

Computer/Man

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In the fast evolving world of technology and computer design, it is evident that mankind is seeking to recreate himself and his world on a digital level. The design of software, hardware, communications and interconnectivity tools are growing in complexity and capability. A closer look at the components of the digital realm shows reveals an uncanny resemblance between the computer's world of bits and bytes and our world of reason and wisdom.

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An overview of all inventions and tools made by man throughout the history of existence will absolutely show that computer is the most influential medium that stamped his life and altered its avenues.

The great digital revolution allowed the computer to claim its place as the unique medium available to face the challenges of timely knowledge and the needs of timely information in the decision making process involving daily life and in the world of business.

This fast, reasonless, manmade machine that understands only the language of 1s and 0s has proven it is capable of tackling the most complex of the problems faced in a myriad of our life's activities. More importantly, it has made it possible for us to go beyond the limits of our physical world, into a realm limited by the imagination.

The greatness of the computer industry lies behind its ability to integrate the power of many fascinating inventions into a single structure. The key driving factor behind the modern computer is the challenge to the imagination in the struggle to teach this powerful medium innovative ways that enable him to conquer new horizons to satisfy man's affinity for knowledge and to solve today most problems that were considered to be impossible myths yesterday.

The computer industry would not have known this explosion in computer use without the breakthroughs of the software industry that democratized the use of computers and allowed novice users to be involved in a game that was previously the exclusive realm of the specialists.

Computer hardware is nice furniture that would be useless without the software that commands this creature to perform every operation and instructs it how it is to be performed. A look back to the history of computers shows how every time man introduced hardware innovations; we had to wait for a compatible software innovation to make full use of it.

Software represents the interface between machine and man, and because computer hardware proved it is able to blindly obey software instructions in tackling problems, the challenge has

always been for the software industry to satisfy the thirst of computers and users facing unlimited human and natural needs.

Furthermore, the challenge rises to new dimensions when making this machine operate with the minimal human intervention, or even in creating automata that can challenge it in operating without human intervention.

Since computers tied the knot with increasingly powerful telecommunications possibilities, computer communities have been created centered on networks located around the world. These communities were rendered global by their integration into the Internet; a global computer community which surpassed the existence of the human global community.

The human community began to mimic the computer in this global behavior, however, the computer community retains the advantage because information travels with no restrictions or border controls. As a result, society is reaching new highs in globalization and facing new challenges in all aspects of our civilization.

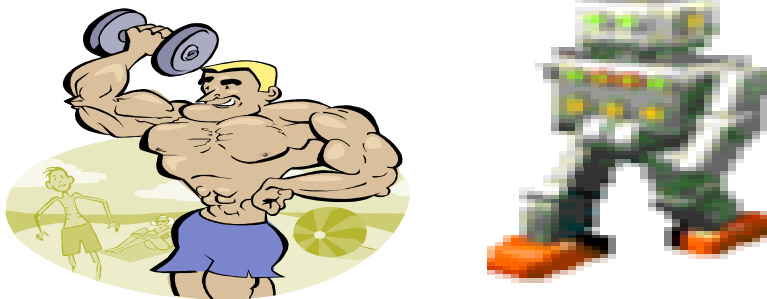
Computer behavior, so far, has been to complement man and extend his possibilities. This relationship of complete submission of machine has allowed the computer to stamp human life with a permanent need for the machine. Even physical and mental human evolution has been influenced by this intruder, to a point that any talk about human evolution has become a function of computer evolution and vice versa.

To be accurate in approaching this relationship one must admit that man developed this medium to fill the gap of his limited mechanical and processing capabilities and to extend them with the speed and power of electronic media.

In developing computers man considered his basic functions and invented electronic ways to enhance them. This is the subject that will be approached in the following analysis, which will compare human capabilities to those of computers and which will attempt to answer some questions about the drive to further fuse man's needs with machine's evolution.

Natural System

In order to exist, any natural system requires a certain physical structure (ex: the human body) and should be able to operate and grow for a given period of time.



A controlled natural system is composed of the following basic components: Input, processing, storage, output, feedback and local connection. Each of these components is compared as follows:

Input

Human input system revolves around the senses that are always limited in range and perceptive cognition. Since the beginning of existence, man tried to enhance the functionality of his senses by inventing tools that provided limited help in extending his possibilities.

At this point in his history, man has finally developed input tools that proved it can quench his thirst for knowledge and advancement, as discussed in these examples:

- Vision: computer assisted cameras carried to the outer-space were able to collect views and clips that were impossible to be perceived by the naked eye, not to forget tiny cameras that infiltrate into the human body helping surgeons perform diagnosis and surgery that would be otherwise impossible.
- Hearing: the ability of input audio peripherals to capture and digitize sounds and music made all audio files public commodity and enabled computers to show up as necessary tool in composing and editing music and files. We also have to mention the great work of software companies in advancing voice and sound recognition and synthesis software.
- Taste, touch and smelling: Computer industry rely on highly sensitive sensors that fulfill most of the functions of these senses.
- In addition, computers accommodate high volumes of different categories of files. Their tremendous ability to deal with large multimedia files completes their necessity in our modern fast-paced life.

Processing

Man processes information in his brain and uses his memory as storage. Recognition of input requires that man be familiar with input codes; an example is understanding languages: in the absence of language knowledge, man needs translation into a language that he can recognize and understand.

