UDC 629.7.01

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Creating 3D models with modern programs for further use in modeling modern constructions and processes related to fatigue and destruction of aviation structures

The work of the study of the process of 3D modeling, as a promising and often used for the design of complex and energy-intensive mechanisms (for example, aviation equipment). Using the described approach to solving problems associated with fatigue and destruction of aircraft structures, it is possible to reduce the costs for the production of aviation equipment, shorten the terms of its development and increase the technological safety of aviation structures.

Aerodynamic diagnostics system.

The use of 3D graphics to create 3D models in energy-intensive industries depends on the ability of the designer to use the appropriate software.3D- graphics is the simulation of 3D models with the help of special software that allows you to display the selected object or object as accurately as possible, to the dimensions. Also, three-dimensional graphics make it possible to more clearly display the whole essence of the model: some of its properties, as well as features of construction and robots, to the smallest details. One of the most urgent issues are programs for creating models for 3D printing. Below is a selection of programs for 3D-modeling, which can be used by both beginners and industry professionals. It is important to understand that not all 3D-modeling programs have a direct connection with 3D - printing, sometimes it is necessary to combine a number of packages to create a high-quality model.

To better understand the process of creating a 3D model, you need to consider the algorithms for modeling it. Here are listed mathematical approaches, integrated in one form or another, each of which has peculiar properties. In total for today all algorithms for creation of technical models can be divided into three categories:

- Polygonal modeling. Most 3D models are now constructed as textured polygonal models based on polygonal mesh, because they are flexible enough and the computer can render them quickly enough. However, the polygons are flat and can only roughly transmit curved surfaces.
- Modeling using subdivisions is one of the modern algorithms that progressively develops and increasingly increases competition to the previous one.
- Procedural modeling- this simulation allows you to operate large-scale projects, therefore it is used by large-scale projects, therefore it is used by large computer graphics studios.

To create a 3D model it is important to choose a method of approach to the beginning of modeling.

Modern software makes it possible to use different approaches to constructing the model independently of the modeling with simple geometric shapes (balls, cylinders, cones, etc.), which are used as bricks for building complex objects. The advantage of the method is a quick and easy construction, as well as the fact that the model is mathematically defined and accurate. Suitable for technical modeling. Some programs can render from direction primitives, others use primitives only for modeling, and later convert them for further work or rendering.

For 3D modeling, such features and capabilities are typical:

- creation of three-dimensional models of the scene and 3D-objects as components;
- rendering(visualization) – the process of obtaining images by model;
- processing and correction of images;
- submission of the finished image or video to the output device: printer or display.

3D models are objects that use a set of points in 3D-space, interconnected by different geometric objects, such as triangles, rectangles (polygons), and so on. To build a 3D model, use a physical object, photos or 2D images (sketches). When designing complex devices, for example aircraft structures, 3D modeling makes it possible to significantly simplify the creation process, as well as finalize the design. In order to avoid, inaccuracies and mistakes, to assess the degree of conformity to the initial plan, to get an opportunity to analyze the behavior of the actuating elements of the mechanism in the course of operation before the project is approved. Special packages are used at the design stage. This package is "Ansys" universal program system of finite element analysis.

Modeling and analysis of aircraft fatigue and destruction with the help of this software allows avoiding costly and lengthy development cycles such as "design – manufacturing- testing". That is, you can test the model when it is still at the design stage in the 3D package. Thus, all the main advantages and disadvantages of the device can be detected in a minimal amount of time. That significantly speeds up the process of project implementation in minimum time and with minimal costs, because all miscalculations are revealed at the design stage, and not in the manufacturing process. Because the finished drawing or the outline sketch does not always give a complete picture of the object and it is not always possible to clearly evaluate the convenience of joining parts or assemblies, and computer modeling allows you to view the type of the projected object from any height, angle and location.

In addition, to see the nodes in the interaction you need some experience with technical documentation. Thanks to the 3D model, it becomes possible to demonstrate how a particular part will look at the design stage of the prefabricated unit, part or product as a whole, and also assess the degree of fatigue and destruction. Since 3D-models have a high level of interactivity and realism. With the help of competent and professional visualization, you can maximally bring the created 3D object to the real one. Therefore, the visualization stage plays an important role in the development of various units and assembly units. 3D modeling, combining with 3D printing, it is possible to create models of aircraft and their components in educational institutions where specialists are trained in this field, and also manufacture parts for their operation aircraft. These models make the learning process easier, more visual and cognitive, and

production is more accurate and deshovym. But to take advantage of the above advantages, it is necessary to have highly qualified specialists in this field by the fact that working with 3D models requires certain skills.

The presence of 3D- modeling, undoubtedly, speeds up the design processes. Although the creation of aviation technology is a relatively expensive and energy-intensive process. With the use of 3D modeling technology, it is possible to accurately design not only the aircraft , but also more detailed modeling of the processes that occur both in the nodes of the aircraft and outside it. This confirms firstly the wide practice of this technology in the production of aviation equipment, and secondly, its universality and a beneficial combination of three important criteria – price, time and quality. Therefore, this method is very promising and is required in the field of aircraft engineering.

References

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