Simultaneously Viewing Monoscopic and Stereoscopic Content on Vertical-Interlaced Autostereoscopic Displays

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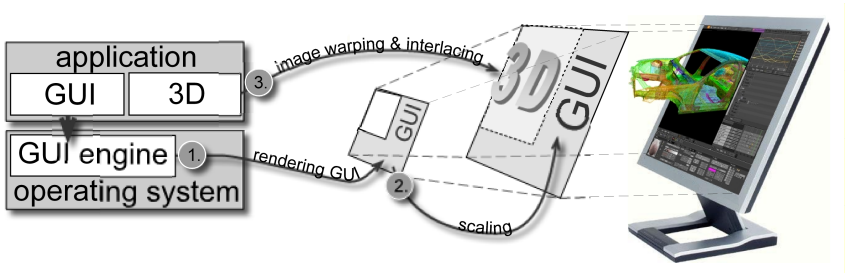

Figure 1: The technique is realized as an additional layer between a 3D application and the OS (left), an example application (right).

1 Introduction

On current vertical-interlaced autostereoscopic displays (ASDs) [2005a] users can view stereoscopic content without having to wear special glasses, since the two stereo images are separated using a lenticular raster or an LCD barrier integrated into the screen. Unfortunately this separation influences the viewing of monoscopic content in such a way that each eye perceives only half an image, resulting in distorted text and images. Although there are some displays allowing to switch off the LCD barrier in order to allow viewing monoscopic content, until now it was not possible to display monoscopic and stereoscopic content simultaneously on a single ASD, and simultaneous viewing is possible only by using an additional *regular* display to show the monoscopic content.

2 Hijacking 3D Applications

We propose a simple but effective technique which allows simultaneous display of monoscopic and stereoscopic content on a vertical-interlaced autostereoscopic display. The technique extracts and separates the content from existing 3D applications during runtime and modifies it to be displayed on ASDs. Our current implementation works on the windows operating system with almost any OpenGL application; we have tested several commercial applications.

To allow the simultaneous viewing we need to modify the monoscopic content in order to make it perceivable on ASDs and generate a stereo pair out of the 3D content. Therefore our technique acts as an integrated layer between the rendering application and the OS exploiting a virtual desktop of quarter ASD resolution (see Figure 1). The virtual desktop is realized by implementing a device driver. To allow proper viewing of 2D GUI elements on the ASD, we need to ensure that both eyes perceive the same information. This can be done by rendering these elements into the virtual desktop (1). Later on the thus generated image is scaled uniformly by a factor of two before it is written to the main desktop (2). To allow stereoscopically viewing the 3D content of arbitrary applications, not necessarily supporting ASDs, we hijack the rendering context, identify the 3D content, render in native ASD resolution, analyze the depth buffer and apply image warping techniques [1999] to generate a stereo pair, which is displayed vertically interlaced (3). An alternative to imaging warping would be tracing the 3D function calls in order to create a stereo pair. However, in a test implementation we have figured out that this leads to state management problems with many 3D applications.

To properly render the mouse cursor, context menus and pop-up windows which may appear on top of the 3D canvas we apply a masking technique. This is for example important, when dealing with 3D modellers, whereas context menus provide convenient access to important features.

3 Conclusion

With our software-based technique arbitrary standard applications, e.g. word processing or web browsers can be displayed on ASDs. Furthermore common 3D applications such as 3D modellers can display 3D content stereoscopically whereas 2D GUI elements are displayed monoscopically. Though our current implementation is working with windows systems, the technique is independent from the technology which is used to generate the stereoscopic effect and it may be integrated into any current operating system. Due to the simplicity of the technique there is almost no performance impact. Recently there have been also hardware-based systems proposed [2005b] to display mono- and stereoscopic content simultaneously. However, these systems incorporate additional costs for development and production and are not yet available. Further information can be found at `www.ivistec.com`.

References

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