“Tworlds”: Twirled Worlds for Multimodal ‘Padiddle’ Spinning & Tethered ‘Poi’ Whirling

Michael Cohen, Rasika Ranaweera, Kensuke Nishimura, Yuya Sasamoto, Shun Endo,
Tomohiro Oyama, Tetsunobu Ohashi, Yukihiro Nishikawa, Ryo Kanno, Anzu Nakada, & Julián Villegas*
Spatial Media Group, University of Aizu; Aizu-Wakamatsu, Fukushima; Japan
Yong Ping Chen, Sascha Holesch, & Jun Yamadera†
Eyes, JAPAN; Aizu-Wakamatsu, Fukushima; Japan
Hayato Ito, Yasuhiko Saito, & Akira Sasaki‡
GClue; Aizu-Wakamatsu, Fukushima & Tokyo; Japan

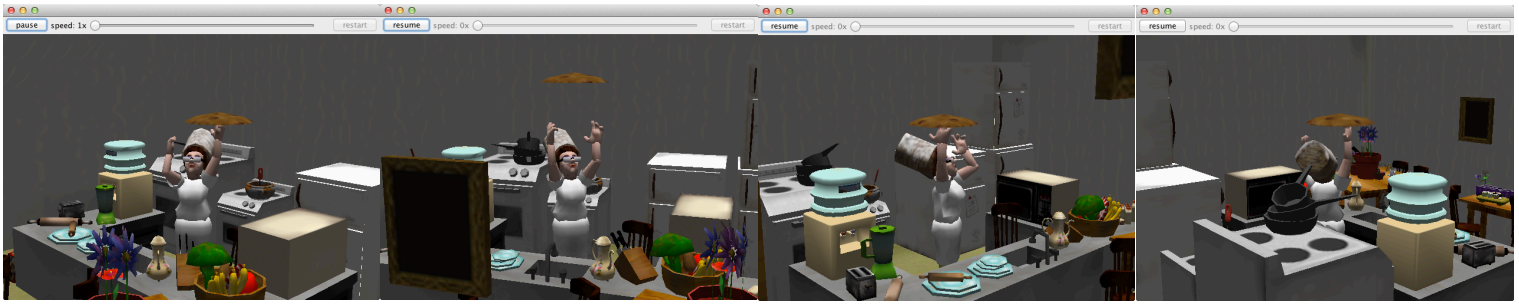

Figure 1: *Avatar ambidexterity allows affordance attitude alignment: As the subjective camera orbits in an “inspection gesture” between mirrored and tethered perspectives around an objective character, which is continuously animated by the connection between real-life motion capture and mixed reality environment rigging, the avatar automatically switches manipulating hand to preserve intuitive natural association.*

Modern smartphones and tablets have magnetometers that can be used to detect yaw, which data can be distributed to adjust ambient media. Either static (pointing) or dynamic (twirling) modes can be used to modulate multimodal displays, including 360° imagery and virtual environments. Azimuthal tracking especially allows control of horizontal planar displays, including panoramic and turnoramic imaged-based rendering, spatial sound, and the position of avatars, virtual cameras, and other objects in virtual environments such as Alice,[1] as well as rhythmic renderings such as musical sequencing.

Embedding such devices into twirling affordances allows “padiddle”-style interfaces, spinning a flatish object, and “*poi*”-style interfaces, whirling a tethered device, for novel interaction techniques. One can “free spin” padiddle a tablet, or embed such a device in a larger object such as a pillow. Poi, originally a Māori performance art featuring whirled weights, also combines elements of dance and juggling. It has been embraced by modern festival culture (especially rave-style electronic music events), including extension to “glowstringing” and “fire twirling,” in which a glowstick or burning wick is whirled at the end of a tether.

Objects in mixed reality environments can be repositioned according to spinning or whirling, and monitored in endocentric “tethered” or “mirrored VR” perspectives (switching handedness between them). A novel feature of our rigging, as shown in Figure 1, is that the avatars are ambidextrous: although a human player typically uses a particular hand (usually the right), as the viewpoint moves between reflected, frontal “mirror” and projected, dorsal “tethered” perspectives, the puppet dynamically switches hands, even while the prop is whirling to allow visual and logical alignment between avatar and human actor facing the display. (To consummate the perspective-invariant visual alignment, we are working on an extension of this newly developed feature to also support elegant phase modulation of the mixed reality prop, and will have it deployed by the summer.)

*e-mail: {mcohen, d8121104, m5161107, m5151107, s1160037, s1170010, s1170052, s1170119, s1170144, s1180027, julian}@u-aizu.ac.jp
†e-mail: {yongping-c, sascha, yamadera}@nowhere.co.jp
‡e-mail: {hayato, saito, akira}@gclue.jp
[1] www.alice.org

Table 1: *Multimodal display and control roomware*

- audio and MIDI-sequenced polyphonic music
  - stereo panning
  - spatial sound and music
- visual
  - QTVR IBR: 360° photo-realistic imagery
    - panoramas (“panos,” inside-looking-out)
    - turnoramas (“turnos” or “object movies,” outside-looking-in)
  - VR scenes: realtime CG
    - Alice (v. 3)
- haptic (touch & proprioception)
  - static pointing
  - dynamic twirling
    - spinning (padiddling)
    - whirling (*poi*)

Padiddling and poi interfaces reveal the potential for embodied interaction exploiting the happy alignment of gravity-oriented horizontal twirling gestures, the latitudinal geomagnetic field, and the horizontally favored visual field and auditory directionalization acuity. These active “exertoys” represent physical affordances for whole body interaction, “practically panoramic” interfaces that can be enjoyed as location-based entertainment systems for cross-platform, “mobile ambient” applications.

References

COHEN, M., RANAWEERA, R., NISHIMURA, K., SASAMOTO, Y., OYAMA, T., NISHIKAWA, Y., OHASHI, T., KANNO, R., NAKADA, A., YAMADERA, J., HOLESCH, S., CHEN, Y. P., SASAKI, A., AND ITO, H. 2012. “Whirled Worlds”: twirling interface for “mobile ambient,” “practically panoramic” whole-body entertainment. In *DCE: **D**igital **C**ontents **E**xpo*, Digital Content Association of Japan. www.dcexpo.jp/2012/en/program/exhibition/detail.php#IT201222.

COHEN, M. 2008. Integration of laptop sudden motion sensor as accelerometric control for virtual environments. In *VRCAI: Proc. ACM Int. Conf. on **V**irtual-**R**eality **C**ontinuum and Its **A**pplications in **I**ndustry*. ISBN-13 978-1-60558-335-8.