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A Journey of Computer Processors since its inception few years ago

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Abstract: Development of computer science and technology is a milestone in the history of human civilization. This paper describes a journey of generation of Processors in brief. Starting from a simple microchip to the largest supercomputer, microprocessor exists everywhere. This development was taken place with time. Notion of a computer processor was perceived around 1950s. Later new development took place and rapid transition was done. Computer speed and processing capability have been changed drastically. Different manufactures started developing processors. However, Intel Corporation got maximum popularity and their products are most widely used. In this paper the structural details of the different generation processors have been described starting from first to fifth generation processors. This survey will help readers to understand journey of processors since its inception long ago.

Keywords: Microprocessor; Generation of processor; Structural details

I. INTRODUCTION

With the passing of time technological advancement have taken place gradually. Technological advancement takes place in every sector including computer hardwires like the microprocessor. This microprocessor is a small chip which is the main part of a computer and controls its different parts. Its development means advancement in computer science in all respect.However, this microprocessor is an electronic device which controls the entire computer to work properly. It controls arithmetical, logical and different input/output functions. It receives commands from the external user through the operating system and works accordingly. Upon receiving instructions, it starts working. It calculates different instructions and performs calculations. More than one processor may be present in the system. Apart from the main processor some small processors may be there which is used for some dedicated tasks. They are called microcontrollers. Nowadays, the microprocessor is an essential component of PCs and other devices. It makes use of the components of a central processing unit, or computer chip. Within a PC, the component may perform customised instructions on a single integrated circuit (IC) that connects the machine devices via the electrical foundation required to support them. The microprocessor arrangement uses a great deal of computing power in a little amount of area.

A microprocessor's primary function is to carry out arithmetic operations such as adding, subtracting, shifting integers from one district to the next, and comparing two numbers. A microprocessor can also be referred to as a logic chip, processor, or computer processor. By combining the components of a single integrated circuit, or central processing unit, it functions in a PC similarly to a mind. It is a versatile device that can be programmed. Binary data is sent into a microprocessor, which processes it to produce an output that depends on the stored instructions in the memory. The ALU, control unit, and register cluster should enable the processor to process data.

Different registers that operate like flitting fast access memory locations handle the data in the diversity of registers. The control unit can handle the flow of information and rules inside the system. The majority of the time, an important microprocessor requires specific parts in order to perform certain functions, such as programme counter, bus, guidance register, control unit, registers, and ALU (Arithmetic and Logic Unit). The microprocessor is a single integrated circuit (IC) package that is made from a single silicon semiconductor chip and has a few useful functions. A system bus, input/output unit, memory modules, and a central processor unit make up its engineering.

The various units are interfaced by the system bus to facilitate data interchange. In order to properly execute data trading, it also includes data, address, and control buses.

A control unit, registers, and one or more arithmetic logic units (ALUs) make up the central processing unit. The generations of the microprocessor can also be organised based on the registers. A microprocessor is made up of unique and generally helpful registers that are used to carry out instructions and store addresses or data while a programme is being executed. The ALU calculates microprocessor sizes, such as 16- or 32-bit, and conducts all arithmetic operations on data in the same way as logic procedures.

The memory unit, which is divided into processor, necessary, and auxiliary memory, stores the programme in the same way as data. Tolerating and transmitting data, the input and output unit links the I/O fringe devices with the CPU.

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In this paper a survey of different generation processors has been described. Section II provides a brief description of special purpose registers of Microprocessors. Section III provides an overview in brief about different types of processors. Conclusion is written in section III.

II. SPECIAL PURPOSE REGISTERS OF MICROPROCSSOR

Microprocessors are available in a number of special-purpose schemes that include the following.

DSP (digital signal processor: One type of specialised processor used for signal processing is a DSP (digital signal processor). GPUs (Graphics Processing Units): The primary purpose of GPUs (Graphics Processing Units) is to provide images gradually. Various types of specialised processors are used for both video processing and machine vision.

Microcontroller with CPU: In embedded systems, microcontrollers combine a CPU with peripheral devices.

