Collaborative Manipulation of Objects in Immersive Authoring Environments for Virtual Reality

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ABSTRACT

Immersive authoring environments enable users to experience, design, and create virtual surroundings beyond reality. They are used to design and create 3-dimensional models, virtual scenes, and more by using so-called authoring tools. The goal of authoring tools is to empower users to realize their imagination as efficiently as possible.

Most authoring tools are still desktop-based applications (e.g., Blender). However, there are certain benefits to directly author from the virtual environment in virtual reality (VR). It increases the significance of the created immersion, leading to a better perception of size, depth, and feeling for the environment. It is also more comfortable not being forced to swap from desktop to virtual-reality headsets to be able to test out the created environment. Furthermore, spatial comprehension is improved, simplifying designing and understanding more complex models.

But challenges exist as well. It is non-trivial to find intuitive metaphors for simple tasks, such as moving objects towards and away from oneself. For this challenge, there are different approaches to choose from. It is possible to realize this challenge through a simple physical movement, input on a controller, or both combined. Many successful metaphors are in use, however, not all solutions are applicable for usage in collaborative environments, where users need to manipulate objects collaboratively.

Collaboration has the potential to increase the time-cost-efficiency of group work by sharing work among multiple people. Additionally, it may raise motivation and create a better learning environment by enabling communication between group members. But if realized inefficiently, it may hold back individuals and slow down the process. The same concept applies to authoring tools. Tools implemented inadequately or under the use of unintuitive metaphors are disruptive to the workflow and confusing to users. But when carried out well, they have the potential to improve the workflow and support the user instead. And because collaboration and authoring tools are challenging to realize on their own, designing a tool made for collaborative authoring is not trivial either.

When multiple people try to realize their concepts, they might not have the same picture in their minds. When one might try to manipulate objects to achieve their vision, the others' plans might conflict. These issues arise from a lack of communication or miscommunication and are solvable by exchanging information. The exchange may happen in an auditive manner using acoustic communication or through other means like visualizing the view direction of individuals or enabling them to hint towards certain spots through different ways of feedback.

Existing metaphors for single-user object manipulation may not be applicable in a collaborative authoring environment. The majority of manipulation techniques were designed for use in single-user applications. Adding more people to the setting raises complications in the desired behavior of objects. When two or more users desire to move the same item, it is unclear how it should behave.

In this Seminar, existing answers and studies on the elaborated challenges of the collaborative manipulation of objects in immersive authoring environments for VR will be investigated, analyzed, and compared.