



**SNS COLLEGE OF ENGINEERING  
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**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**

## **INSTRUCTION SET PRELIMINARIES IN EMBEDDED SYSTEMS**

The instruction set is a collection of machine-level commands (instructions) that a processor can execute. Each instruction is encoded in binary and corresponds to a specific operation. It is the processor's "vocabulary" for performing tasks.



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## **TYPES OF INSTRUCTION SETS**

### **1. CISC (Complex Instruction Set Computing):**

Example: Intel x86

Rich set of complex instructions.

Instructions may perform multiple operations (e.g., fetching, adding, storing).

Requires more hardware for decoding but fewer lines of assembly code.



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**2. RISC (Reduced Instruction Set Computing):**

Example: ARM, MIPS

Focuses on simple instructions that execute in a single clock cycle.

Optimized for speed and energy efficiency.

Commonly used in embedded systems due to low power consumption.



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## **INSTRUCTION SET ARCHITECTURE (ISA)**

The ISA is the specification that defines the supported instructions, data types, registers, memory architecture, and addressing modes of a processor. Examples include:

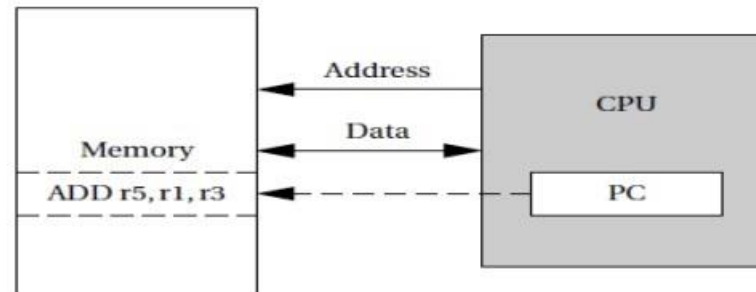
- ARM ISA (widely used in embedded systems)
- AVR ISA (used in microcontrollers like Arduino)
- x86 ISA (used in general-purpose processors)



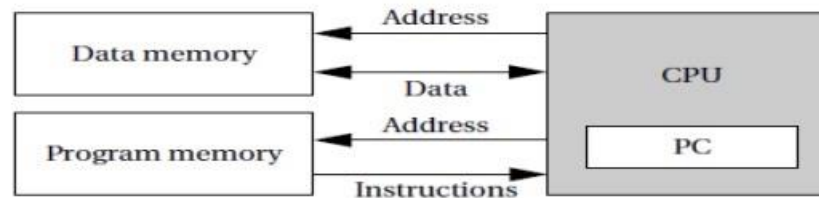
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A von Neumann architecture computer.



A Harvard architecture.



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## **Applications**

- **Real-time Systems:** For applications like robotics or automation, instructions are optimized for time-critical operations.
- **Power-sensitive Systems:** RISC-based instruction sets ensure energy-efficient operations in IoT devices or wearables.
- **Signal Processing:** Specialized instruction sets, such as SIMD (Single Instruction Multiple Data), enhance the performance of digital signal processing.



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**Thank you**