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In-Pocket Tap on Paired Device as Input to Augmented Reality Glasses

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ABSTRACT

While augmented reality glasses can detect input provided via a handheld controller, via hand gestures, via voice, etc., such input can be infeasible in certain contexts due to physical limitations or social convention. Some AR glasses are paired to a second device that provides computing and/or other resources. This disclosure describes the use of connected electronic devices that are typically available to a user, e.g., a smartphone, an earbud case, or earbuds with tap sensitivity, to provide input to AR glasses. By utilizing input mechanisms on such devices, the user can perform operations such as rotation of body-locked AR content around the user.

KEYWORDS

- In-pocket tap
- Unobtrusive input
- Hands-free input
- Body-locked object
- Object rotation
- Earbud case
- Augmented reality (AR)
- Virtual reality (VR)
- Mixed reality (MR)

BACKGROUND

Augmented reality (AR) glasses allow for a variety of use cases, however interacting with AR devices can be cumbersome. Users can provide input via a handheld controller, via voice, via gestures etc. It may be difficult or impossible to provide such input in certain situations, e.g., due to physical limitations of the user's context, due to social convention, etc. Also, some AR glasses utilize tracking a user's hands to detect gestures which may be feasible in many such situations. However, such tracking typically requires multiple cameras and uses substantial power, which can reduce battery life and contribute to heating of the AR device. Gesture tracking hardware and corresponding power needs also add weight and bulk to the device which can cause user discomfort.

DESCRIPTION

To enable use in different contexts, augmented reality glasses can benefit from natural, unobtrusive input mechanisms that do not require a specialized peripheral or extra hardware. Some AR glasses are paired to a second device, e.g., a smartphone or other device, that may provide computing and/or other resources. Being able to use these devices to provide input in a hands-free manner can allow the user to interact with the real world more easily. This disclosure describes the use of connected electronic devices that are typically available to a user, e.g., a smartphone or earbuds with tap sensitivity, to provide input to AR glasses. By utilizing input mechanisms on such devices, the user can perform operations such as rotation of body-locked content around the user. The input mechanism may use signals detected by an inertial measurement unit (IMU) or other sensors on the smartphone or earbuds.

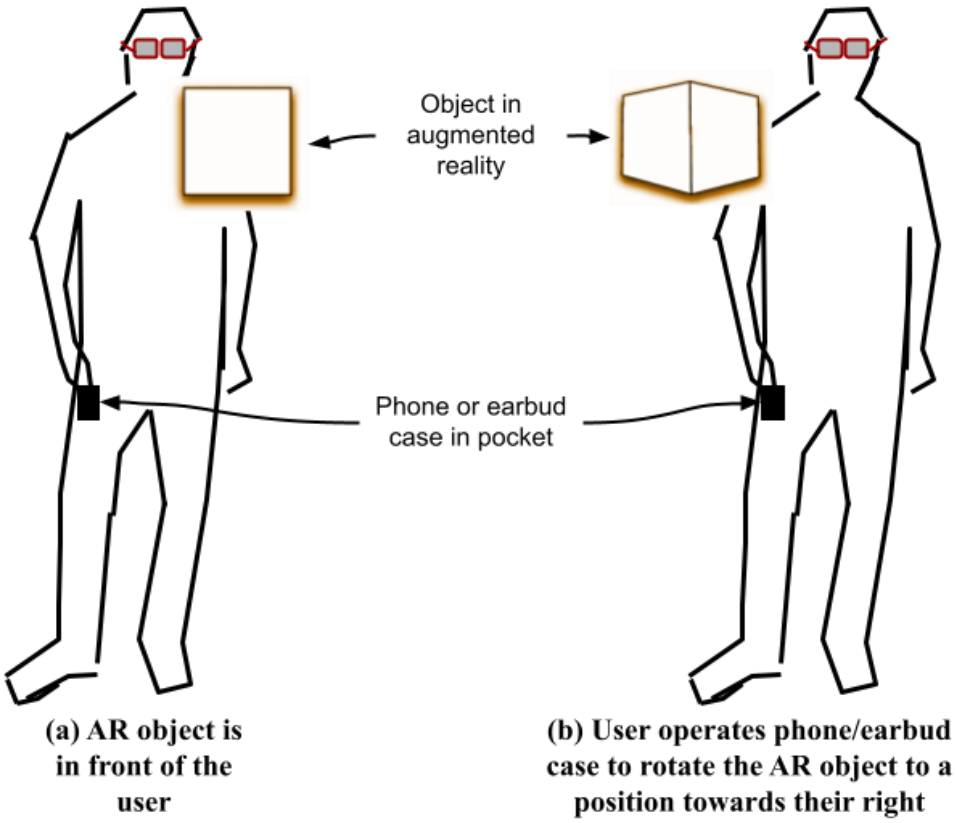

Fig. 1: In-pocket tap as input to augmented reality device

Fig. 1 illustrates an example of the use of in-pocket taps on a smartphone or other device (e.g., earbuds, earbud case, etc.) to provide input to AR glasses worn by a user. The user can control the rotation of body-locked content around the user via touch input on the smartphone, without having to touch the AR glasses or perform visible gestures.

As illustrated in Fig. 1(a), the user perceives an AR object in front of them through their AR glasses. The user has their smartphone in the pocket which is paired to the AR glasses. The smartphone display is turned off while it is in the pocket. Per techniques of this disclosure, the user can tap on the outside of their trousers while the smartphone is in the pocket. The taps are detected by the smartphone as inputs intended for the paired AR glasses. As shown in Fig. 1(b), splay, the AR object is rotated to a position towards their right based on the tap input provided

by the user.

While Fig. 1 illustrates the use of a smartphone or earbud case in the user's pocket, earbuds worn by the user can also be paired to the AR glasses and used for unobtrusive input. A tap on the right earbud can rotate the AR object by a prescribed angle towards the right. A tap on the left earbud can rotate the AR object by a prescribed angle towards the left. The ability to control display of AR objects via AR glasses using such input can be enabled via any compatible electronic device that can be paired with the AR glasses.

CONCLUSION

This disclosure describes the use of connected electronic devices that are typically available to a user, e.g., a smartphone, an earbud case, or earbuds with tap sensitivity, to provide input to augmented reality glasses. By utilizing input mechanisms on such devices, the user can perform operations such as rotation of body-locked augmented reality content around the user.

REFERENCES

1. Tome, Basheer, Hayes S. Raffle, and Chun Yat Frank Li. "Virtual/augmented reality input device." U.S. Patent 10,545,584, issued January 28, 2020.
2. Dobbelstein, David, Christian Winkler, Gabriel Haas, and Enrico Rukzio. "PocketThumb: A wearable dual-sided touch interface for cursor-based control of smart-eyewear." Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies 1, no. 2 (2017): 1-17.
3. "Bose introduces audio augmented reality platform" available online at https://www.bose.com/pressroom/bose-introduces-audio-augumented-reality-platform, accessed on September 4, 2023