



Microprocessor and Microcontroller

Any embedded system needs a controlling device that decides the behavior of the system as a whole. This behavior is determined by controlling devices such as microcontrollers/microprocessors.

Microprocessor

A microprocessor is a controlling unit of a micro-computer wrapped inside a small chip. It performs Arithmetic Logical Unit (ALU) operations and communicates with the other devices using various interfacing devices connected with it.

Microcontroller

A microcontroller is a chip optimized to control electronic devices. It is stored in a single integrated circuit that is dedicated to performing a particular task and execute one specific application.

It is a specially designed circuit for embedded applications and is widely used in automatically controlled electronic devices. It contains memory, processor, and programmable I/O.

Microprocessor and Microcontroller- Comparison

<i>Microprocessor</i>	<i>Microcontroller</i>
<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px; text-align: center;">Arithmetic and logic unit</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px; text-align: center;">Accumulator Working Registers</div> <div style="display: flex; justify-content: space-around; margin-bottom: 5px;"> <div style="border: 1px solid black; padding: 5px; text-align: center;">Program Counter</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">Stack Pointer</div> </div> <div style="display: flex; justify-content: space-around; margin-bottom: 5px;"> <div style="border: 1px solid black; padding: 5px; text-align: center;">Clock Circuit</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">Interrupt circuit</div> </div>	<div style="display: flex; justify-content: space-between; margin-bottom: 5px;"> <div style="border: 1px solid black; padding: 5px; text-align: center;">ALU</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">Timer/ Counter</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">IO Ports</div> </div> <div style="display: flex; justify-content: space-between; margin-bottom: 5px;"> <div style="border: 1px solid black; padding: 5px; text-align: center;">Accumulator Registers</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">Internal ROM</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">Interrupt Circuits</div> </div> <div style="display: flex; justify-content: space-between; margin-bottom: 5px;"> <div style="border: 1px solid black; padding: 5px; text-align: center;">Internal RAM</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">Stack Pointer</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">Clock</div> </div> <div style="border: 1px solid black; padding: 5px; text-align: center; margin-bottom: 5px;">Program Counter</div>
<i>Block diagram of microprocessor</i>	<i>Block diagram of microcontroller</i>



Microprocessor contains ALU, General purpose registers, stack pointer, program counter, clock timing circuit, interrupt circuit	Microcontroller contains the circuitry of microprocessor, and in addition it has built in ROM, RAM, I/O Devices, Timers/Counters etc.
It has many instructions to move data between memory and CPU	It has few instructions to move data between memory and CPU
Few bit handling instruction	It has many bit handling instructions
Less number of pins are multifunctional	More number of pins are multifunctional
Single memory map for data and code (program)	Separate memory map for data and code (program)
Access time for memory and IO are more	Less access time for built in memory and IO.
Microprocessor based system requires additional hardware	It requires less additional hardwares
More flexible in the design point of view	Less flexible since the additional circuits which is residing inside the microcontroller is fixed for a particular microcontroller

Text Resources

- https://www.tutorialspoint.com/microprocessor/microprocessor_overview.htm
- https://www.tutorialspoint.com/microprocessor/microcontrollers_overview.htm

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Happy Learning!

References

'Fundamentals of Microprocessors and Microcontrollers', 8th Revised Edition, by B.RAM and SANJAY KUMAR, Dhanpat Rai Publications (P) LTD.