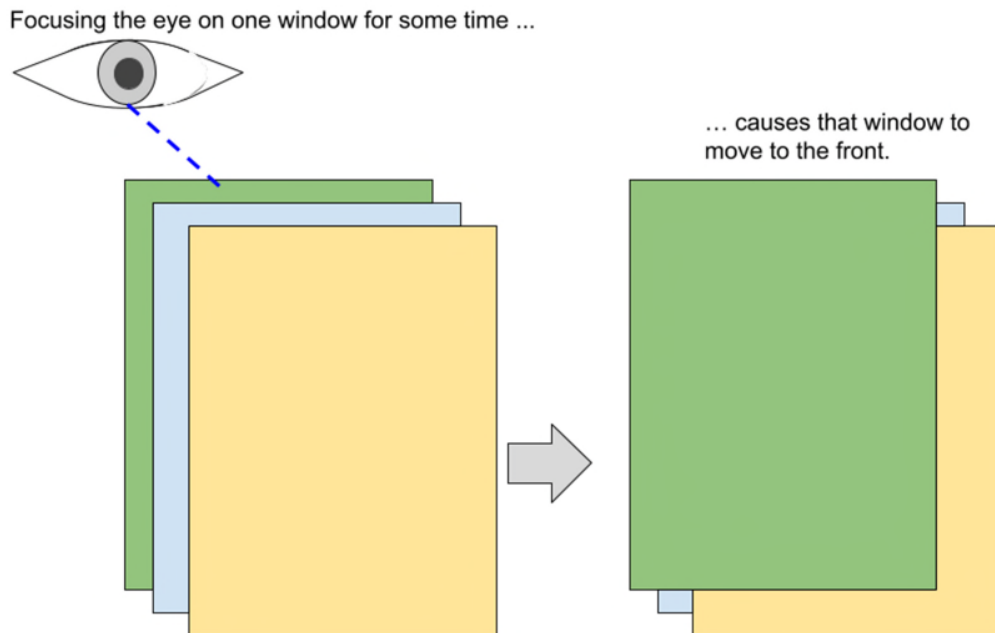


Fig. 2: Bringing background windows to the front of the stack

- **Bringing a background window to the front of the stack** on a slight delay when the user looks at it (as illustrated in Fig. 2).
- **Bringing windows to the front of the stack** when looking at the corresponding icon, e.g., on a dock, taskbar, desktop, or other location where icons are displayed.
- **Providing context on the user's current cognitive load and activity** on the laptop/desktop device back to a centralized context engine.

CONCLUSION

This disclosure describes techniques for human-computer interaction based on eye gaze derived from the user's smart glasses. With user permission, the user's eye movements, as captured by the camera on the user's smart glasses, provides an additional interactive channel to

the user's other devices (e.g., laptop, desktop, etc.) to enable eye-gaze based actions such as scroll focus, text focus, notifications dismissal, window focus, auto-scrolling of text, etc.

REFERENCES

- [1] Kumar, M. "Gaze-enhanced user interface design (Doctoral dissertation, Stanford University)." (2007). Available online at <https://hci.stanford.edu/research/GUIDe/publications/Manu%20Kumar%20Dissertation%20-%20Gaze-enhanced%20User%20Interface%20Design.pdf>
- [2] "Notification." <https://developer.mozilla.org/en-US/docs/Web/API/Notification> accessed on Mar. 14, 2021.