Joyman: an immersive and entertaining interface for virtual locomotion

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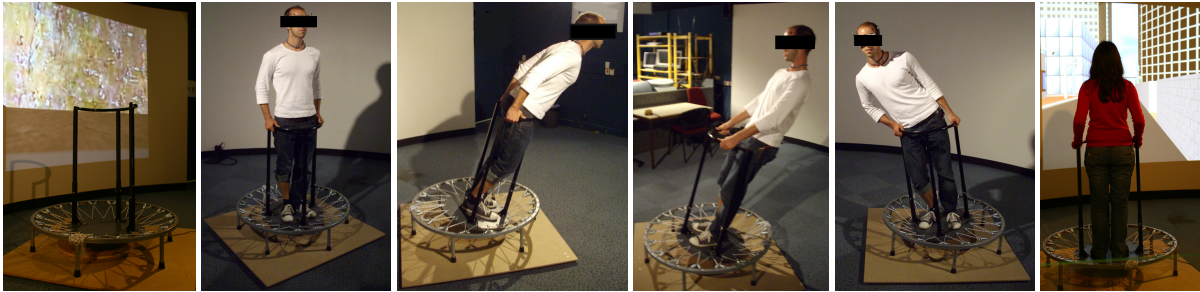INSA / INRIA-Rennes

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Figure 1: *Left: The Joyman interface.* **Center (4 images):** *Based on a simple mechanical design, the device allows a user to stand upon it and to lean in any direction without falling.* **Right:** *The inclination of the board of the device is transformed into a virtual velocity vector: this enables us to immerse users into environment navigation scenarios.*

Abstract We propose to demonstrate a novel interface called Joyman, designed for immersive locomotion in virtual environments. The interface is based on the metaphor of a "human-scale joystick". The device has a simple mechanical design that allows a user to indicate his virtual navigation intentions by leaning in the corresponding direction. It is often said that walking is equivalent to constantly falling ahead. The Joyman follows this assertion: whereas many previous interfaces preserve or stimulate the users proprioception, the Joyman aims at preserving equilibrioception in order to improve the feeling of immersion during virtual locomotion tasks. Thus, the interface could be applied in various virtual reality applications such as urban or architectural project reviews or training, as well as in videogames.

CR Categories: I.3.1 [COMPUTER GRAPHICS]: Hardware Architecture—Input Devices;

Keywords: 3D interface, device, locomotion, virtual worlds

Principle Navigation is one of the fundamental tasks needed for 3D interaction with Virtual Environments. However, it is still a challenge to allow a user endlessly walking in a large virtual world in an immersive manner when the physical real workspace is limited. Many interfaces and techniques were proposed. The Joyman is one of the most recent, as detailed in [Marchal et al. 2011]. While the interface is a low-cost one, it is also based on an innovative principle. Whereas most of previous interfaces proposed an immersive experience of walking in virtual worlds by preserving human proprioceptive senses, the Joyman exploits the human equilibrioception to drive the virtual locomotion. The Joyman is very intuitively used by a novice and the virtual locomotion is initiated identically to real one. The interface is based on the metaphor of a "human-scale joystick": the user leans in the direction of the desired motion (e.g., forward to start walking ahead). In a way, this experience is close to the one of using a Segway or skying.

The Joyman device The main objective of the Joyman is to provide realistic locomotion trajectories in a virtual environment. The interface meets this objective by combining two roles. It first allows users to lean safely beyond the point of falling, as illustrated in Figure 1. Falling is prevented by an adjustable barrier, rigidly fixed to a board upon which the user is standing. The board is finally articulated to a platform using springs which allows the board to tilt when the user is leaning. The second role of the Joyman interface is to transform the measured board inclination into a virtual velocity. This is the functionality of a control law that takes into account the basic constraints of the human locomotion (bounded velocities, accelerations and collinearity of the velocity vector with the tangent to the trajectory). The Joyman is often wrongly compared to a force platform because equilibrioception is involved when using such a device as well. However, users lean widely beyond the point of falling using the Joyman, which is not possible to do using a force platform and which deeply change the felt sensations.

Scenario The robustness of the Joyman enables to easily and safely demonstrate it to a large audience. We propose a basic scenario where a large-scale environment (e.g., small city) is explored. The scene can be visualized through a HMD or by projecting it to a screen as displayed in the companion video. The video shows that the proposed demonstration scenario is ready, nevertheless, we are currently working on extensions, new scenes, new control modes and new scenarios (skying, flying, etc.) that we expect to be available for the conference. The user can exploit his own equilibrioception to control his virtual locomotion through the different streets and buildings. By using the Joyman, we can also maintain a high level of immersion compared to handheld devices (e.g, joysticks). We have demonstrated the Joyman to be intuitively used and we believe this can provide attendees with a novel and fun experience. Various VR applications but also real applications could be envisaged when navigating in a 3D world. Thus, the Joyman interface can be used for example for videogames, rehabilitation, training tasks or virtual visits.

A patent for the interface presented in this submission has been filed on November 19, 2010 under the number FR10/595551.

References

MARCHAL, M., PETTRÉ, J., AND LÉCUYER, A. 2011. Joyman: a human-scale joystick for navigating in virtual worlds. In *Proceedings of the IEEE Symposium on 3D User Interfaces (3DUI 2011)*.

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