Systems on-chip, or SOCs: These are devices that combine one or more microcontrollers and microprocessors by using additional components such as radio modems. These modems are found in tablets, smartphones, and other devices. 8-bit or 16-bit microprocessors may be preferred over 32-bit ones for SoC or microcontroller applications that need very low force electrons.

Due to the CPU's need to execute programming in many directions, demand for an 8-bit processor may abruptly surge at the point when 32-bit arithmetic becomes necessary.

III. EVOLUTION OF PROCESSORS

The Intel 4004 CPU is the company's main offering. After a few years, an article on the Altair, which used the new CPU—the Intel 8080 in particular—was published in the Hardware Magazine in 1975. It's a CPU from the second generation. IBM made the decision to employ the Intel 8088 CPU in 1980.

Appropriately named the PC, this CPU was the first mass-produced PC. The number of processors inside the container increased when people started using PCs for other tasks including creating graphics and word processing; yet, the processor is still the main focus of attention today.

In the below section different generations of processors are discussed.Significant development took place [1, 2, 3] since its inception a few years ago. All the modern-day devices including smart phones and other gadgets are actually microprocessor-based devices. In fig. 1 picture of a desktop computer is shown. There are different generations of microprocessor devices like:

I. First Generation
II. Second Generation
III. Third Generation
IV. Fourth Generation
V. Fifth Generation

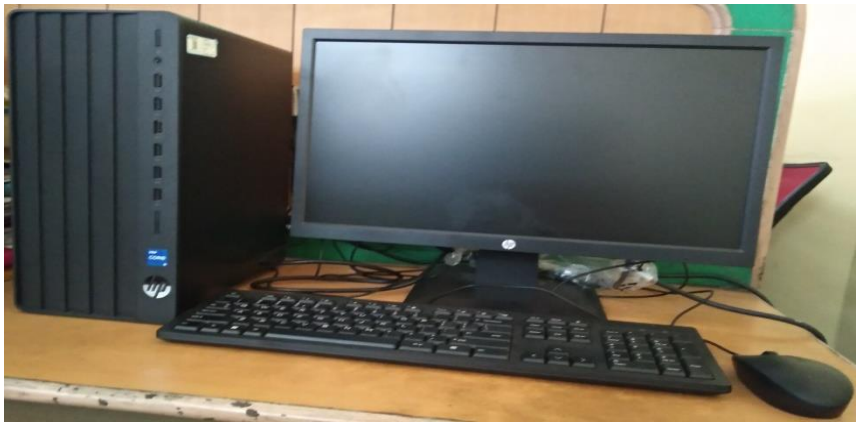

Fig. 1 Desktop computer

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FIRST GENERATION PROCESSOR

This was the history of the microprocessor from 1971 to 1973. The first 4004 microprocessor, which could operate at a clock speed of 740 kHz, was created by Intel in 1971.As per available record Intel 4004 was the first CPU released which was a CPU based device. It was developed with first general-purpose programmable processor system. It can be customized by the users. Different electronic devices were made with this processor like the teller machines or calculators. It consists of almost 2300 transistors and could perform around 92600 calculations.It consists of 20 bits long address bus which could address 1 MB memory space. It had a register size of 8 bit. Also 8-bit external data bus and a 16-bit address bus were there in the processor. In this model data was stored in the external memory but instructions are stored only in the read-only memory. Several microprocessors were on the market at the time, including the Public Semiconductors Devil 16, the Rockwell Worldwide PPS-4, and the Intel-808 CPU. Whatever the case, none of these processors were TTL viable.

SECOND GENERATION PROCESSOR

This was the time frame from 1973 to 1978 when several of the most well-known 8-bit microprocessors were developed, including the Motorola 6800 and 6801, INTEL-8085, and Zilog's Z80. They were extremely fast, which suggests that they were quite expensive because they relied on NMOS innovative production.Transistor were first used in this system. It was not only much faster than the previous one but also more portable and dependable. High level programming languages like COBOL and FORTRAN were started to be used in this system. It used 32nm micro architecture technology. It used less power but achieved higher energy. The CPU graphics are now tied to the ring architecture that joins the x86 processing cores together. An 8080 microprocessor is a general-purpose digital computer system microprocessor with an 8-bit parallel CPU. It's built utilizing Intel's N-channel silicon gate MOS technology on a single large-scale integrated chip. The microprocessor 8080 has 40 pins and uses an 8-bit bidirectional 3-state data bus to transport internal information and data (D0-D7). A 16-bit 3-state address bus is used to send peripheral device and memory addresses (A0-A15).

