

Introduction:

Definition of CAD:

CAD stands for Computer Aided Design; the modeling of physical systems on computers, allowing both interactive and automatic analysis of design variants, and the expression of designs in a form suitable for manufacturing.

In my opinion, this definition encompasses all of the types of work that enters into the CAD arena.

Fulfilling the above mentioned definition, CAD software run via a computer system that supports geometric functions in both 2D (two Dimensional) & 3D (three Dimensional) formulas producing virtual models in their primary pre-production stages.

The history of CAD:

It all started in the late 1940's when the first digital computer was developed. About a decade later in the 1950's commercial computers became available too.

After the 1980s professional CAD packages were launched (AutoCAD, Micro Station, Architectural Desktop ect..). Each of these packages now-a-days can be used as an independent system for the purpose of 3D solid modeling or as the primary system for the operation of CAM, (Computer Aided Manufacturing) see (fig: 1.0) for the history of CAD.

A very brief history of CAD development is listed:

- * 1940 - First digital computer developed
- * 1950 - Commercial computers become available
- * 1955 - CRTs being used in military projects
- * 1957 - APT II (Automatic Programmed Tool) developed for generating NC control. Automatic NC used in industry
- * 1959 – Stromberk Carlson develops a system to interpret graphics on tape, then output them to a screen, or print on special paper.
- * 1963 – Ivan Sutherland presents a paper on "Sketchpad" which allows interactive graphics
- * 1965 – Lockheed introduces a CAD /CAM system, and a FEM system. Ac Donnel introduced CADD.
- * 1966 – Business world sees Wall Street Journal title "Electronic Sketching; Engineers Focus on Screen to Design Virtually via Computer; Keyboard Enlargers, Rotates Drawings; Lockheed, GM was enthusiastic about Uses"
- * 1971 – David Prince writes first book on computer graphics

- * 1975 – ICAM (Integrated Computer Aided Manufacturing) project is begun by US Air force
- * 1976 – Color raster graphics technology begins to develop.
- * 1979 – Development of IGES begins
- * 1980 – Introduction of PCs revolutionizes all markets
- * 1980s – Solid Modeling on UNIX
- * 1990s – Solid Modeling on low-end systems.

(Fig.1.0)

The benefits of CAD:

CAD has resulted in a reduced time scale from the overall design to the manufacturing process, accompanied by a greater confidence in the quality of the finished product.

In fact the CAD reach-out process laid hands on almost all industrial sectors of the world, mainly in AEC (Architectural Engineering Construction), Art & Design and Science and Technology.

Firstly, as we all know market competition is the most potent driving force. In order to win business **AEC** companies used CAD to produce better designs more quickly and more cheaply than their competitors. Productivity in this field has been much important since CAD systems enabled the usage of drawing tools that can draw complex geometric shapes in seconds.

In the past, creating complex geometry often involved a lot of measuring and location of reference points. Any mistakes or requests for revisions meant the loss of several hours of work, which in my opinion is completely ridiculous. On the other hand, with CAD, these complex forms are achieved in a breeze and revisions for the drawings are even simpler.

For instance, Deconstruction "a form of Architecture known for its complexity and confusion with weird shapes situated in different angles".

Deconstruction was much criticized in the 1970s and early 1980s. According to the International Union of Architects, this form of architecture was "unsettled and unsettling if not confused and confusing".

Nevertheless in 1986, Deconstruction was much recognized around the world, with the help of CAD, Deconstruction was neither unsettled nor confusing anymore.

In fact, most significant buildings of the world are of deconstructed nature for instance. (See the Guggenheim Museum in Bilbao, Spain (fig: 3.0) by Frank Gehry in 1997.



(Fig. 3.0)

On the other hand, CAD acts as the main supporter for FEA (Finite Element Analysis), a sub-system that exists within. FEA permits the rapid generation of models of proposed structural designs as wire frames. Then, CAD will calculate surface areas, volumes, and weights of different materials, center of gravity, and moments of inertia. Most importantly CAD will verify whether the suggested design will be capable of supporting the expected loads, thus providing the biggest contribution to the building construction field throughout.

