METHODS OF DATA REDUCTION FOR AUGMENTED REALITY APPLICATIONS

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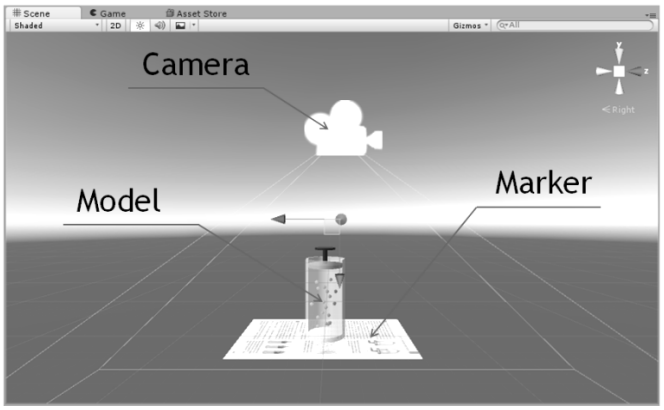
The intensive hardware and software tools development allow to using a wider range of multimedia and interactive functionalities in different areas of everyday life. One of the potentially interesting directions in IT development is augmented reality. Augmented reality (AR) is the environment with the direct or indirect complement of the real world with the digital data in real time. This is implemented by using computer devices such as tablets, smartphones and other gadgets and includes the specially designed software [1]. Unlike virtual reality in computer games, which is not exist, AR technology aims at enriching the existing environment by the additional information.

Today, AR is the emerging technology, but it is already used in many industries including healthcare, military training, education, business, marketing, design and planning.

The term "Augmented reality" was introduced by the researcher Thomas Caudell in 1990. Another researcher, Ronald Azuma, defined some features of the AR [2]:

- these are the combination of the real and virtual worlds;
- instructiveness;
- 3D visualization of objects.

The AR is based on the algorithms for recognition of the "markers", i.e. control images. These markers are generated in special ways and are stored in computer databases. When a computing devise browses and receives digital information from the marker, it calculates the position of the marker and as a result should correctly visualize images of the 3D objects on the screen (Picture 1).



Picture 1 – The structure of the augmented reality

Since 3D model generation is done in the real time and model browsing is performed from all sides of view, the AR applications are rather resource intensive. Additionally, it is obvious, that the larger number of such models in the application databases leads to the need for more computer capacities. Thus, the problem

of 3D models optimization for AR applications is very important. The issue concerns on problem of AR data minimizing.

The AR application data volume includes three parts:

– the procedure of the markers recognition and model generation;
– markers databases;
– 3D models databases.

Due to the fact that it is almost impossible to change the implementation of the application and the set of markers, the problem of data minimizing will be solved by 3D models optimization.

The studying of 3D models optimization methods was based upon the physics school textbook for 7^{th} grade. The implemented idea there was that each time, the device camera browsed the textbook pages, a certain supplementing text explanations 3D model appeared. While working with the models, the following methods were used:

a) optimal polygons number finding. Particularly, the task was to find the minimal polygons number which is sufficient to keep the right shape of the object. This was done by using the widely used low-poly models when not required to have a high level objects detalization or when the objects are defined by the standard primitives. This method is used to minimize computer resources in 3D applications with model visualization and animation in real time;

b) rejection of animation when the focus is on the description of the structural composition or on the object outlook. Animation of such models is based on the rotation along their axis which gives the visualization of the object from all sides of view. The application allows the user to investigate the model by changing the device position with respect to the marker;

c) short cyclic animations applying instead of the long repeating phenomena demonstrations (pendulum swings, wave phenomena, mechanisms action);

d) standard tools using such as Material Editor instead of textures when the object material does not influence the final result during the physical process demonstration [3];

e) applying of the image compression algorithms for models including textures. Particularly, use the textures with the highest possible image compression coefficients to achieve the required quality of the implemented model image.

The optimization methods considered in this study allow to improving the computing devices performance while real time models visualization and will reduce the whole application volume.

Bibliography

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