

1. Introduction to AVR Assembly Language

Assembly is a low-level programming language that allows manipulation of every bit in memory, resulting in highly efficient and fast code. It has a strong one-to-one correspondence with the machine code instructions of the computer architecture.

On Arduino microcontrollers (specifically the ATmega328P), Assembly programming enables high-level control suitable for real-time systems and applications requiring complex mathematical processes.

Advantages of Using Assembly:

- **High efficiency:** Full control over memory usage and execution time.
- **Deep understanding:** Helps understand fundamental microcontroller operations.
- **Problem solving:** Can solve problems that may arise in other high-level languages.

Disadvantages:

- **Steep learning curve:** Requires deep understanding of hardware architecture.
- **Longer code:** For simple tasks, Assembly code is much longer compared to high-level languages.

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