



The Analysis of Computer Applications in Various Fields

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Abstract: - Computer is most emerging tool in the research process. Computer is an electronic machine that is used for various purposes. Computer can perform various tasks speedy as compare to human beings. it has vast capacity to store large amount of data that is beneficial for future use. it provide better performance .Computers are used to reduce the paper work. Computers play a major role today in every field of scientific research from genetic engineering to astrophysics research. Today's computers are used in various fields such as education, artificial intelligence, weather forecasting, CAD/CAM, embedded system, simulation etc. In this paper, various computer applications are discussed with respect to ease of human.

Keywords: - Embedded system, Expert System, Simulation, Neural Network, CAD.

I. INTRODUCTION

The word "COMPUTER" comes from the word "COMPUTE", which means, "TO CALCULATE". Hence, people usually consider a computer to be a calculating device that can perform arithmetic operations at high speed. Although the original objective of inventing a computer was to create a fast calculating device, we now define a computer as a device that operates upon data because more than 80% of work done by today's computers in data processing. Data can be anything like bio-data of applicants when computer is used for short listing candidates for recruiting; marks obtained by students in various subjects when used for preparing results; details(name, age, sex, etc.) of passengers when used for making airline or railway reservations; or number of different parameters when used for solving scientific research problems, etc. Notice from the examples that data can be either numerical, non-numerical, or a mixture of both.

A computer is often referred to as a data processor because it can store, process and retrieve data whenever desired. The name data processor is more inclusive because modern computers not only compute in the usual sense but also perform other functions with data that flows to and from them. For example, data processors may gather data from various incoming sources, merge(process of mixing or putting together) them all, sort(process of arranging in some sequence-ascending or descending) them in the desired order, and finally print them in desired format. Notice that none of these operations involves arithmetic computations in the usual sense but a computer is the most suitable device for performing them.

The activity of processing data using a computer is called data processing. Data processing consists of three sub-activities: capturing input data, manipulating the data, and managing output results. As used in data processing, information is data arranged in an order and form that is useful to people receiving it. Hence, data is raw material used as input to data as input to data processing and information is processed data obtained as output of data processing.

II. CLASSIFICATION OF COMPUTERS

There are various methods on which the computers can be classified. The classification may depend on size, technology, area of application, type of data processed etc.

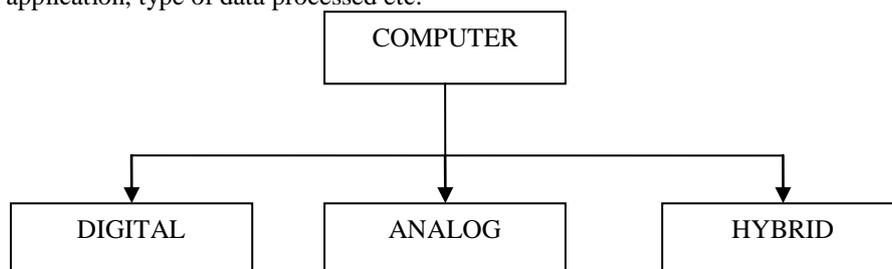


Fig1. Types of Computer on the Basis of Data Processing

A. Digital Computers:

Digital computers are the computers that work on discontinuous or discrete data. These computers convert the inputs into binary language of 0's & 1's. They carry out operations on binary data at a very fast rate and generate output in user understandable language. These computers are more accurate, faster and reliable than analog computers. They are the most commonly used computers in homes and offices. The real life example of a digital computer is a digital watch. Now days, computer used for the purpose of business and education are also example of digital computers.

B. Analog Computers:

Analog computers are the computers that work on continuous data. Analog computers are used to measure the physical quantities like pressure, temperature, speed etc. These computers accept input data in the form of signals and convert them to numeric values. For example: A thermometer does not perform any calculations but measures the temperature of the body. These are mainly used for scientific and engineering purposes, because they deal with quantities that vary constantly. These are faster than digital computers but they are not as accurate as digital computers. That's why they are less commonly used.

