PanoFusion: Stereoscopic Panoramic Viewing System for View-Dependent Impossible Objects

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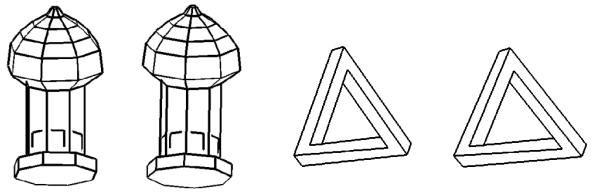

Figure 1: Examples of stereoscopic viewing of impossible objects

1 Overview

Content creation for stereoscopic projection systems is a key issue for such systems to become popular. For traditional realistic computer graphics, the geometry of the scene is consistent for any viewpoint, so the creation of stereoscopic images can be done by simply changing the viewpoint. However, non-photorealistic contents often imply view-dependent geometry: the image for the left eye is showing a different object than the image for the right eye. The challenge is then to generate convincing 3D images while having different geometries.

We propose the PanoFusion system, which generates panoramic stereoscopic images of scenes consisting of impossible objects. We extended the DynaFusion system [Owada and Fujiki 2008] that allowed impossible object interaction in order to generate 360 degrees stereoscopic images.

There are two approaches for generating stereoscopic images of view-dependent models. The first one is to directly use the two view-dependent models for the two different viewpoints (usually left and right eye). While this is straight-forward, it makes the images more difficult to reconstruct by our visual system, as the geometry is deformed. The other one is to fix the 3D geometry for a given pair of images. The main problem is then the 3D consistency of the view-dependent models: it might be convenient to limit the deformations in order to preserve this consistency. For example, constraining the deformations to the horizontal direction only.

In PanoFusion, we chose to take the first approach, as our impossible objects are made of multiple standard parts that are carefully arranged in 3D space to match some predefined edges [Owada and Fujiki 2008]. In other words, two edges of two different (possible) parts must share one line on the screen. If the viewpoint slightly changes, the edges do not match any more. We therefore use the first approach: using view-dependent models.

The main feature of our system is the generation of panoramic images. For the stereo disparity to be present for all viewing angles (especially on the side), panoramic stereoscopic rendering requires the rotation of the viewpoints (see Figure 2 and [Ishiguro et al. 1992]). This implies that for every column (1-pixel wide) of the screen, a different geometry is needed. As such, when designing the scene, this must be taken into consideration by the designer: rendering should be previewed constantly. Our system seamlessly integrates this projection into the modeling process [Owada and Fujiki 2008].

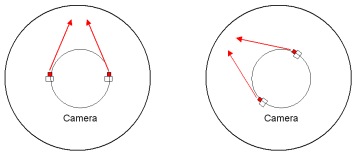

Figure 2: Viewpoint rotation

2 Results

Figure 3 shows one snapshot of our system. The user can directly edit impossible objects in the stereoscopic preview windows, and the user-defined edge correspondence is automatically retained upon viewpoint change or object rotation. We believe that the idea of merging the modeling process with the rendering process can also be applied for the creation of stereoscopic contents of view-dependent models in general.

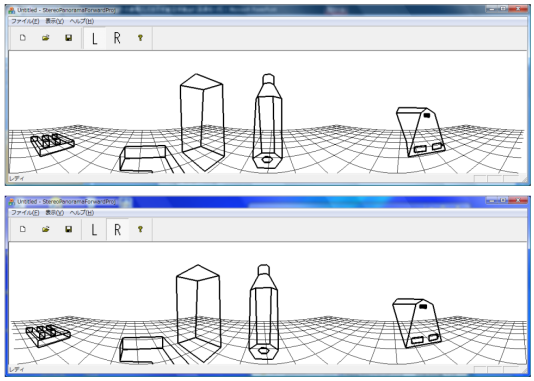

Figure 3: An example of panoramic image generation

3 Future work

Even though our system successfully produces stereoscopic panoramic images, due to the different geometries, impossible objects sometimes appear strongly deformed. While this problem is intrinsic to the framework (view-dependent models), we are currently developing a technique to suppress the deformation effect by introducing specially crafted rendering styles.

References

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