THIRD GENERATION PROCESSOR

Using HMOS innovation, 16-bit processors were designed and manufactured at this time. INTEL 8086/80186/80286 and Motorola 68000 and 68010 were developed between 1979 and 1980. When compared to CPUs from the second generation, the processors' speeds were several times faster. There is a significant amount of improvement in 3rd Generation processor design. Both features and speed have been improved here. The 3rd generation Intel CPU used Intel's own 22nm process technology. In this system both dual-system and graphic system made significant improvement. Also, graphics and media processing capabilities have been improved. Its technology and design provide a significant improvement in gaming and media development. As an improved version for Intel 8085, in 1976 another modified version 8086 was built by Intel itself which is basically a 16-bit microprocessor having 20 address bus as well as 16 data bus capable of storing 1MB of data. It makes multiplication and division an easy task. It supports both maximum and minimum mode. For multi-processor system maximum mode is suitable but for single-processor system, minimum mode is more appropriate.

FOURTH GENERATION PROCESSOR

This generation used HCMOS manufacturing to generate 32-bit microprocessors between 1981 and 1995. The mainstream CPUs were Motorola's 68020 and 68030 and Intel's 80386. Intel 4th Gen Processor is a multi-core, 64-bit processor developed on a 22-nanometer process. It was made to work along with the Intel's 8 Series chipset. It includes Intel HD Graphics 4600 cum virtualization technology. Also, it has several new instructions set cum new anti-theft and identity protection technology.Like previous versions Intel 80486 also maintains full backwards object code compatibility with all preceding x86 processors. Only a new layer of cache memory was added for better performance. Both data and instructions were cached in an 8 KB, 4-way set associative, and write-back policy cache. As a result, faster access to data and instructions was made possible. Also, the bus interface has also been improved.

FIFTH GENERATION PROCESSOR

Since 1995, this generation has been releasing high-end, fast processors that make use of 64-bit CPUs. These CPUs include Celeron, Pentium, Double, and Quadcenter models. From 1980 to till today fifth generation is running. Main backbone is its VLSI technology. It uses disentangled super scalar computing technology. Around 10 million transistors are used in the design. A single CPU controls the PCs. It is gradually becoming based on artificial intelligence technology. Large amount of storage is also possible.

INTEL CELERON

In April 1998, Intel released the Celeron processor. It alludes to a selection of affordable personal computers' Intel X86 CPUs. It is Pentium 2 based and compatible with all IA-32 software.

PENTIUM

The first Pentium was released on March 2, 1993. The Pentium microprocessor superseded the Intel 486; the number four denotes the fourth iteration of microarchitecture in microprocessor history. The single-core x-86 microprocessor from Intel, known as the

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Pentium, is built on the fifth-generation microarchitecture. The Greek term Penta, which meaning five, is where the name of this processor originated. In 1996, the Pentium MMX replaced the original Pentium CPU. The data bus on this CPU is 64 bits long. In 1996, the Pentium MMX replaced the original Pentium CPU. The data bus on this CPU is 64 bits long. Up to 64 bits can be read or written in a typical single transfer cycle. The Pentium CPUs support the burst read and write back cycles. These cycles transport 32 bytes—the capacity of a Pentium cache line—in four clock cycles and are utilised for cache operations. For the Pentium, all cache operations are burst cycles.

XEON

Intel's 400 MHz Pentium processor, the Xeon processor, is designed for usage in workstations and corporate servers. Large database servers, engineering graphics, multimedia apps, and the Internet are all intended uses for this CPU.

III. CONCLUSION

This paper discusses the development of microprocessors from long ago to its current state. In the mean time several developments took place. In this paper several generations of computer processors were developed. In future more such development will take place.Ayearwise survey work along with state-of-the-art works has been descriobed here. Scopes for future research is also described.

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