C. Hybrid Computers:

Hybrid computers employ both the features of digital and analog computers i.e. they can work on continuous as well as discontinuous data. These computers are useful in those environments, where both digital & analog signals are used in processing. The use of hybrid computers are increasing day by day they are number of areas in the real world where we need both analog and digital computers. For example: In a hospital, there may be number of devices like E.C.G. machine etc. which are used to measure the patient's heart beat, temperature and other information. This is done by analog computers. The information received from these analog computers is then supplied to digital computers to generate reports. Thus, this whole system uses hybrid computers.

III. APPLICATIONS OF COMPUTER

A. Role of Computer in Embedded System:

Embedded systems are used to control, monitor or help the operation of equipment. An embedded system has software embedded into hardware, which makes a system dedicated for an application (s) or specific part of an application or product or part of a larger system. It processes a fixed set of pre-programmed instructions to control electromechanical equipment. Embedded systems often interact (sense, manipulate & communicate) with external world through sensors and actuators and hence are typically reactive systems; a reactive system is in continual interaction with the environment and executes at a pace determined by that environment.

Today, embedded systems are found in cell phones, digital cameras, camcorders, portable video games, calculators, personal digital assistants, microwave ovens, answering machines, home security systems, washing machines, lighting systems, fax machines, scanners and many other devices.

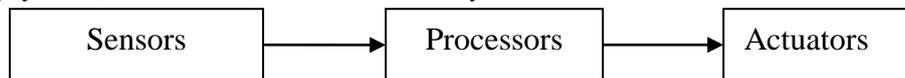


Fig 2. Embedded System

Characteristics of Embedded System

- Embedded systems are application specific.
- Embedded systems are very efficient. They save time and cost..
- Real time systems performed operations within time. Embedded systems are typically designed to meet real time constraints
- Embedded systems often interact with external world through sensors and actuators and hence are typically reactive systems; a reactive system is in continual interaction with the environment and executes at a pace determined by that environment.
- They generally have minimal or no user interface.

B. Role of Computer in Simulation:

A computer simulation run on a computer to show behavior of a system. It represent running of system's model. It makes the use of abstract model to simulate the system. Computer simulation used in mathematical systems like physics, chemistry, biology and in various human systems like economics, social science, and engineering. Computer simulation can assist in the design, creation, and evaluation of complex systems. Designers, managers, analysts, and engineers use computer simulation to understand and evaluate the behaviour of the system.

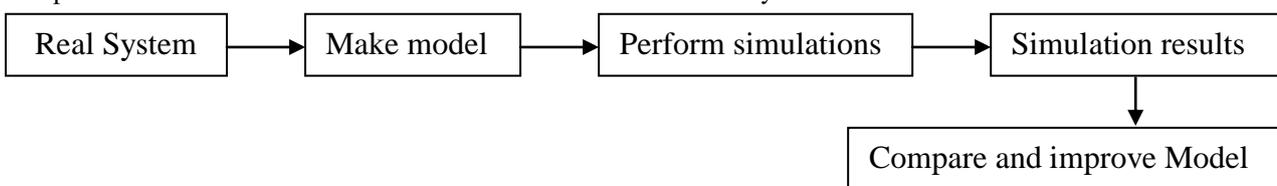


Fig 3. Simulation

Computer simulations are used in various areas:-

- Simulators are used to give training to pilots.
- It is used for modeling car crashes to test safety mechanisms in new vehicle models.
- Robot simulators are used for the design of robots and robot control algorithms
- Urban simulation models that simulate dynamic patterns of urban development .

- e) Traffic engineering to plan parts of the street network from single junctions over cities to a national highway network
- f) Reservoir simulation for the petroleum engineering to model the subsurface with simulation tools.
- g) They are used in weather forecasting.

