THE KNOWLEDGE SYSTEMS IN CAD/CAM SYSTEMS

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Abstract: The CAD/CAM systems development is adapted to customer requirements. The customers ask for possibility to implement their own knowledge from work experiences to the system. The necessary of time reduction in particular phases of product lifecycle requires automation of routine, identification of critical points and utilization of experiences of successfully realized projects. On the present, the development of expert and knowledge systems is associated with the CAD/CAM systems development in order to fulfill the customer requirements. The CAD/CAM systems producers have placed software systems in specific version on the market. These software systems contain the knowledge modules for designing and manufacturing aid.

Key words: CAD/CAM system, knowledge system

1 THE CAD/CAM SYSTEM DEVELOPMENT

The following phases were specified by analysis of CAD/CAM system development and customer requirements for a period of 15 years:

1st phase: 1990-1995. The complex CAD/CAM/CAE systems were released with operating system UNIX based on hardware platform WS. In this phase, the only Pro/ENGINEER worked with operating system Windows. It was important period of 2D CAD systems.

2nd phase: 1995-2000. The operating system Windows progressed in CAD/CAM/CAE systems what caused the hardware platform PC was enforced. The new 3D CAD systems based on programming core Parasolid were put on the market. These systems, for example SolidEdge, SolidWorks, Pro/DESKTOP, had lower functionality as complex systems. The producers of complex systems split the systems into so-called subsystems (as are Foundation, Assembly, Drawing module) especially the CAD systems. That time CAD systems were set for customer requirements by their function and they could have worked independently.

3rd phase: 2000-2005. PDM (Product Data Management) and PLM (Product Lifecycle Management) systems are released. They integrate systems into information system of company. The 3D CAD systems include the analyzer modules for cinematic and dynamic of mechanisms. The AutoDESK company has put on the market 3D CAD

Inventor. Pro/ENGINEER, CATIA, UNIGRAPHICS implement into their CAD/CAM systems knowledge system components. [1], [4]

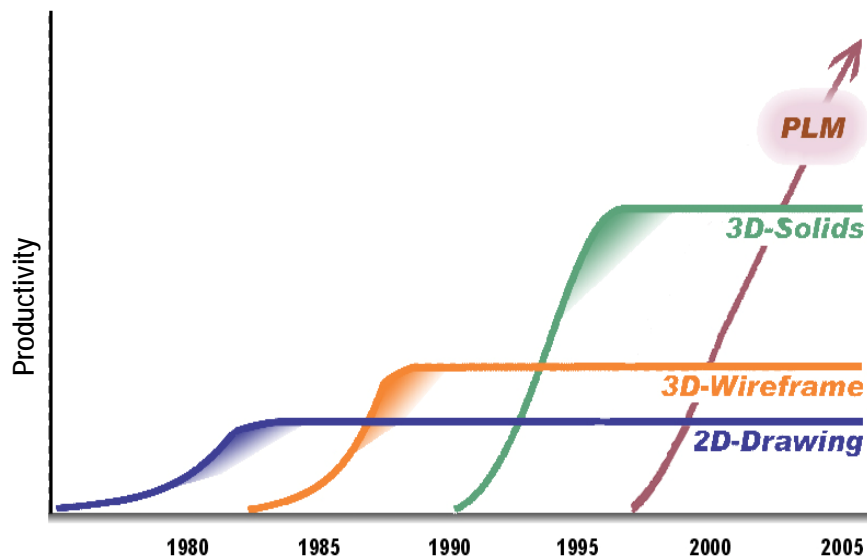The figure 1 represents the development of CA… systems utilization.

Fig. 1 Industry evolution

2 THE KNOWLEDGE SYSTEMS

The development and following implementation of knowledge systems in CAD/CAM systems strongly influences time factor of process of development and production of new products.

In period of ´80s, when the investments to informatics were increasing, the development of knowledge systems moved from laboratories to commercial utilization. The progress of knowledge systems was phased from medical diagnostic to machine-engineering industry.

