Design Encyclopedia Article

Design

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Contents

Design Encyclopedia Article.....1

Contents.....2

Design.....3

Design

Many activities are referred to as design. Design involves both synthesis—the making of something--and analysis. The general design process involves proceeding from an identified need, to the function that will meet that need, to the design and manufacture of the structure that will perform the function. Computers now play an important role in the design process,

Computers have contributed to the design process for a long time by providing analysis tools, **databases**, and computer aided drafting and drawing tools. The latter is also called **computer-aided design**. A computer-aided design (or **CAD**) system is a combination of **hardware** and software that provides a powerful designing tool for engineers.

Design systems have been developed for a myriad of functions, ranging from furniture design to home improvement, automotive engineering, and aircraft design. While design systems in the past required specialized and powerful computers, design software can now run on workstations and even personal computers. Some enhanced equipment is still required, such as a high quality **graphics** monitor, a light pen or a digitized tablet for drawing, and a **printer** or plotter capable of printing complicated design specifications.

When first developed, computer design systems mearly automated drawing. Now, an engineer can computationally rotate a design so it can be viewed from any angle. Additionally, the engineer may zoom in for close-up details or zoom out for a long-distance view. The software also keeps track of inter-related design values, so that if one **value** is changed the others are changed appropriately. This type of image analysis is moving closer to what is termed knowledge representation--the capability to model all aspects of knowledge about the designed **object**. The use of three-dimensional computer graphics to depict the structure and **operation** of various enzymes by molecular biologists and molecular engineers is a type of **knowledge representation**. Another example of knowledge representation is the prediction of protein structure by computational analysis of the genetic material that encodes the particular protein molecule.

Design programs now often include various analytic tools to enable the testing of the computer-generated design. For example, if a design is supposed to bear a load, the load-bearing efficacy of the design can be modeled. If deficient, the computer model can be modified. Only when a satisfactory computer model is obtained need a scale model be constructed. This can save both time and the expense of building unsatisfactory structures.