C. Role of Computer in Artificial Intelligence:

Artificial intelligence is very emerging field of computer science. The main objective of AI is to develop machines that have human kind of intelligence. Various AI techniques are used that are used to solve AI problems. It includes **Expert systems and Neural network**. An expert system is a set of programs that manipulate encoded knowledge to solve problems in specialized domain that normally require human expertise. Expert system has explanation module, input/output interface, editor, inference engine, knowledgebase, case history file, learning module. Various Expert Systems are available:-

- a) **Dendral:** it is capable of determining the structure of chemical compounds given a specification of the compound's constituent elements and mass spectrometry data obtained from samples of compound.
- b) **Mycin:** it is an expert system which diagnoses infectious blood diseases and determine are commended list of therapies for the patient.
- c) **Puff:** It is a diagnostic expert system for pulmonary diseases.

A trained **neural network** can be thought of as an "expert" in the category of information it has been given to analyze. Neural networks process information in a similar way the human brain does. This expert can then be used to provide projections given new situations of interest and answer "what if" questions.

D. Use of Computer in Defence:

Computer performs very important role in Defence. Computers are used to track incoming missiles target to destroy them. Computers are used in tanks and planes and ships to target enemy forces, help diagnose any problems with the platforms. Computers are used to hold documents, maintenance records and records of events. They are also used on Intercontinental Ballistic Missiles (ICBMs) that uses GPS and Computers to help the missile get to the target.

Applications of Computer in Defence

- a) **Computer Simulation-** Computer simulations allow the military to train soldiers without actually having to put them in harm's way. It is a way to develop military's tactical, strategical and doctrinal solutions in battle.
- b) **Communication** - When it comes to military training, being able to communicate with the team in far places is essential in learning to work together. Allow those who are specializing in military communication to get hands-on training in real world setting.
- c) **Military Secrecy-** It also helps them organize their files for safekeeping and easy access. There are programs and hardware of military computers that are confidential for security purpose.

E. Role of Computer in Medical:

Computer plays very important role in medical science. It helps the doctors to conduct various surgeries. Using computers, we are able to hold all of patients' information in a more organized way. With so many patients and their information, files and records would occupy too much space. Computers allow people in the medical field to store information. Medical history, current health status, family history, and more can be easily accessed and looked up within a few minutes. Computers can be used to perform research in the health sector. Research studies can be done on a computer. Studying certain types of cells, micro organisms, body functions, etc. are done through computer. They can easily save important information and open it up later and this information can be easily displayed through presentations and google documents, or be sent to whomever needs to view it. Web conferencing can be used to guide new trainee doctors. Doctors are able to freely communicate across the world using computer based programs and internet access. Computers are used in many of the diagnostic tests that take place within the hospital. Types of Computer Techniques Used in Hospitals are Computerized Axial Tomography (CAT or CT), Magnetic Resonance Imaging (MRI), Functional MRI (fMRI). Applications of Computers in Medical

- a) Computer-assisted surgery (CAS) represents a surgical concept and set of methods, that use computer technology for surgical planning, and for guiding or performing surgical interventions. CAS has been a leading factor in the development of robotic surgery.
- b) In radiology, computer-aided detection (CADe), also called computer-aided diagnosis (CADx), are procedures in medicine that assist doctors in the interpretation of medical images. Imaging techniques in X-ray, MRI, and Ultrasound diagnostics yield a great deal of information, which the radiologist has to analyze and evaluate comprehensively in a short time.

F. Role of Computer in Biometrics Systems:

The word "biometrics" came from Greek word which can be divided into two roots: "bio" means life and "metrics" – to measure. Biometrics offer automated methods of identity verification or identification on the principle of measurable physiological or behavioral characteristics such as a fingerprint or a voice sample. The characteristics are measurable and unique. Biometric technologies can be divided into 2 major categories according to what they measure:

- a) Devices based on physiological characteristics of a person (such as the fingerprint or hand geometry).
- b) Systems based on behavioral characteristics of a person (such as signature dynamics).

