

Presence in Interactive Experiences

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Introduction

Current applications areas of both Virtual Reality and gaming such as edutainment, cultural heritage, and serious gaming, rely heavily on creating an Interactive Experience. Work in our group focuses on supporting the creation of Interactive Experiences in immersive VR settings, particularly the creation of interactive, dynamic environments. Interactivity and dynamics are often cited as factors affecting Presence in nearly every paper, though little theory to their relationship exists and only few experimental results.

We propose:

agency as a primary factor to presence
afforded agency must have matching interaction
dynamics work by increasing realism and affording interaction
initial investigations into the proposed relationship

Agency a primary factor to Presence

We propose that *Agency* is central factor influencing levels of user presence. Agency is how much does the user feels that they are an actor in the environment, "the power to take action" [Laurel]

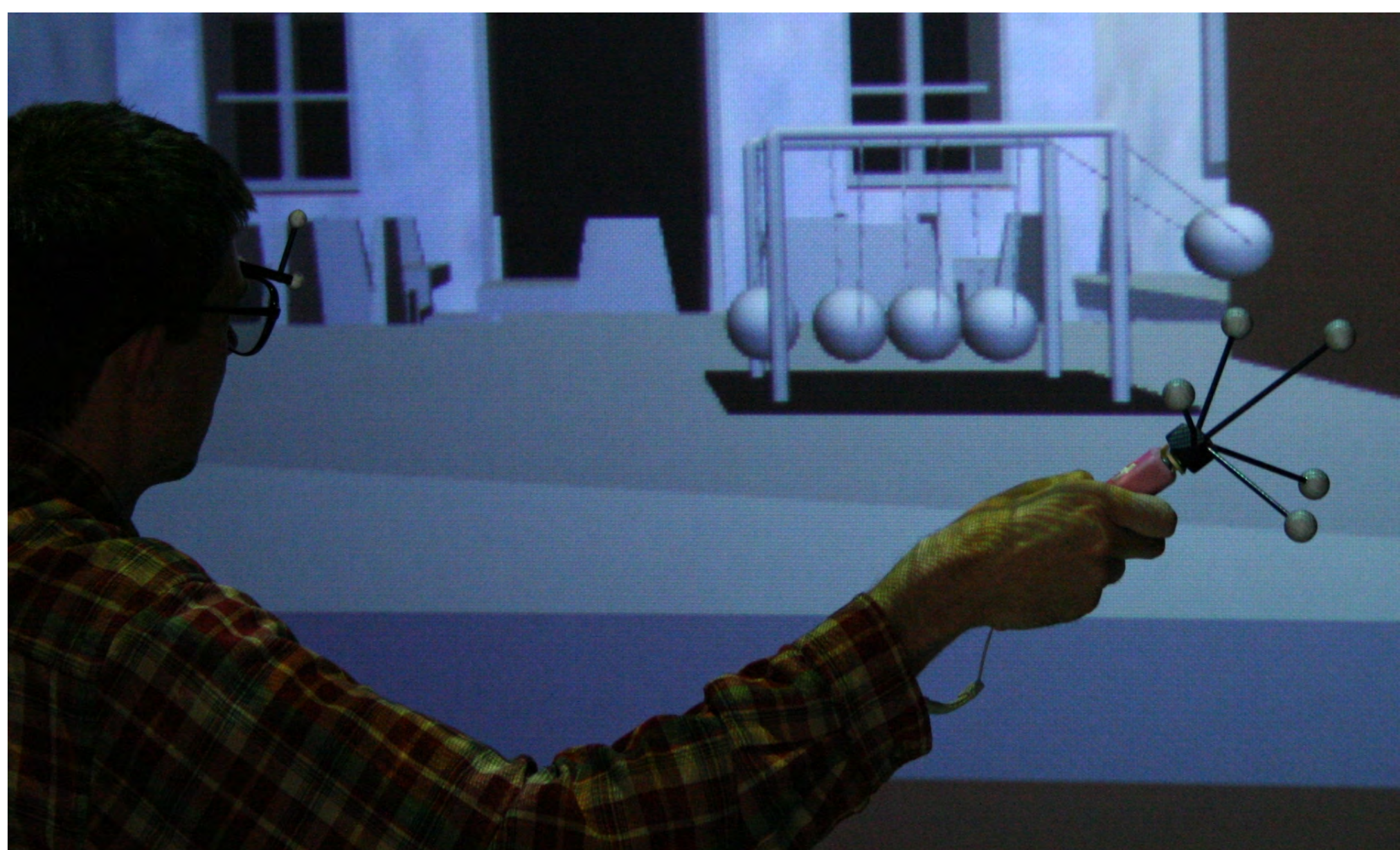
Agency's relation to presence over two factors:

- matching the expected level of Agency
- appropriate level of agency for the application

The expected level of agency is affected by:

- the interface (VR system <-> watching a film)
- the affordances of the environment [Norman] e.g. a door handle affords "turn me and open the door"

Note that agency and presence do not form a direct one-to-one relationship. A higher level of agency may not equal a higher level of presence. The desirable level of agency may be application dependent. Dow et. al show evidence that higher levels of agency diminish "dramatic presence," as the user can not "role play."



A Newton's Cradle, physical or virtual affords play. We have developed a system make interaction with dynamics easier to program. Here, the user grabs the moving ball, repositioning it, and releasing it to again run.

Citations:

Norman, Donald. *The Psychology of Everyday Things*. New York. Basic Books. 1988.

Cho, Park, Kim, Hong, Han Lee. "The Dichotomy of Presence Elements: The Where and What." Proceedings of IEEE VR 2003.

Dow, Mehta, harmon, MacIntyre, Mateas. "Presence and Engagement in an Interactive Drama." Proceedings of SIGCHI 2007.

Vinayagamoorthy, Brogni, Gillies, Slater, Steed. "An Investigation of Presence Response across Variations in Visual Realism." Proceedings of Presence 2004.

Laurel, Brenda. *Computers as Theatre*. Reading, Mass. Addison Wesley. 1993

Reynolds, Craig. "Interaction with Groups of Autonomous Characters." Game Developers Conference 2000. 2000.



A flock of birds: here we see them avoiding the user, who is flying around and positioning themselves in the path of the birds. Such interactions reinforce the user's agency in the world.

Afforded Agency with matching Interaction

We propose that a central factor influencing agency is how the system matches the affordances of objects. Norman proposes that objects afford particular interactions and expectations.

When affordances are not matched, the user feels disempowered, i.e. less agency, causing a Break in Presence.

Matches between realism of dynamics, presentation, and interaction must be present. Cartoons can defy gravity, but a Newton's Cradle (normally) shouldn't. A lifelike avatar, like those of Vinayagamoorthy et. al, affords lifelike interactions, and complex internal states and emotions, where a stickman affords none of these. Eye contact from a stickman is creepy, but expected from a life-like avatar. Affordances aren't met in this case.

Dynamics increase Realism

Avatars are not the only dynamic possibilities.
Even simple dynamics increase the believability and interest.

Excepting the work of Cho et. al, all research has been with avatars. Our work focuses on these other possibilities, from the physics based Newton's Cradle to autonomous creature such as Boids and fish (as in Cho et. al).

Dynamics afford Interaction

Dynamics afford play.
Users want to interact with anything that moves.
Users want to do everything one can in real-life + what can only be done in virtual.

Enabling afforded interaction with dynamic objects, will increase the user's presence in a world.

We propose testing with simple interactive dynamic objects like the Newton's Cradle. For more complex behavioral level testing, we propose using simple entities, in an application similar to Reynold's "Pigeons in a Park" [Reynolds].

Conclusions

We have proposed that agency is a factor to presence. Meeting the afforded level of agency of a scene through possible interaction is crucial to creating effective Interactive Experiences. Interaction affects presence only over agency, while dynamics of an environment effect the realism and afforded agency of an environment.

We propose testing these hypothesis, through tests with simple interactive components and non-avatar dynamics.