Adding Interactivity: Active Touch in Broadcast Media

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Abstract

Despite continual consumer demand for richer broadcast media, there have been few examinations of senses other than vision and hearing in this domain. This demonstration paper considers the role that touch may be able to play in future broadcast systems. We have begun to explore the addition of haptic cues to children's cartoons, and through this process unearthed a number of practical design issues unique to this domain. This paper discusses one such issue: how the psychological distinction between passive and active touch influences broadcast media, and how this in turn affects notions of interactivity. Demonstrations of broadcast content featuring active cues will be shown to illustrate the points raised.

1. Introduction

There is a continual demand from the viewing public for richer broadcast media. This is illustrated by the rapid adoption of new audio and video technologies such as Dolby 5.1 and wide-screen TV. However, even within the development of the newest technologies, such as Interactive TV, the use of senses other than vision and hearing has remained relatively unexplored. Specifically, despite research linking haptic feedback to increases in involvement and immersion in virtual environments [6] its use has not been formally examined in a viewing scenario.

As highlighted in the psychophysical literature [3] one critical aspect of haptic perception is that it is inherently active. Sensing touch stimuli is a process closely coupled with, even mediated by, physically acting on the environment. We believe that supporting the active perception of haptic stimuli will be essential to the successful integration of this modality into the broadcast domain. However, despite the recent focus of broadcast technologies on interactivity, viewing remains an essentially passive process in which media content is perceived, but not interacted with. We suggest that the integration of haptic cues that can be actively explored into broadcast programming may be a key bridge that facilitates truly interactive TV [5].

2. System

To enable us to explore the addition of haptic cues to broadcast media, we have adopted a number of consumer technologies which tied together serve as a prototype platform. Visual and audio media are authored in Macromedia Flash [4], and output to a TV and speakers, creating the illusion of a typical broadcast viewing scenario. Haptic cues are displayed through a 2 DOF force feedback gaming joystick: the Gravis Xterminator Force [1]. As illustrated in Figure 1, we have re-housed this device to resemble a TV remote control. To experience the haptics, viewers place their fingers or thumb over the actuator positioned on the right of the figure. In software, the haptics cues are linked to the Flash content using the Immersion Web Plug-in [2].

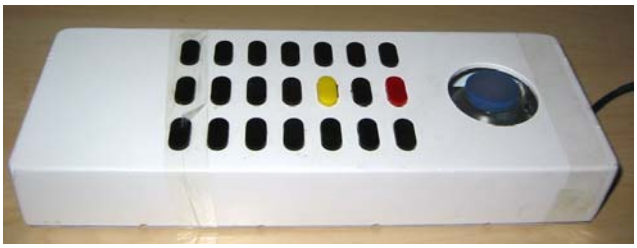

Figure 1. Haptic remote control

3. Presentation Interaction

To achieve the seamless addition of active haptic cues into linear broadcast content, we propose what we term *presentation interaction*. In this reduced form of interaction, a viewer cannot alter the structure of the narrative in any way. The pace, sequence and path through the different scenes composing the content is always constant. However, viewers are able to interact with and, by doing so, influence the presentation of the content in individual scenes.

Figure 2. Scene from haptically enhanced cartoon.

To explore this idea, we have created a number of cartoons that feature presentation interaction. The first example we produced was a short sequence embedded within a much longer narrative detailing the adventures of a nocturnal elf. As the cartoon begins, the protagonist is riding a bee through a forest. This scene is represented visually as shown in Figure 2, sonically by a buzzing sound coupled with the elf's sporadic and gleeful laughter, and haptically (on a small 2 DOF force feedback display) by a high frequency vibration additively combined with a force vector derived from the character's displacement from the centre of the screen. Viewers are able to interact with the presentation of this scene by manipulating the haptic actuator, which also serves as a position sensor. By moving the actuator, the character's rendered location is changed. This involves the alteration of the force vector in the haptic presentation, the spatialisation of the audio cues, and the character's visually displayed position. However, regardless of whether the viewer chooses to interact with the scene, it always ends in the same manner and at a predetermined time: the elf falls from the bee, and the narrative moves on to the next scene.

In another example, illustrated in Figure 3, two characters are on screen simultaneously. On the right of the screen, one is dangling precariously from a leaf, while on the left the other is hurrying to reposition a bucket in order to provide a safe landing place for the first's inevitable fall. In this instance, a viewer can aid the second character as they push the bucket, by moving the haptic actuator against a force representing the bucket's resistance to motion, its friction against the ground. Doing so influences the visual and audio presentation of the scene by having the character and bucket move more rapidly across the screen. The haptic presentation is altered as the friction can only be perceived by actively pushing against it. Once again, whether or not the viewer chooses to interact with the scene the final outcome remains the same: the first character is saved by the timely actions of the second.

Figure 3. Scene from haptically enhanced cartoon.

4. Conclusions

We are investigating the application of haptics in a subtly new domain: broadcast media. Haptic cues have proven very successful in other forms of entertainment, such as gaming and simulator systems and we believe that they could achieve the same pervasive nature in viewing scenarios, particularly within the context of Interactive TV. We have begun to consider how we can include active haptic perception in the essentially passive domain that is broadcast viewing, and the demonstrations that accompany this paper represent an initial step towards a final design methodology for the inclusion of haptic cues in broadcast content.

5. References

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