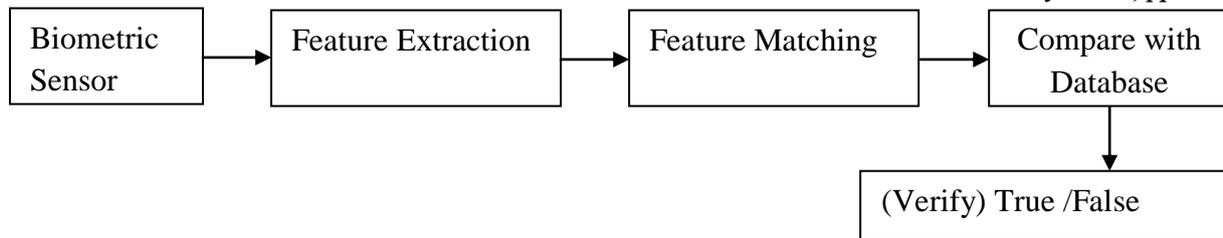


Fig 4. Biometric System

Applications of Biometrics:

- a) Biometric time and attendance systems, which are being increasingly used in various organizations to control employee time keeping.
- b) Biometric safes and biometric locks, provides security to the homeowners.
- c) Biometric access control systems, providing strong security at entrances.
- d) Biometric systems are also developed for securing access to pc's and providing single login facilities.
- e) Wireless biometrics for high end security and providing safer transactions from wireless devices like PDA's, etc.
- f) Applications of biometrics technology in identifying DNA patterns for identifying criminals, etc.

G. Role of Computer in Banks:

Computer technology has made several important impacts on our society. Today computer is playing very important role in every field of life. Many activities in daily life can be performed very easily and quickly. A lot of time is saved and overall cost is reduced to solve a particular problem. Many fields where computer are widely used. Computers are widely used in banks. They are used in banks for record keeping and maintaining accounts of customers. Most of the banks provide the facility of ATMs. The customers can draw money through ATM card from any branch of that bank (or another bank) at any time of a day. Computers support all these functions and services:-

- a) **Mainframe:**-Your bank's workhorse is the mainframe. It's the backbone of any bank's operations because it performs all the following, simultaneously: all customer account data
 - i. Performs complex analysis of constantly changing financial markets
 - ii. Keeps track of all the bank's product offerings and their associated interest rates and earnings
 - iii. Communicates with other mainframes at branch locations around the world
- b) **ATMs:**-The automated teller machine, which was introduced in the 1970s, liberated the typical bank customer from that last-minute race to get to the bank before it closed. Using an ATM, customers were finally able to check account balances, withdraw cash and eventually deposit cash and checks, make transfers between accounts and make loan payments. The individual computer units inside each ATM are linked to the bank's mainframe, where all the data are stored and coordinated
- c) **Teller Terminals:**-Servicing the varied national and international needs of today's bank customers requires a teller able to communicate as much with the outside world as with the mainframe. All of this communication happens from the individual teller terminal. **Teller computer terminals** provide access to business and personal overseas accounts and process wire transfers and bill payments to the bank's proprietary credit cards and any other bills, such as your electric bill, that the bank offers to facilitate at its location.
- d) **Scanners:**-scanners ensured that would never happen again by making digital scans of checks as legally viable as paper checks. Now banks and their customers use check scans routinely for deposits and transfers, making the digital imaging function a major player in today's computerized banking.
- e) **Biometric Devices:**-American Express and BBVA are two U.S. financial institutions that jumped first into biometric identification of customers. Press your thumb to the digital device and the tiny computer inside verifies your identity using your unique fingerprint. American Banker predicts that with increasing availability of this technology through devices like Touch ID from Apple, these print readers will soon be standard computer technology for banks internationally.

