The Gestalt of Virtual Environments

Jacquelyn Ford Morie and Josh Williams
USC Institute for Creative Technologies
Presented at the Presence 2003 Conference, Aalborg, Denmark, October 2003

Gestalt - a structure, configuration, or pattern of physical, biological, or psychological phenomena so integrated as to constitute a functional unit with properties not derivable by summation of its parts. *The American Heritage® Dictionary of the English Language, Fourth Edition*

Introduction

The majority of research in the field of virtual reality to date has focused on increasing the fidelity of the environments created and trying to determine the quality of the participant experience. Efforts have been made to quantify such aspects, especially in regards to visuals and sound, and to a lesser extent to the user experience. [1-6] Recent thinking has tended towards the assumption that ever-greater fidelity would ensure a better user experience. However, such emphasis on photo-realism and audio-realism does not take into account the collective results of our multimodal sensory inputs with their intertwined effects. Our design philosophy for the creation of virtual environments attempts to replicate the *human experience*, and asks the question: Is there an underlying fidelity of *feels-real* through which the quality of the participant experience could be improved?

"Feel," in this case, is defined as, "*to undergo the experience of*". Experiences are perceived by humans and qualified primarily through an emotional reading of that experience. Therefore, a *feels-real* environment would be qualified according to its mediated stimuli's ability to induce within the participant a pattern and degree of emotional response equivalent to that induced within the same individual by a perceptually-equivalent *real* environment.

What are the benefits of focusing on an emotional experience? The structure of virtual environments provides the participant with what amounts to "free will" within the space, giving them the capability of choosing to go anywhere and do anything within the limitations of the model space and navigational methods. As our goal is to provide meaningful experiences, whether for training, education, entertainment or art, we aim to create experiences that are meaningful within the context of the goals of the world. We define meaningful in the experience space as that which is both cohesive and memorable. The human experience looks to emotions as providing salience in both these respects. [7,8]

Our Sensory Environments Evaluation (SEE) Project proposes to identify patterns and degrees of emotional response to orchestrated multimodal sensory stimuli in virtual environments. These findings will result from the design methodology outlined in this paper, specifically our utilization of three specific techniques: *Corroborative Detail*, *Coercive Narrative*, and an *Emotional Score*. The implementation of such techniques helps to steer the actions and behavior of a participant within such an environment, and thereby make possible predictable patterns of emotional response within a simulated *human experience*.

The Design Process

To begin the design process, we define the *experience space* in both spatial and temporal terms. In Figure 1, the solid vertical lines represent the thresholds separating the *actual* (human) experience from the *virtual* one. The arrowed line at the top indicates the progression of time throughout the entire experience, including both *actual* and *virtual*. The timepiece icons denote the perception of time during the participant's experience; the clock indicating a more discreet awareness while outside of the *experience space*, and the hourglass indicative of the ambiguity (by design) while within. The three-colored gradient between the thresholds of the *experience space* is representative of *sights*, *sounds*, and *smells* (particular to our test environment) comprising the multiple sensory inputs that delineate the *virtual environment*.

In Figure 2, the *participant's* existence within the *actual* and *virtual* experiences is depicted as a solid trajectory shown to enter and exit the *experience space* in "rough" accordance with *time*. Although this trajectory, referred to hereafter as the *journey* of the participant, is not specifically expressive of the participant's spatial position in relation to time, the aforementioned temporal ambiguity within the experience space corresponds to the environment's ability to compress and expand time as necessary. For example, we can control (postpone or speed up) the occurrence of an event until the proper (or most effective) time for it to happen (denoted by the back looping curves). Also represented here is the transitional condition referred to as *priming* [9,10], during which the participant's real world expectations and schemata are "allowed" into the *experience space*. Part of this priming is afforded by the participant's life experiences (the solid center section). As important is the set of expectations elicited just prior to the virtual experience (the bordering lighter area) by the specific instructions given to the user concerning this specific virtual world. Such priming serves to constrain irrelevant schemata, and becomes a "contextual filter" through which the environment is perceived.

