



THREE-DIMENSIONAL MODEL OF THE OPTICAL EFFECT FOR AN AUGMENTED REALITY APPLICATION

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This work concerns augmented reality technology. Augmented reality is a process of viewing the real world and the virtual objects at the same time, where virtual information is superimposed in the physical world. Three-dimensional models of optical effects should be reliable, but at the same time, provide application files with minimal volumes. To carry out these requirements, it is proposed to use three-dimensional primitives in combination with effects in the augmented reality environment and with specially prepared textures.

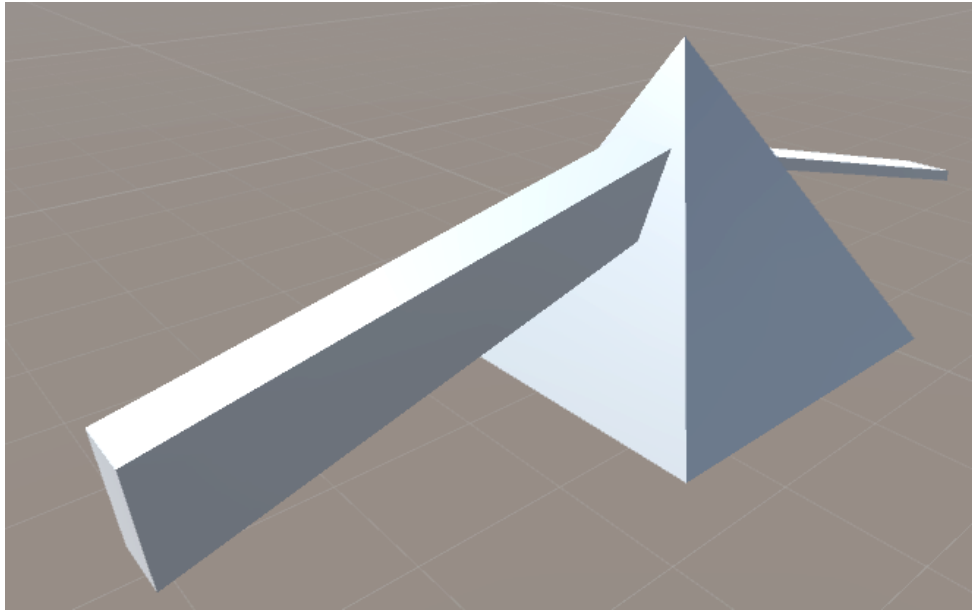
Among the areas of application of augmented reality technology, it is especially possible to distinguish textbooks, because this technology increases the students' interest in the subject, allows visualizing complex objects and processes. One of these areas is the development of three-dimensional models of optical phenomena for augmented reality in the study of physics [1, 2]. To create realistic scenes, one must take into account the fact that different conditions of a real scene illumination can seriously affect the model visualization after its imposition. The effect of this factor is noticeable in the modeling of clear glassy environments and objects.

The main task of this work is the development of a reliable optical phenomenon three-dimensional model for an augmented reality application.

For this task, the physical phenomenon of light diffraction was chosen. The classical experiment on light diffraction demonstrating is simple: a light beam, passing through a prism, decomposes into wave components. The phenomenon model must contain a ray of light entering the prism, an element within the prism itself, which presents the ray decomposition, and rays that exit from the prism. Three-dimensional visualization should ensure the minimum application file size.

The model is developed in the 3Dmax (fig. 1). In the model it was used a prism that must be glassy, has some "wear and tear" on its faces by model texturing. The more correctly the texture maps are selected and grouped, the more beautiful and correct the model will be. But complex and detailed texture will require more memory for storage, the model will be worse displayed by the device, it is more difficult to calculate and implement.

To minimize the file size, it is proposed to use basic primitives for beam modeling, which will have the maximum transparency when creating a texture (the color decomposition of the ray will come from the maximum transparency – 100%, to the minimum – 0%), and create a visual effect of the light beam. So the incoming beam is simulated by the Rectangle object, the outgoing beam is represented by an elongated Box. As an element that presents the beam decomposition, the element Box deformed under the incoming and outgoing rays is used.



Picture 1 – Three-dimensional simplified model of the diffraction phenomenon without imposing textures after import into Unity

The key step is to create the necessary materials and sweeps, which will be applied to the model. To give the model a reliable view, wrapping projection is used. In doing so, grouping of parts of the model, which will have the same texture, is used. For these groups, the same texture maps were created in Adobe Photoshop. Here, the blur, color balance and contrast effects are applied to the maps. The finished model is imported into Unity, where additional effects, such as anti-aliasing, shadow, glow, sun filter, spatial mapping, etc. [3], were added.

References

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