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COMPARATIVE ANALYSIS OF PROGRAMS DESIGNED FOR AUTOMATING PRODUCTION PROCESSES

Nowadays, various design organizations are introducing computer technology, which raises design work to a higher level. This increases the speed and quality of design. The ability to solve complex engineering problems that were previously impossible to solve increases. All this work takes place with the help of effective and specialized programs. The entire process of creating programs and hardware for automating technological processes is included in computer-aided design (CAD) systems.

With the development of the technological process, the importance of CAD in all possible industries increases, since the system makes it possible to reduce the time required for design and technological preparation of production, as well as obtain data that is many times superior to the results of manual design. Considering that the development of science and technology is in full swing, all structures and technologies are becoming more and more complex. Therefore, the creation of the necessary systems, software support, and constant updating of data is a necessity.

Goals of creation and tasks of CAD

The main task of CAD is to solve the problem of automation of work at the stages of design and technological preparation of production. And the main purpose of creation

CAD is an increase in employee productivity with the help of:

- reducing the complexity of design and planning;
- reduction of design time;
- reduction of design and manufacturing costs, reduction of costs for exploitation;
- improving the quality and technical and economic level of design results;

- reducing costs for full-scale modeling and testing.
- You can ensure the achievement of these goals by:
- automation of documentation;
- information support and automation of the decision-making process;
- use of parallel design technologies;
- unification of design solutions and design processes:
- reuse of design solutions, data and developments;
- strategic design;
- replacing full-scale testing and prototyping with mathematical modeling:
- improving the quality of design management;
- application of variant design and optimization methods.

Review and comparative analysis

For review and comparative analysis, software packages were taken that are most suitable for working in the field of space technology, that is, these are programs with the ability to work with geospatial data. These are: Kompas , PTC , SolidWorks , Autodesk . Next, we will look at each separately.

Kompas -3D is a universal design system that is used both in construction and process design. The program is based on the mathematical core of 3D developed by our own employees and some parametric technologies. Program supports next row formats models

STEP, ACIS, IGES, DWG, DXF. They are among the most common, which makes it convenient to share data as an enterprise with other enterprises .

The program can be provided in a basic boxed version or with one of

proposed application packages. They are divided into the following categories:

- Mechanical engineering
- Construction
- Instrument making

According to available sources, the price for the boxed version is about 2150$. And for the purchase together

with any package it can cost a large amount.

Excellent features of Kompas -3 D :

- The most convenient classic solid modeling
- Creation of sheet parts and shells
- Design using complex surfaces
- Formation of an electronic model of products
- Full support of GOST and ESKD during design and documentation

PTCCreo 4.0 is a design system that currently has greater capabilities than other programs.

Different features from other packages are:

- Design of smart network products
- Additive manufacturing
- Model-Based Design (MBD)
- Augmented reality (AR)
- Efficient work with large and very large assemblies
- History-based modeling and direct modeling tools
- Working with complex surfaces.

And the rest are standard packages that were in older versions and are in other programs are CreoParametric, CreoSimulate, CreoSchematie, Creo has a rich set of functions, which is why it was rich in errors and shortcomings, which were noticeable only to experienced users who used it day after day. But after the release of the latest version 4.0, we see that the developers have tried their best. These problems and shortcomings have been resolved - the system is at a high intellectual level, and in the design area everything works quite smoothly.