H. Role of Computer in E-Commerce:

E-Commerce stands for electronic commerce. It is also known as e-trade or e-business. E-commerce is a financial business transaction conducted electronically between business partners over computer network (such as on Internet). This saves time for participants on both ends. The users can buy, sell, and exchange products or services via computer network. There are many applications of e-commerce such as home banking, shopping in electronic malls, buying stocks, finding a job, conducting an auction, collaborating electronically with business partners around the globe, marketing & advertising and providing customer service. The following services of e-commerce are used most frequently.

- a) **Electronic Mail (E-mail):** The e-mail is a service that transports text messages from a sender to one or more receivers via computer. Voice mail systems capture, store and transmit spoken messages.
- b) **Video conferencing:** Video conferencing is a type of conference in which video cameras and microphones capture sight and sound transmission over networks. It is an advance form of teleconferencing. Video conferencing should provide a complete simulation of a normal meeting environment, enabling both parties to see, hear and present material, just as if they were in the same room. It can speed up business process and

procedures in the same way that the fax and the e-mail have revolutionized the way we share information. Tangible benefits are most easily related to actual cost savings. The most obvious quantifiable saving is the cost of travel and cost of the time wasted during travel. Following hardware and software are required in video conferencing.

- i. Webcam is a digital video camera. Its output can be viewed in real time over a network/Internet.
 - ii. Microphone & speaker or headset.
 - iii. Special software for video conferencing.
 - iv. Computer with a large memory and fast processor.
- c) **Electronic-Shopping(E-Shopping):**The shopping conducted through Internet is known as electronic shopping or e-shopping. Many business organizations have their websites on the Internet. These websites are used to sell goods and services. Customers place their orders through websites and make payments using credit cards. Any computer connected to Internet can be used for this purpose. People can purchase any goods such as books, software, movies, and computers etc.

I. Role of Computer in Weather Forecasting:

Weather forecasting is the application of science and technology to predict the state of the atmosphere for a given location. It involves so many mathematical calculations. The mathematics involved is too complex. The task is not too much for computer, however. Computers can perform a series of calculations in a few hours that would take a meteorologist his or her whole lifetime to finish. In numerical weather predicting meteorologists select a group of equations that describe the conditions of the atmosphere as completely as possible for any one location at any one time. This set of equations can never be complete because even a computer is limited as to the number of calculations it can complete in a reasonable time. Thus, meteorologists pick out the factors they think are most important in influencing the development of atmospheric conditions. These equations are fed into the computer. After a certain period of time, the computer will print out the changes that might be expected if atmospheric gases behave according to the scientific laws to which they are subject. From this printout a meteorologist can make a forecast of the weather in an area in the future. The accuracy of numerical weather predictions depend primarily on two factors.

- i. First, the more data that is available to a computer the more accurate its results.
- ii. Second, the faster the speed of the computer the more calculations it can perform and the more accurate its report will be.

The types of computer models that are used in forecasts depend mostly on the type of climate and weather conditions.

- a) **Climate Models:-**Climate models are primarily used to forecast substantial changes in the earth's climate. Climate is the average weather conditions in an area for a prolonged period of time.
- b) **Mesoscale Models:-**Mesoscale models are mainly used to forecast the weather locally. Mesoscale in meteorological terms means the atmospheric conditions ranging usually from two to 20 km.
- c) **Dynamic Models:-**Dynamic models are the most sophisticated and costly tools used to forecast the weather. Dynamic models use advanced fundamental equations of the atmosphere to predict changes in the weather based on current conditions. Despite their efficiency, dynamic models can make errors during the initial runs.
- d) **Statistical Models:-**Statistical models are primarily used to help meteorologist provide accurate analog forecasts. Statistical models use data from previous storms and weather conditions to help meteorologists get a better idea of how to track current weather systems. Statistical models are commonly used to track tropical and mid latitude cyclones. If the dynamical model consensus is not reasonable, meteorologists often use statistical models to provide better forecasts.