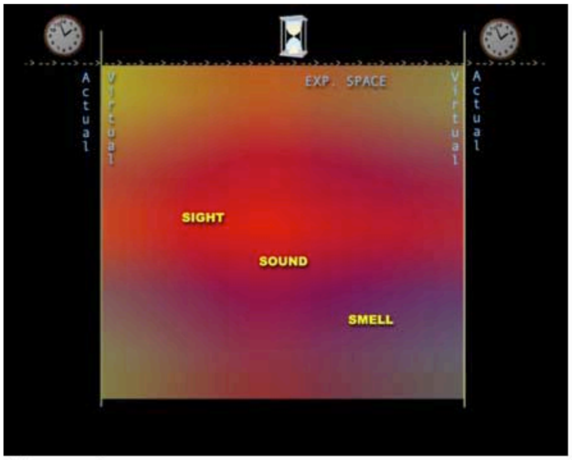


Figure 1

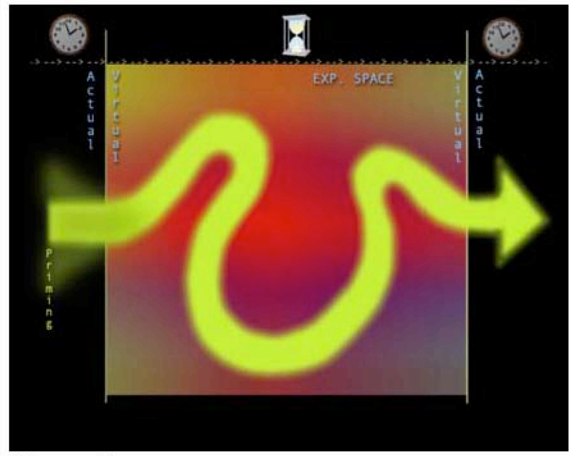
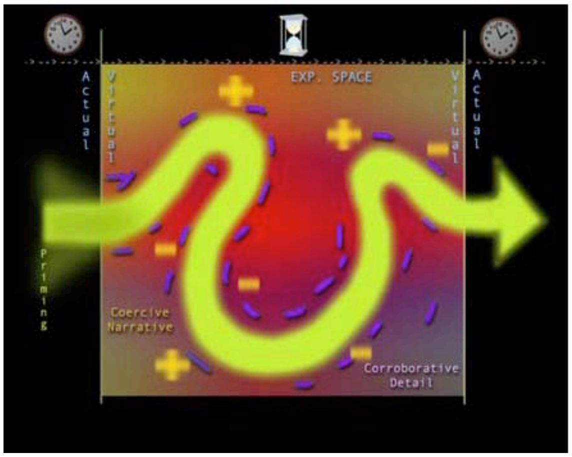


Figure 2

The elements contained within the description thus far should hold true for the entirety of virtual environments, granted their variation by design and available display modalities. In Figure 3, we introduce the techniques we have developed for our design methodology. First is the concept of *Corroborative Detail*. Depicted in the diagram as small dashes alongside the journey, such details constitute the marks of time and humanity. These include effects of aging, weathering, use, and abandonment. Often omitted from virtual environments as too computationally costly, these details substantiate the believability within such spaces, providing evidence of temporal coherence and persistence.

The "plus" and "minus" signs denote *attractors* and *repulsers* metaphorically placed by way of *Coercive Narrative* [11]. These might best be thought of as "nodes" within the environment, composed of orchestrated multiple sensory inputs, and experienced as part of the environmental setting (static) or an environmental event (dynamic). The act attraction and repulsion in each case plays upon both expected responses to sensory stimuli based on studies in cognitive science (such as common phobias and normal reactions to bright light, loud noises, etc.) as well as predicted actions/reactions promoted within the participant by the *priming* administered beforehand. It is important to note that the environmental event nodes can be temporally and spatially independent, making possible their triggering at any time and in any place in accord with the participant's behavior. Given the careful placement of *attractors* (designed to draw in the participant) and *repulsers* (designed to force away the participant), the trajectory of the participant becomes possible to predict.



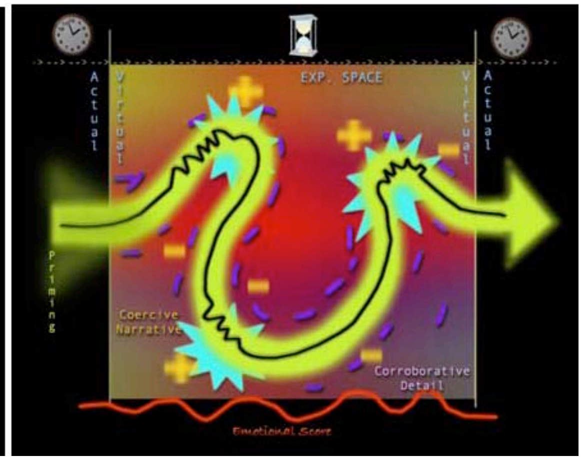


Figure 3   Figure 4

Given the stability of the environment that *Corroborative Detail* has ensured and the predictions that are afforded by *Coercive Narrative*, we now are in a position to augment the predicted emotional responses. We do this by way of what we term an *Emotional Score*. The bursts in the diagram correspond to carefully designed emotional cues within the environment. These are crafted and augmented by specific audio techniques that pervade the entire experience, much like a soundtrack in a film. This score is typically unheard but perceived through visceral means and uses techniques such as entrainment (synching the user's heartbeat up to specific rhythms) [12] and the modulations of low frequency sounds (to intensify or mediate the participant's arousal state) [13].
These techniques are currently undergoing evaluation studies and anecdotal evidence thus far suggests a high correlation of expectations with actual performance. We anticipate that our findings will provide insights that will allow us to further refine our techniques and contribute to virtual worlds that more completely simulate the reality of the human experience.

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