PAMANTASAN NG LUNGSOD NG MAYNILA
(University of the City of Manila)
Intramuros, Manila

MICROPROCESSOR (LECTURE)

Activity No. 1
Review of Terminologies

Score

Submitted by:
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Submitted to:

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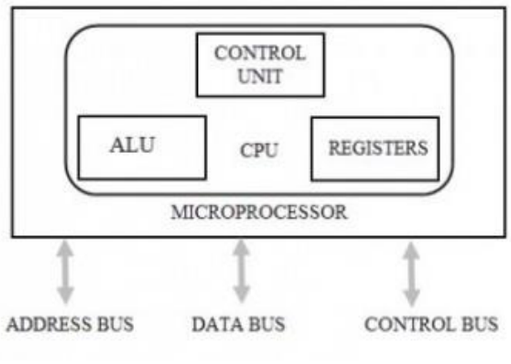
Instruction

A. Define and discuss the following terminologies related to microprocessor systems:
   1. MPU
   2. MCU
   3. Features of microprocessor and microcontroller
   4. Applications of microprocessor and microcontroller
B. Cite your References below.

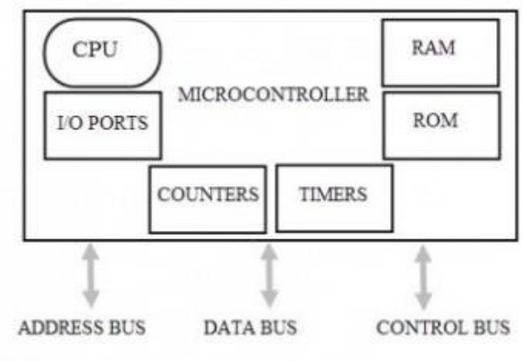
MPU: Microprocessor Unit



The history of the microprocessor began with Fairchild Semiconductors' invention of the first integrated circuit (IC) in 1959. Afterwards, Intel was founded in 1968, and by 1971, they introduced the first-generation Microprocessor 4004. In 1970s comes the emergence of second-generation 8-bit microprocessors followed by third-generation Intel 8008 in 1978, and fourth-generation 32-bit processors in 1980s. Finally, Intel released fifth-generation 64-bit processors in 1995. Microprocessors, often known as the central processing unit (CPU) in computer systems, function as the core computational unit, executing instructions and performing complex tasks. Unlike microcontrollers, they rely on external connections for memory and I/O components, leading to more intricate circuitry. While microprocessors offer flexibility by allowing customization of memory size, I/O ports, and peripherals for specific applications, they are less suitable for compact systems due to their larger size. Operating at high clock frequencies, typically ranging from 1 GHz to 4 GHz, microprocessors provide substantial computational power, making them ideal for intensive tasks in devices like personal computers. However, their higher power consumption, reliance on additional components such as RAM, ROM, and I/O ports, and larger system footprint contribute to increased cost and complexity.

Microprocessors are composed of three key components: arithmetic and logic unit (ALU), responsible for mathematical and logical operations; register array, which stores temporary data for the ALU; and control unit, which manages data flow, timing, and control signals within the microprocessor. They come in various types including CISC (complex instruction set computer), which executes multiple low-level operations in a single instruction and such as Intel's 386, 486, and Pentium series; RISC (reduced instruction set computer), which prioritizes quick execution by completing instructions in a single clock cycle such as IBM RS6000 and DEC Alpha series; and EPIC (explicitly parallel instruction computing), which boosts performance without depending on higher clock rates by enabling parallel instruction execution through compiler optimization and 128-bit instruction bundles such as IA-64.

MCU: Microcontroller Unit



The history of microcontrollers started in 1975 when Intel introduced the first microcontroller – the 8048. In 1993, EEPROM technology was presented, offering data storage capabilities. In the same year, Atmel made a breakthrough by introducing the first microcontroller utilizing Flash memory. Microcontrollers serve as the heart of embedded systems, featuring integrated memory and I/O components within a less complex circuitry, making them well-suited for compact and efficient applications like washing machines and alarms. These single-chip computer systems are optimized for specific, predefined tasks, operating at clock speeds typically below 100 MHz, with fixed instruction sets and on-chip memory. Highly integrated and cost-effective, microcontrollers combine CPU, RAM, ROM, registers, timers, and I/O ports, offering an efficient, self-sufficient solution with lower power consumption and a smaller footprint.