J. Role of computer in Entertainment:

Today, computers are used in a variety of areas for entertainment purposes. The technology is used for streaming and watching videos, listening to downloads of music, playing video games. The computers started as very simplistic machines for storing and transferring data. Most of these files were text-based reports used in a work environment. As technology advanced, computers became increasingly versatile in what they could do. With the creation of the Internet and faster processors, file sharing and entertainment became a popular use for personal computers everywhere in the world. Computers have endless uses in the entertainment industry by directly marketing products to users. Computer used in these fields.

- a) **Music:** Computers now have almost unlimited access to any song by any artist. This is the way of entertainment. Many website services allow users to purchase individual tracks or albums directly to their computer. Most record labels take advantage of these services to make up for lost revenue from illegal downloading. Computers also open a venue for many amateur musicians in the music industry to record their own music without a professional studio needed. Computers also allow musicians to create artificial instruments to record with, called MIDI instruments that provided by multimedia.
- b) **Television and Movies:** In entertainment with the advancement of video card and Internet speeds, movies and streaming television are now at the click of a mouse button. Many websites provide the services of movies with the cost of monthly subscription fee. Various websites offer free streaming episodes of certain TV series with Internet commercials. With the use of newer HD televisions and computers, the option of sending your

computers video. These videos feed to the full screen. Many times users may not even need to pay for cable service or television because of all the free available video content online using internet.

- c) **Art:** Art is entertainment using computers. Pictures, paintings, poetry and more are just a technique of art. Various browsers offer specific image search options to quickly browse through art with a single keyword and movement of a mouse. Besides general use, computer photo editing programs and animation programs are also the sources of art and photography.
- d) **Games:** Computer games are video games. However, computer games offer a variety of possibilities. Computers have access to many peripheral devices such as keyboards, mice, joysticks, controllers. Computer games also are highly customizable because computers can manipulate game files and video games. For examples creating new levels, characters or graphic files for specific games. Video games are based on these files.

K. Role of Computer in Education:

Computer teaching plays a key role in the modern education system. Students find various notes on the internet using computer. Students find it easier to refer to the Internet than searching for information in fat books. The process of learning has gone beyond learning from prescribed textbooks. Internet is a much larger and easier-to-access storehouse of information. When it comes to storing retrieved information, it is easier done on computers.

- a) **Computers are a brilliant aid in teaching:** Online education has revolutionized the education industry. Computer online education technology has made the dream of distance learning, a reality. Education is no longer limited to classrooms and practical labs. It has reached far and wide, thanks to computers that provide very vast knowledge of study that is extra from books. Physically distant locations have come closer due to Internet accessibility. So, even if students and teachers are not very well communicate with one another. Online educational courses provided by the internet that are better for students that are not required to attend classes physically.
- b) **Computers have given impetus to distance education:** Distance education is most popular technique in these days. Computers facilitate effective presentation of information. Presentation software like PowerPoint and animation software like Flash among others can be of great help to teachers while delivering lectures in distance education. Using multimedia computers facilitate audio-visual representation of information, thus making the process of learning interactive and interesting way. Computer-aided teaching adds a fun element to education. Teachers hardly use chalk and board today. They bring presentations on a flash drive, plug it in to a computer in the classroom, and start teaching. The color and the view of the presentations make full interest of students in study. Due to the visual aid, difficult subjects can be explained in better ways and understand easily.
- c) **Computer software help better presentation of information:** Internet can play an important role in education. Computer provides the various software for presentations. As it is an enormous information base and retrieval of information on a variety of subjects. The Internet can be used to refer to information on different subjects with different way. Both teachers and students benefit from the Internet and gain advance information. Teachers can refer to it for additional information and references on the topics to be taught. Students can refer to web sources for additional information on subjects of their interest get extra information of education. The Internet helps teachers set test papers, frame questions for home assignments and decide project topics.
- d) **Computer used for storage of educational contents:** Computers enable storage of data in the electronic format, thereby saving paper. Memory capacities of computer storage devices are in gigabytes. This enables them to store huge chunks of data. Moreover, these devices are compact. They occupy very less space, yet store large amounts of data. Both teachers and students benefit from the use of computer technology. Presentations, notes and test papers can be stored and transferred easily over computer storage devices. Similarly, students can submit homework and assignments as soft copies. The process becomes paperless, thus saving paper. Plus, the electronic format makes data storage more durable. Electronically erasable memory devices can be used repeatedly. They offer robust storage of data and reliable data retrieval.
- e) **Computer hard drives and storage devices are an excellent way to store data:** This play important role in education. Storage is the education sector which computers have impacted. They are of great use in every field. This underlines the importance of computer education. Knowledge of computers can make the career in the right direction of any person. Computers are a part of almost every industry today. They are no longer limited any specific field. They are used in networking, for information access and data storage and also in the processing and presentation of information.

