Khronos Projector

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1 Introduction

The Khronos Projector is an interactive-art installation that allows people to visualize movie content in an entirely new way. By actually touching and deforming the projection screen, the user can send portions of the image forward or backward in time.

When we view a still image or a motionless sculpture, we are free to direct our sight wherever we want over the entire work, perhaps only subliminally compelled by the compositional forces the author has instilled in it. This is barely possible when we view a movie, because we are forced to adopt a unique point of view both in space and time.

Thanks to the Khronos Projector, space and time can be unlinked in a pre-recorded movie. Causality becomes relative to the spatial path we decide to follow on the screen, which allows for multiple interpretations of the pre-recorded facts. In this sense, the Khronos Projector is an exploratory interface that transforms a movie sequence into a spatio-temporal sculpture for people to explore at their own pace.

2 Implications

The Khronos Projector frees both filmmakers and audiences from the constraint of a pixel-ubiquitous time arrow. During a Khronos projection, we cannot change the nature of the pre-recorded events, but the perspective, the way we perceive their temporal relationship. We are at the same time spectators of x ed movie content and, in a strong sense, directors of a personalized post-production process.

The Khronos Projector is also a suggestive tribute to Einstein's Theory of Relativity: the temporal relationship between two physically separate events is a perception relative to the observer. This is not, however, a serious platform for recreating any typical relativity paradox, because the interactive projection infringes one fundamental law of nature: although it is true that temporal relationships are relative to the observer's inertial frame, causality is not relative. Two events that are in causal relationship should therefore always maintain their temporal order. The Khronos Projector breaks this rule, but this is precisely what makes the experience interesting and fun.

From the technological point of view, the goal of this installation is to demonstrate a prototype tangible human-interface that tightly combines visual display and the sense of touch.

3 Technical details

The spatio-temporal fusion algorithm is the core of the Khronos program: it consist on blending hundreds of images from a movie sequence to produce a unique displayed image. The blending operation is controlled by interactively shaping a "spatio-temporal membrane", which is a "cutting" surface lying inside the spatio-temporal volume of the movie (sometimes called the "video-cube").

Figure 1: Khronos tissue-based screen.

The spatio-temporal membrane is shaped using a parametric model that feeds on data resulting from the continuous scanning of a deformable screen made from spandex ber. Scanning is done using a special illumination con guration and a proprietary "vision chip" that computes in real time both the magnitude and localization of the pressure exerted by the user hand (Fig.1). The membrane then relaxes "naturally", producing "spatio-temporal waves" all over the image.

4 Conclusion

Presently, even the f ilmmaker who is less devoted to linear narratives is forced to integrate a screen-ubiquitous time arrow as a fact in their work. But imagine a version of Hitchcock's "Rear Window" especially tailored for being "Khronos-projected": the audience would be able to go backward or forward in time at the desired window - literally. The movie would contain several possible interleaved stories, depending on the way the space-time volume is explored. The Khronos Projector also allows exploration of otherwise conventional movie content, producing interesting, cubist-like dynamic images. People may bring to the installation their own short movie sequences and experience rst hand their Khronos interactive projection.

Finally, it is interesting to note that the Khronos Projector deformable screen may represent an interesting human-computer interface per se, for den ing and visualizing arbitrarily shaped slices of volumetric data - in particular scanned medical images. It could be a starting point for developing a pre-operatory interface capable of showing internal body sections mapped onto complex surfaces, displaying them just as they would appear to the surgeon during the actual operation. Surgeons could "see" inside a virtual body during pre-operatory work by "pushing" their hands against a deformable projection screen, instead of being limited to a set of (interactive) planar cuts, as they are now.

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