

Common CPU Components

ALU (Arithmetic Logic Unit)

- Performs arithmetic calculations (add, subtract, multiply)
- Performs logic operations (e.g. <, >, =, !=).

CU (Control Unit)

- Controls the flow of data between registers in the CPU.
- Controls input and output of data to and from the CPU
- Controls the timing of signals sent within the CPU.

CACHE

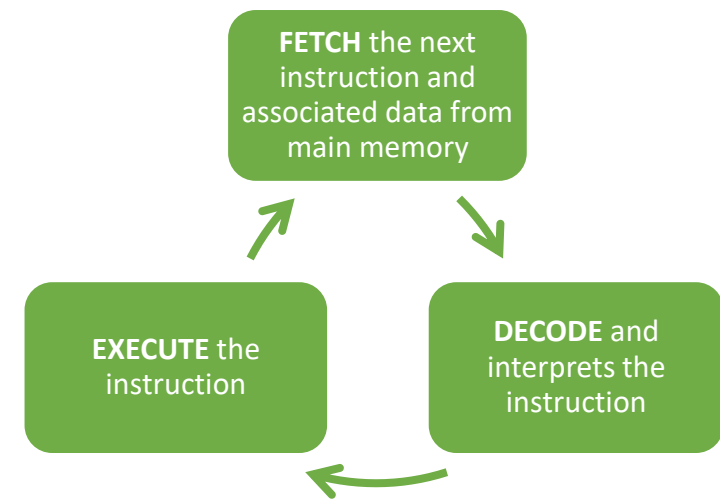
- Stores frequently used instructions and data
- Built onto the CPU and so provides quicker access than RAM
- Allows instructions and data to be loaded into the CPU more quickly.

Registers

- Very fast memory on the CPU itself
 - PC (Program Counter) - stores the address of the next instruction
 - MAR (Memory Address Register) - stores the address of the next instruction to be accessed
 - MDR (Memory Data Register) – stores the data to be brought from or sent to main memory
 - ACC (Accumulator) – stores the value currently being worked on



The Fetch – Execute Cycle



The Purpose of the CPU

- The CPU is the brain of the system.
- Processes all the data and instructions to make the system work.
- It is installed on the motherboard.

1.1 Systems Architecture

The Purpose of Embedded Systems

- To provide a specific, pre-defined function
- Cheaper than providing a full personal computer system.
- Can be made much smaller than a personal computer system
- Allows for a device to be automated / programmed.

The Characteristics of Embedded Systems

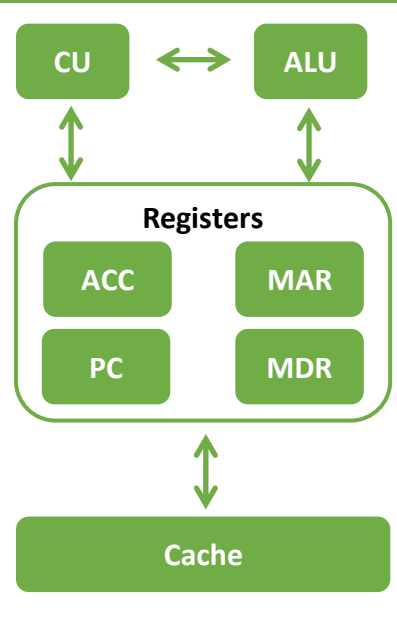
- Task specific.
- The task is performed in a certain time frame.
- Do the same thing repeatedly.
- Basic or no UI.
- May respond to sensors.

Examples of Embedded Systems

- Dishwasher
- MP3 player
- Washing machine
- Mobile phone
- Manufacturing equipment
- Tills



Von Neuman Architecture



How Common Characteristics of CPUs Affect Performance

Clock Speed

- A faster clock speed allows more instructions carried out per second and so instructions are executed more quickly.
- This allows for more programs to be run at the same time.
- This also allows for more complex processing operations to be completed in real time.

Cache Size

- A larger cache gives more space for frequently used instructions.
- This provides more storage for fast access, meaning faster fetching of instructions and so faster processing

Number of Cores

- More cores allow more instructions carried out simultaneously.
- More cores allow the processor to process more instructions at the same time.
- This allows batches of instructions to be executed more quickly, which allows for more programs to be run at the same time.