L. Role of Computer in Architecture:

Computer used in architecture for designing and manufacturing buildings, magazines, prints, newspapers, books and many others. The construction layouts are designed beautifully on system using different tools and software's. These are CAM/CAD.

- a) **Computer-Aided Manufacturing (CAM) :-**Computer-aided manufacturing (CAM) commonly refers to the use of numerical control (NC) computer software applications to create detailed instructions (G-code) that drive computer numerical control (CNC) machine tools for manufacturing parts. Computer-aided manufacturing (CAM) is an application technology that uses computer software and machinery to facilitate and automate manufacturing processes. Manufacturers in a variety of industries depend on the capabilities of CAM to produce

high-quality parts. A broader definition of CAM can include the use of computer applications to define a manufacturing plan for tooling design, computer-aided design (CAD) model preparation, NC programming, coordinate measuring machine (CMM) inspection programming, machine tool simulation, or post-processing. Depending on enterprise solution and manufacturer, CAM may present in the following areas:

- i. Manufacturing process and usage complexity
 - ii. Product Lifecycle Management (PLM) and modern enterprise integration
 - iii. Machine process automation
- b) Computer-Aided Design (CAD) :-** Computer-aided design (CAD) is a computer technology that designs a product and documents the design's process. CAD may facilitate the manufacturing process by transferring detailed diagrams of a product's materials, processes, tolerances and dimensions with specific conventions for the product in question. It can be used to produce either two-dimensional or three-dimensional diagrams, which can then when rotated to be viewed from any angle, even from the inside looking out. The concept of designing geometric shapes for objects is very similar to CAD. It is called computer-aided geometric design (CAGD). CAD is used to:-
- i. CAD is used for detailed engineering designs through 3-D and 2-D drawings of the physical components of manufactured products.
 - ii. CAD is used to create conceptual design, product layouts, strength and dynamic analysis of assembly.
 - iii. CAD is used to prepare environmental impact reports, in which computer-aided designs are used in photographs to produce a rendering of the appearance when the new structures are built.

Advantages of CAD/CAM

- i. Speed up the process of experiments
- ii. Sharing of data
- iii. Increased productivity
- iv. Ease of storage and access
- v. Use integrated validation tools throughout the process
- vi. Keep your data organized so you can work in teams and react faster to design changes
- vii. Eliminate extra and costly data translation steps between applications that are operating on the same 3D model
- viii. Streamline CNC programming work flow
- ix. Virtual simulation eliminate costly errors.

IV. CONCLUSION

In this we described about computer and its applications. In this we considered , classification of computer on the basis of data processing and the role of computer in education for e-learning , embedded system that are used for ease of human, biometric system for security , artificial intelligence for developing machines that have human kind of intelligence, Simulators are used to give training to pilots, entertainment for downloading videos, music, images etc. In future we will discuss more about the new application of the computer.

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