The evaluation of the effectiveness of using various methods in three-dimensional modeling of objects

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Parameters that affect the performance of simulation

As mentioned above, the list of points for using each method is:

- Resource consumption;
- Ease of learning (list of additional knowledge for applying the method);
- Compliance of the final model with the final concept.

1. Resource consumption.

Time spent on creating the model.

2. Technical resources.

How much a particular method loads the system on which the simulation is performed. This data will show which of the presented methods is most convenient for use on weak configurations.

3.Ease of learning.

Research in this area will help determine the most convenient method for constructing models for inexperienced and novice users, which will significantly reduce the threshold for young professionals to enter 3D modeling.

4. Correspondence of the final model to the final concept.

It will also be necessary to find out in which approach the model most closely repeats the original concept and how this data correlates with the previously obtained temporal calculations.

Methods used to assess performance

When calculating the optimal approach, we used two formulas:

1. "Linear" method and formula for calculating performance:

Performance = Actual / Plan·100%.

For this method, exact numerical correspondence is important, since simple mathematical calculations are performed.

In this methodology, Fact means a specific value obtained from users for each of the methodology assessment scales and averaged in advance by the principle of adding all the assessments and dividing them by the number of these assessments. A plan means a certain ideal value that we expect from each method in various rating scales.

2. It also created its own formula for calculating the effectiveness, used to study any methods of creating software products by human hands using computer technology:

$$\frac{(Co + Ac) - (Qu + Teh + Tr)}{t} = \frac{Ef}{t} \qquad (1)$$

In this formula:

1. *Q*u - the qualification of the performer (from 1 to 30 points).
2. *Co* - usability (from 1 to 30 points).
3. *t* - execution time (in minutes).
4. *A*c - compliance with the final result (from 1 to 30 points).
5. *Teh* - the level of technical equipment of the performer (from 1 to 5 points).
6. *Tr* - the presence of problems during work (from 1 to 5 points).
7. *Ef* - points of efficiency factor

This mathematical formula is unique in that it allows you to systematize the approach to calculating efficiency for any method of creating computer graphics by human hands.

Table 1. Table of weights of evaluation criteria.

Qualification of the executor	0,3 (30%)
Ease of use	0,3 (30%)
Compliance with the final result	0,3 (30%)
Level of technical equipment	0.05 (5%)
Problems during operation	0.05 (5%)

Based on the results of the study, the most effective modeling method was found based on the results of the control group. The results display form is shown in table 2.

Table 2. The final results of evaluating the effectiveness of methods.

Modeling method from geometric shapes	Modeling method based on 2d drawings	Spline modeling method
Percentage of efficiency 125.32%	Percentage of efficiency 54.67%	Percentage of efficiency 37.53%

Conclusion

At the moment, many methods of polygonal modeling are known, which have their pros and cons, but not a single complete study has been carried out in order to identify the most profitable method for each industry sector.

Within the framework of the study, a distributed computing system was developed that allows for analytical calculations of the effectiveness of methods for creating 3D models (for example, 3D models in an organic style).

A study of performance methods was carried out, an assessment of the appropriate ones for tasks in the field of 3D modeling evaluation. The modeling methods involved in the study are determined. A distributed computing system has been designed, which has a software module for evaluating input user data and a software module for analyzing data using performance evaluation methods.

Also, thanks to the work with a distributed computing system in the framework of the study of the issue, proposals were received for the modernization of software hardware in distributed computing systems by the example of creating a system that maximally performs all the necessary functions for correct work with data using methods of comparative analysis.