Abstract

Master's Certification

on:

"Distributed computing in applications with intensive use of three-dimensional graphics"

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The relevance of research

Computer graphics systems are a branch of modern information technology that plays an important role in human-computer interaction. Data visualizing helps to convey information to the user, because more than 80% of information a person receives through the visual channel. But nowadays amount of information, including graphics one, increased with huge tempo so it's difficult to handle it timely and properly not only for people, but also for machines. In particular, with regard to visual information, the drawing of complicated graphics requires considerable computational cost to calculate position, color, and other parameters of image pixels. Consequently, for accurate and fast visualization of three-dimensional object models the powerful hardware and software systems are needed. Hence it leads to the necessity of keeping a lot of rendering resources, which are often used inefficiently or are not optimal loaded. The most acceptable solution of this problem is the creation of parallel and distributed visualization (rendering), which combine hardware resources visualization (display devices, GPUs, etc.) using the communication channels and manage them by middleware. Creating of such software requires special tools that could meet the diversified requirements of users. One of the most powerful of these toolboxes is an Equalizer open framework, which contains the necessary functions for distribution and parallelization of the data visualization of three-dimensional objects between hardware resources. Therefore, extending of Equalizer and investigating of its application is very

urgent problem in computer graphics.

Purpose

The aim of research is the using of Equalizer framework for building distributed applications and parallel rendering programs, extending framework functionality with third-party software libraries and researching of using these combinations to visualize 3D-models in terms of hardware resources usage and the final image rendering quality.

Problems to be solved

1. Investigation of features of rendering object three-dimensional models scale algorithms existing within Equalizer framework.
2. Comparative analysis of distribution methods and rendering parallelization problems in terms of their performance and quality of final images.
3. Integration of three-dimensional object models visualization tools into Equalizer and their research.
4. Development of recommendations for further research and extending of Equalizer.

Achieved results

Having solved the problem that put in the work, the author defends:

- analysis methods for scalable rendering three-dimensional object models;
- developed application visualization of three-dimensional models, configured to import the model representations that are created by third-party graphics packages;
- recommendations for expanding the functional framework Equalizer for visualization of three-dimensional models.

Scientific novelty of the work

The scientific novelty of the work is that:

- the software application, which is visualizing standard representations of three-dimensional object models imported from formats graphics editors, was developed;
- the performance of different rendering methods before and after integration import tools was tested.

The practical value of work

The practical value of the work is that:

- experimentally investigated the possibility of flexible scaling visualization of three-dimensional models imported from other graphics packages and shells;
- experimentally investigated productivity application on the basis of functional Equalizer stronnimy means of import models.

Conclusions

1. The basic methods and algorithms for distributing and parallelizing three-dimensional images rendering by Equalizer were analyzed.
2. The features of integration of third-party libraries into Equalizer were analyzed.
3. Recommendations for further extending of Equalizer functionality, including by integrating third-party libraries, are provided.

The work contains 113 p., 25 fig., 5 tables, 15 sources, 1 appendix.

Keywords: PARALLEL RENDERING, MODEL, LOAD-BALANCING, CONFIGURATION, NODE, PIPE, WINDOWS, CANVAS, COMPAUND, SEGMENT, LAYOUT, VIEW, ANIMATION, BONE.