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Microcontrollers consist of five key components: central processing unit (CPU) that handles computations within the system; memory, including ROM for program storage and RAM for variable storage; timers and counters that manage clock-related tasks like pulse-width modulation and clock control; analog-to-digital converters (ADC) and digital-to-analog converters (DAC) that facilitate signal conversion for input and output processes; and input/output (I/O) ports that enables data exchange and control with external devices. They have different types including 8-bit microcontrollers that are used in simple applications like remote controls due to their limited processing power and memory; 16-bit microcontrollers that are more advanced and used in more complex tasks like medical devices, and automotive systems; 32-bit microcontrollers that are the most powerful since they can handle large data and high-speed processing used for gaming systems, multimedia devices, and industrial automation; ARM microcontrollers that are versatile and mostly used in mobile devices; PIC microcontrollers that are widely used in home appliances; and AVR microcontrollers that are employed in robotics.

Features of Microprocessor and Microcontroller

Features of Microprocessor

Some features of microprocessors include:

- *Microprocessors devise built-in monitor / debugger program with interrupt capability*. This feature enhances system control by enabling more efficient program debugging and handling of interrupt tasks.
- *Microprocessors have extensive instruction set.* The microprocessor's wide array of instructions allows various operation with dissimilar addressing modes by aiding multiple computing tasks and data handling.
- *Microprocessors support both serial and parallel I/O through external system buses*. This functionality helps with smooth connectivity among outside devices and can handle various data transfer needs.
- *Microprocessors include instruction cycle timer.* For real-time applications and synchronization, the instruction cycle timer ensures precise timing for the execution of instructions.
- *Microprocessors admit external memory interfacing.* This facilitates external memory connections since the chip can access memory resources other than its built-in memory, which is necessary for managing huge datasets or complicated applications.
- *Microprocessors utilize Von-Neumann architecture.* The Von-Neumann architecture simplifies data and code management by storing both data and code in the same memory space for memory access and program execution efficiency.

Features of Microcontroller

Some features of microcontrollers include:

- *Microcontrollers have processor reset.* This is used to restart or reboot the microcontroller, which can be helpful in troubleshooting the system.
- *Microcontrollers support program and variable memory (RAM) I/O pins.* These pins enable dynamic data storage and retrieval by facilitating data transport between the microcontroller and RAM.
- *Microcontrollers devise clocking central processor.* This system offers timing signals needed to synchronize the central processor's operation to ensure precise and well-coordinated instruction execution.
- *Microcontrollers include instruction cycle timers.* Instruction cycle timers assist in controlling the timing of individual instructions, ensuring that they are carried out in accurately and precisely.
- *Microcontrollers employ Harvard architecture.* The Harvard architecture stores data and code are stored in separate memory spaces, while allowing simultaneous access to each that can increase system performance and efficiency.

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Application of Microprocessor and Microcontroller

Applications of Microprocessor

Microprocessors are designed for general purpose and is used for big applications such as:

- Simple calculators
- Accounting systems
- Gaming machines
- Complex industrial controllers
- Traffic lights
- Data control
- Military and defense applications
- Personal computers (PCs)

Applications of Microcontroller

Microcontrollers are designed for specific embedded system application to execute a single task such as:

- Washing machines
- Water purifiers
- Refrigerators
- Microwave ovens
- Cameras
- Security alarms
- Keyboard controllers
- Printers
- Modems
- Mobile phones
- CD/DVD players
- Mp3 players
- Watches
- Automobiles
- Flight control systems
- Traffic lights
- Control systems
- Military and defense applications

References

Difference between microprocessor and Microcontroller. Components101. (2019, October 23). https://components101.com/articles/difference-between-microprocessor-and-microcontroller

Difference between microprocessor and Microcontroller. ElectronicsHub. (2023, March 25). https://www.electronicshub.org/difference-between-microprocessor-and-microcontroller/

Introduction of microprocessor. GeeksforGeeks. (2021, July 22). https://www.geeksforgeeks.org/introduction-of-microprocessor/

Kumari, R. (2021, August 31). *Difference between microprocessor and Microcontroller*. Scaler Topics. https://www.scaler.com/topics/difference-between-microprocessor-and-microcontrolle/

Microcontroller and its types. GeeksforGeeks. (2023, May 5). https://www.geeksforgeeks.org/microcontroller-and-its-types/?ref=gcse

Microprocessor vs microcontroller: The differences. All3DP. (2022, January 25). https://all3dp.com/2/difference-between-microprocessor-and-microcontroller/

Panighari, K. K. (2023, August 21). *Difference between microprocessor and Microcontroller*. Online Courses and eBooks Library. https://www.tutorialspoint.com/difference-between-microprocessor-and-microcontroller

What's difference between Microcontroller (μC) and microprocessor (μP)? GeeksforGeeks. (2023, May 2). https://www.geeksforgeeks.org/whats-difference-between-microcontoller-%c2%b5c-and-microprocessor-%c2%b5p/

Williams, L. (2023, July 25). *Difference between microprocessor and Microcontroller*. Guru99. https://www.guru99.com/difference-between-microprocessor-and-microcontroller.html