The skull forms the protective housing that holds the brain, which is in turn divided into several compartments, each of which performs assigned functions such as the motor skills, logic, feelings and so on.



Man's capability of retrieving information stored in memory throughout his life is very limited (8% for an average person). This necessitated the use of tools that were limited in effectiveness before the advent of computers.

The brain is a flexible tool, capable of reason, logic and free thought. Computers, on the other hand, understand only one language which is based on the binary system: two states zero and one, corresponding to the electronic states OFF or ON, charge or no charge. This property made electronic adaptation to computer logic handy and easy to develop using the power of the BIT (Binary Digit).

This situation imposed the necessity of data representation codes that translate all forms of input into binary (all data files are stored in binary form).

Unlike the human brain, a computer has no logic. It only executes programs which are sequences of instructions authored by man (Software programs). These programs tell the computer what is needed and instruct it on how to attain the result. In other words, the software plays the role of man's nervous system.

In the quest to achieve more complex programs, man created high level languages to author software and then created translators to break them down into binary code. The translators proved very effective:

- Compiler: That translates the whole program as a single bloc and submit it to the processor that execute it instruction after another following the logic of the program.
- Interpreter: That translates only one instruction at a time accommodating inter activity that is most needed in the modern computer environment

Both, compiler and interpreter assume the job of detecting program errors and their places of occurrence within the code. However, they remain unable to detect logic errors.

The “brain” of computer is the CPU. This is where processing takes place. The CPU is divided into two units:

- ALU, which performs binary calculations and uses registers (bank of capacitors) to temporarily store data and results. The capacity of the registers depends on the Word Size of the processor.
- The Control Unit, which supervises the whole process under the control of the Operating System installed on the computer.

Like man’s heart synchronizes his physical functions, the computer clock synchronizes computer functions. Its pace determines processor speed, that is number of machine cycles a processor is able to perform in one second (one Gig processor performs one billion instructions/sec) this speed may be enhanced using several technologies like Pipelining, Multiple processing and Co-Processing. Another critical factor affecting processing speed is memory access time which is generally around 100 nanoseconds (almost 1000 times faster than a blink of an eye).

Computer memory can be either volatile (RAM) which accommodates system and application software and temporary location of needed files during the processing or NON-Volatile (ROM and CMOS) which hold basic software (Bootstrap) that keeps the computer “alive” when it is off.

The system unit is the machine’s skull. It houses the motherboard, which carries the processor and memory. It also provides connectivity between all components, including ports, which provide the machine connectivity to peripheral units and the boundless world of networks and Internet. Finally, the system unit also houses the most important storage component, the hard disk drive.

Storage

Under this title you can imagine locations where the most valuable assets of businesses and people are kept. All servers that host websites rely on hard disks to store databases and knowledge bases able to provide online access. A simple PC has a hard disk with a capacity that may reach hundreds of gigabytes. There are several storage technologies:

- Magnetic storage technology includes hard disk drives, floppy disks, smart cards and credit cards.
- Optical technology, using laser technology, includes CDs and DVDs.
- Solid state technology using flash memory.
- RAID technology (Redundant Array of Independent Disks) is high level reliable storage that duplicates a collection of hard disks and is generally used for servers.

Output

Output is the ultimate achievement of processing. On the input side, there is data with no informative use, or partial information that needs to be further processed to have a meaning. Output is the finished product provided as useful information that people can understand and use. Output may also take the form of completed actions that need no human intervention.

While human physical output possibilities are limited by body mechanics, Computer output can be adapted to almost any medium or device, allowing computers to be integrated with any activity in our world (video, audio, active intervention, games, etc.).

Connectivity

The ability to communicate and exchange knowledge helped man advance and form communities that are the building blocs of human society. Telecommunication means were used by man to reach across longer distance at a faster pace. Even these were limited before the contribution of computers, which enabled people to communicate through an interconnected worldwide community of the computer.

Computer networking was crowned by the invention of the Internet (collection of all global networks) followed by the browser which is the window to this web of networks, the World Wide Web or the “Web”. This little formatting software (first created by Tim B. Lee) using HTML tags allowed people to create and exchange an unfathomable and ever expanding wealth of information, regardless of how or where the information was created and stored. This is possible thanks to the Internet pathways and the services of HTTP (Hyper Text Transfer Protocol).

The browser software assumes two functions: connect with HTTP to send queries to server and receive answers from HTTP then interpret and display them. HTTP assumes the function of the mailman; it takes queries to servers and brings back answers while itself remaining stateless. While the Internet is a communication network that accommodates all these services using a single protocol “TCP/IP”.

The Web is a service that uses Internet pathways and its own protocols coupled with TCP/IP. The Web has made possible a new virtual world with E-commerce or E-business. Cyber stores are erected as websites, minimizing the competition gap between large and small companies while allowing customers access to goods and services irrespective of place and time. Growth of E-commerce (\$5 trillion at the end of 2005) pushed most businesses to provide at least a cyber storefront with or without bricks and mortar.

Future trends and conclusion

To accommodate global business needs, computers are becoming smaller and more mobile, integrating the expanding telecommunication services and incorporating more media. Computers have become an integral part of most tools, cars, appliances and even some human body parts. Man took advantage of their capabilities to extend his reach to horizons that were unattainable without the computer. With this fast pace in computer evolution, the next generation of robots , which are currently only able to execute limited functions, will, with the help of man's reason, have extended capabilities that may result in a new digital wisdom and allow them to behave on their own in an new and unexplored environment.