The smoothness of work is largely due to the company's new partners. They are -GrantaDesign , LuxionKeyShot and Sigmetrix . Integration of the KeyShot rendering engine is very smart move. But one thing is interesting - why are developers trying to rebuild model-based design tools when

Sigmetrix has already established all the standards and has the necessary technologies and knowledge base.
Overall, the latest release is a very solid update with Creo 4.0. All existing program features have been improved and updated. And this software package is on the list of the best.
Solid Works (SW) is an almost identical software package with Creo 4.0 but is more popular due to its stability and ease. This program creates most of the technical details for 3D printing and other technical purposes. The price for the program package is about 5800$.
Great features of SW :
- Solid 3D modeling ;
- Development of welded structures
- Working with 3 D scanning data (ScanTo3D function);
- Ability to design sheet metal products;
- Orientation towards both design and technological training
production
- Libraries of standard elements
The latest version has increased the information content of the assembly tree. Improved capabilities for commenting on design ideas. In terms of design, that is, creating a sketch and part, there are no special innovations, but it is worth noting the appearance of two new tools:
- work with automatic filling of closed areas;
- a mouse cursor movement analyzer that recognizes randomly created lines;
- automatic cutting of threads along the end faces of a bolt or nut;
- hole wizard, which allows you to create holes from a set of different
elements - chamfer, cylinder, etc.;
- SolidWorks 3D Interconnect - for working with third-party CAD source data
suppliers
- From **Autodesk** the following can be used in design programs:
- AutoCAD
-Inventor
- Autodesk Nastran In-CAD
- Inventor HSM
The entire collection listed above has a cost of $1,300 per year.
AutodeskInventor - 3D CAD for product design. Almost all the capabilities of this program provided by the developers are available in the above two.
Great Features:
- full compatibility with AutoCAD format; |
- the ability to use two-dimensional parametric elements from the program
AutoCAD for creating new 3D models.
In general, Inventor is similar in many respects to Creo and SolidWorks but is still inferior to them in highly specialized functions, although it has its advantages.
Which program is best suited to the enterprise must consider the specifics of the enterprise’s work and the design and technological developments being carried out.
AutoCAD is a CAD program designed for drawing in both 3D and 2D. IN
The latest version does not have any innovative solutions. The program itself in the field of space technology has established itself as an additional design tool - it is used in conjunction with programs such as SolidWorks.

Conclusion
In the era of technology, instead of drawing on paper with one's own hand, computer-aided design systems came. They provide a huge number of possibilities on which human hands and heads would spend a huge amount of time.
This article reviewed four CAD software products. This -
Autodesk software (Autodesk Inventor 2018, AutoCAD), PTC Creo 4.0, SolidWorks 2018 and

Kompas-3D. SolidWorks has a big advantage among these products, despite the complete identity of functions with RTS CREO. It is as simple as possible and generally accepted by a large number of CIS engineers. It is also worth noting that it is recommended to use SW with AutoCAD. The second program is more convenient when working with 2D.
The choice of program depends entirely on the goals of the enterprise. That is, it is necessary
take into account the functionality of the system, localization and compliance with standards, specialized applications and packages, the system database, system requirements and compatibility with enterprise equipment, cost, popularity among collaborating organizations.
The future of CAD lies in integration with programs from other areas. This process implies the ability to use data from one program in another program without losing any important data. For example, the connection of calculation programs like MathLab with drawing programs like AutoCAD. If, after designing a spacecraft, it is necessary to calculate an estimate and transfer the data to an accounting program, then the programs must be interconnected. Such integration can make it easier and better to automate the manufacturing process and work in one environment.

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ЯДРОЛЫҚ ФИЗИКА, ЖАҢА МАТЕРИАЛДАР МЕН ТЕХНОЛОГИЯЛАР / ЯДЕРНАЯ ФИЗИКА, НОВЫЕ МАТЕРИАЛЫ И ТЕХНОЛОГИЙ

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НАБЛЮДЕНИЕ ТРАНСМУТАЦИИ ХИМИЧЕСКИХ ЭЛЕМЕНТОВ В РАЗЛИЧНЫХ ЭКСПЕРИМЕНТОВ

Аннотация

Эта научная статья представляет собой обзор современных исследований, посвященных наблюдению трансмутации химических элементов в различных экспериментах. Трансмутация, или изменение одного химического элемента в другой, была долгое время темой интереса для ученых. Несмотря на то, что первые успешные трансмутации были