Furthermore, CAD / CAM (Computer Aided Manufacturing), are highly related to the field of construction, when linked to CAD, CAM can produce a physical "real object" of the original design proposed. Thus, the output could result in the rapid manufacturing of mechanical elements, construction building materials; even sculpture and massive detailing. Construction after the mid 80s has flourished through the high rise towers and Landmarks that stand as a firm witness to what was and what is right now just because of CAD.

ART & DESIGN

Secondly, CAD produced Artistic Packages to support various fields of art and design like Interior Design and Advertising.

These packages include software like:

3D Studio Max, Lights cape, 3Dviz etc...

These software produced life-like representations of all materials, realistic photo-like images at high resolution and the ability to alter the color or patterns in rendering at less cost than our traditional perspective artist. With CAD, it is more affordable and better in terms of quality and time consumption. "Using Lightscape to produce realistic effects by replicating actual ambience and lighting form Luminaries is no longer an expensive process." Concept Imagine Inc, Michigan. (See fig.4.0)



(Fig. 4.0)

Moreover, CAD aided advertising agencies that used the same software as interior designers in addition to several products that support animation like 3D character like "Maya".

In this case, media artists work with 3D Max along with other applications to produce Photo-realistic surfaces and various elements of nature. Actual materials and colors are selected by the designer, then a piece of art will be generated depending on the artist's imagination and creativity. (See fig. 5.0, 5.1, and 5.2)



(Fig. 5.0)



(Fig. 5.1)



(Fig. 5.2)

So far there is not a thing that cannot be done with CAD software and the computer. Similarly note that interior relationship between this paragraph and the previous in format lies in the output of imaging which is produced via CAM supported printing machines. Therefore, the output can be on Canvas, glossy paper or other desired material.

Science & Technology

Thirdly, CAD's long arms reached out so far up to the heart of science and technology.

NASA; (the National Aeronautics and Space Administration), for instance, is totally depended on both CAD, CAM solutions that allows for the design of the space shuttles and it is components, CAD, CAM at NASA are mainly used for the development of science inventions through soft prototyping and simulation, prior to taking any actual or physical location. (See Fig. 6.0)



(Fig. 6.0)

NASA has established its own CAD center for virtual expectation aids. There, space shuttle movements can be tracked and saved. The center can also produce demos for presumption of space shuttle and comment explosions or expected explosion. In addition to the above, NASA has also hired CAD contracting comp for additional support for instance David Well; CEO for Micro station CAD solutions says "we do many of CAD drawings for NASA and their suppliers of rocket Lunch facilities at the Kennedy Space Center. The main drawings we do are of the towers that support the rockets prior to lunch one we recently worked on was (Lunch Complex 40)"

Science and technology are quite inter-related since the works of NASA are recognized as scientific technology aspects. The world technology itself means "the study of mechanical arts and applied sciences".

Looking at everything around us just remember that whatever you are looking at has been pre-designed using CAD software especially our interior household electronically gadgets.

Let's take for instance the vacuum clearer, Dyson, vacuum clearer manufactures in the UK,

Three years ago, Dyson has speeded up its production by converting from traditional design and prototyping technologies to the new state of Art CAD/CAM systems.

The result was splendid in Feb 2000 Dyson Launched its revolutionary "Dual cyclone vacuum clearer (See fig. 7.0) through a series of 3D solid models.



(Fig. 7.0)

Each and every component was modeled from the largest shaft to the smallest screw. Furthermore, the CAD effects at Dyson were recognized as a "right-at-first-time-development" according to (C3), a design and visualization magazine. "Issue # 2 Feb 2000.

Conclusion

Finally, enhancing the technology content of CAD products is inevitable. Perhaps, functional modeling will allow large scale changes to assemblies without significant remodeling.

As computers become more powerful, more tools evolve that allow us to build larger and more complex software systems. The artificial barriers that keep us from modeling the real world are fall. Finding the ways to do this best is all dependant on computer science.

Therefore, I would like to thank all computer engineers, scientists, and programmers for inventing CAD, since sometimes people tend to forget "**who does the credit go to**" ...