Spaceline: A Way of Interaction in Cinematic Virtual Reality

Sylvia Rothe
LMU Munich
Munich, Germany
sylvia.rothe@ifi.lmu.de

Harald Brunner
LMU Munich
Munich, Germany
harald.brunner@campus.lmu.de

Daniel Buschek
LMU Munich
Munich, Germany
daniel.buschek@ifi.lmu.de

Heinrich Hußmann
LMU Munich
Munich, Germany
hussmann@ifi.lmu.de

ABSTRACT

Watching omnidirectional movies via head mounted displays puts the viewer inside the scene. In this way, the viewer enjoys an immersive movie experience. However, due to the free choice of field-of-view, it is possible to miss details which are important for the story. On the other hand, the additional space component gives the filmmakers new opportunities to construct stories. To support filmmakers and viewers, we introduce the concept of a 'spaceline' (named in analogy to the traditional 'timeline') which connects movie sequences via interactive regions. We developed a spaceline editor that allows researchers and filmmakers to define such regions as well as indicators for visualising regions inside and outside the current field-of-view.

CCS CONCEPTS

• **Human-centered computing** → Virtual reality

KEYWORDS

Cinematic Virtual Reality; 360° movie; timeline; spaceline

SPACELINE CONCEPT

In Cinematic Virtual Reality (CVR) head mounted displays are used to watch omnidirectional movies. In this way, the viewer looks no longer from outside on the movie, but is inside the scene. Using conventional cutting methods and arranging the story via timeline leads to two problems. On the one hand, things which are important for the story may be missed by the viewer. On the other hand, after a certain time the scene is switching, even if the viewer wants to look further or has not seen the essential details.

Moving away from tools of traditional film production and taking advantage of the possibilities offered by VR, opens up new options. One more component is available for constructing a storyline: the space. Therefore, it is worth to consider that cuts not only depend on elapsed time, but also on the viewer's line of sight. In conformity with the term timeline we introduce the term **spaceline** for this method of storyline construction.

The spaceline concept defines two types of regions: An **out-region** is the area whose activation ends a shot. From there, the switch to the next shot takes place, where the viewer first sees **the in-region,** from which the scenery then can be explored. The spaceline links out-regions with in-regions. In this way shot changes become interactive, triggered by the viewer.

For nonlinear storytelling more than one out-region can be defined. In this case, it is possible that each viewer discovers their own story, at their own pace and with their own priorities.

In addition, we introduce **act-regions** which offer the viewer supplementary interaction options, such as magnifying details, or retrieving additional textual information. Out-regions are interactive and thus also count as act-regions.

To make it easier for the viewer to recognize and interact with the act-regions defined by the filmmaker, we investigated several visualization methods. It is important that these visualizations do not obstruct the viewing experience. There are two cases: Regions in the viewer's current field-of-view need to be highlighted to be recognizable. This is done by on-screen indicators. In contrast, off-screen indicators indicate regions out-of-display to facilitate discovery by the viewer. We implemented a tool, the CVR-Editor for testing such indicators in a comfortable way and to support filmmakers to use the spaceline concept. This can be done by defining out- and in-regions and defining on/off-screen indicators of different types. In addition, the tool allows to define further interactions for act regions, such as textual pop-ups.

Reflecting on the overall concept in the CVR context, we highlight that spaceline and timeline are both needed to realize interactive story structures in CVR. Even when using the spaceline concept, filmmakers should be able to define the time limit of a shot. We conclude that the spaceline is a feasible and valuable concept for filmmakers and viewers in interactive CVR, when supported by helpful indicators. We evaluated first indicator designs, showing their potential in guiding the viewer. We also revealed the CVR-specific challenge of balancing discovery and distraction with off-screen indicators. Our spaceline concept and editor enable filmmakers to create CVR movies with dynamic storylines: Scene switches depend on interactive regions selected by the viewer.