The each knowledge system has their own basic structure which is illustrated on figure 2.
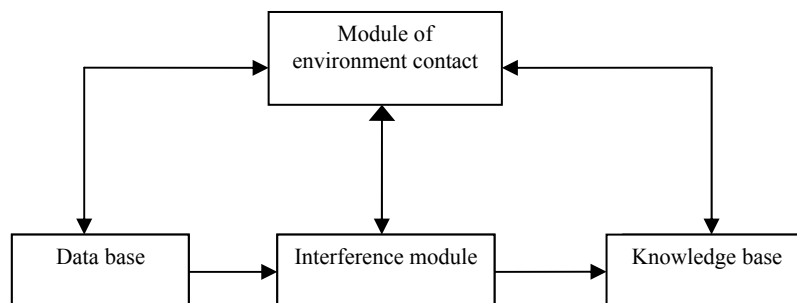

Fig. 2 The basic structure of knowledge system

2.1 The development stages of knowledge system

The knowledge engineering deals with effective creating of knowledge systems. It combines the work of programmers and experts for particular fields. This work is realized in following stages:

1st stage:

- development of essential programming technique for creation of knowledge systems,
- transfer of knowledge to representation schemas,
- knowledge coding.

2nd stage:

- segmentation of knowledge system to knowledge level and level of calculation,
- definition of clear terminology for creating of knowledge system,
- modeling of experts´ knowledge.

3rd stage:

- implementing of knowledge systems into information systems,
- the first knowledge modules in CAD/CAM systems.[3]

3 THE IMPLEMENTATION OF KNOWLEDGE SYSTEMS INTO CAD/CAM SYSTEMS

The analysis of knowledge system implementation into CAD/CAM systems was made for systems:

- Pro/ENGINEER, Parametric Technologies Corporation,
- CATIA, IBM/DassaultSystemes,
- UNIGRAPHICS, Unigraphics Solutions.

Pro/ENGINEER system does not include knowledge systems but it includes in its CAD system following modules:

- Behavior Modeling – designing according to defined criteria,
- Advanced Assembly Extension, Top Down Design – principle of designing,
- MoldBase Extension – tools and mold designing.

The mentioned modules allow using knowledge databases in agreement with defined criteria and requirements. [5]

CATIA system includes knowledge module directly in CAD system named CATIA PRODUCT SYNTHESIS Solutions, which involve following modules:

- CATIA Knowledge Fundamentals,
- Knowledge Advisor,
- Knowledge Expert,
- Product Engineering Optimizer.

The mentioned modules allow influencing the designed product directly through the use of knowledge system. The knowledge system is opened and expert-designer is able to define his knowledge so as to automate the cyclic operations during model designing. [2]

UNIGRAPHICS system includes integrated system Predictive Engineering that is used in material and semi-product design and also in case of repeating geometry in product designing. The system involve following functions since V17 version:

-    Knowledge Based Engineering,
-    Knowledge Driven Automation.

UNIGRAPHICS system uses knowledge oriented group of tools UG/Knowledge Fusion that includes:

-    Progresive Die mold Wizard – follow-on mold designing,
-    Gear Engineering Wizard – gearbox designing,
-    Weld Assistant – assistant for welded construction designing,
-    Die Engineering Wizard – molded panel designing.

The mentioned modules allow using knowledge databases according to specific criteria. The level of knowledge system implementation in UNIGRAPHICS system is between Pro/ENGINEER system and CATIA system. [6]

The all mentioned complex systems assume implementation of knowledge systems or some of their parts in whole Product Lifecycle Management system.

5 CONCLUSION

The CAD/CAM system development follows two tendencies, namely productivity and customer product designing. The customer product designing was strongly influenced by operating system Windows. The productivity increasing requested in the first step the implementation of PDM/PLM systems into job engineering and in the second step implementation of knowledge systems into CAD/CAM systems. The mentioned facts divided the market of CAD/CAM systems in high-functional products and aided products according to included functions. The similar dividing was among users of systems that were divided into development-manufacturing concerns and manufacturing concerns that participate on the activities of the first group. By implementation of knowledge systems, CA… products become the effective tools for increasing the competitive capacity on the product market.

6 REFERENCES
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