Whirling Interfaces: Smartphones & Tablets as Spinnable Affordances

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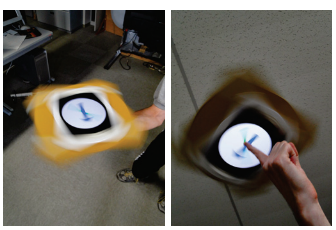
Abstract

Interfaces featuring smartphones and tablets that use magnetometer-derived orientation sensing can be used to modulate virtual displays. Embedding such devices into a spinnable affordance allows a "spinning plate"-style interface, a novel interaction technique. Either static (pointing) or dynamic (whirled) mode can be used to control multimodal display, including panoramic and turnoramic images, the positions of avatars in virtual environments, and spatial sound.

"Spinning," in which a flatish object is whirled with an extended finger or stick, is a disappearing art. We hope to re-motivate this vanishing skill, modernizing it and opening it up to internet-amplified multimedia. The ubiquity of the modern smartphone makes it an attractive platform for even location-based attractions. We are experimenting with embedding mobile devices into suitable affordances that encourage their spinning. Using azimuthal (yaw) tracking especially allows such devices to control horizontal planar displays such as periphonic spatial sound, as well as avatar heading and (QTVR-style) panoramic and turnoramic imaged-based rendering.



(a) Below (b) Above

Figure 1: Double-headed configuration

We use modern mobile smartphones and tablets (Google Android Samsung Galaxy S and Apple iOS iPhone & iPad), in particular their magnetometers (electronic compasses), to track azimuth, sending such heading to a collocated computer via WiFi. Such sensing affords two modes of operation: static pointing and dynamic whirling [2]. By simply pointing the device in a certain direction, anything can be steered. More innovatively, spinning it yields a whirling controller. An important feature of such design is that mobile devices can display graphically. By compensating for rotation, graphical display can be stabilized. A "double-headed" back-to-back configuration, as shown in Figure 1, allows the display to be seen when the spinning is both below and above eye level. To enable integration with various multimodal displays, including those used for stereographic, panoramic, or turnoramic viewing, we use our own Collaborative Virtual Environment (CVE) to synchronize distributed clients, as seen in Figure 2. Using a software "transmission" to downscale azimuthal displacement allows using even a spinning mode to control other azimuthal displays, such as our "Schaire" (for 'share chair') rotary motion platform [3] or the position of avatars or other objects in virtual environments such as Alice,[1] Open Wonderland,[2] or Second Life.

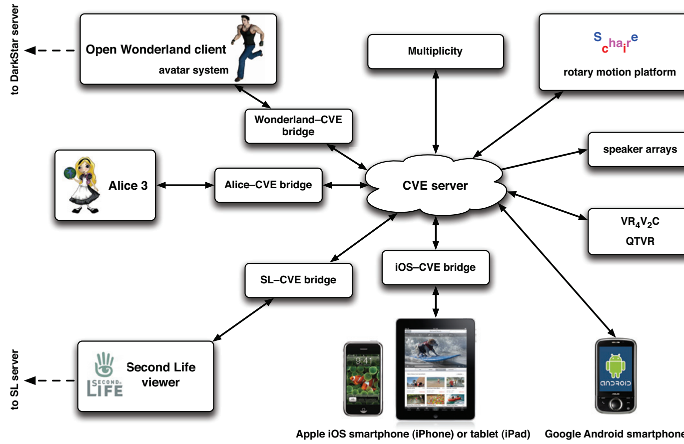


Figure 2: Our CVE provides a shared infrastructure, so that heterogeneous multimodal clients can display data from multiple spinning affordances.

This "exertoy" or "exergame" represents an active interface, a physical interface for whole body interaction. Its groupware capabilities encourage social interaction through physical play [1]. It's a "come as you are" interface, requiring no special markers or clothing. Direct manipulation gives immediate multimodal feedback, in either static (pointing) or dynamic modes (whirling). A video of its operation surveys such applications.[3]

References

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The 21st International Conference on Artificial Reality and Telexistence
November 28-30, 2011, Osaka, Japan
ISSN: 1345-1278