VILNIAUS UNIVERSITETAS

MATEMATIKOS IR INFORMATIKOS FAKULTETAS

INFORMATIKOS STUDIJŲ PROGRAMA

Report

Comparison of two computer achitectures

Motorola 68HC11 vs. Intel i960

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ELEMENTARY BASE OF THE PROCESSOR

Intel i960

The Intel 80C186/188 family microprocessors were introduced in the early to mid-1980s and represent a generation well beyond simple transistor or discrete component designs. By this time, processors were fabricated using advanced CMOS semiconductor processes. The 80C186/188 series integrated not just a 16-bit CPU but also peripherals such as timers, interrupts, and bus controllers onto the same silicon chip.

This level of complexity, packing tens of thousands of transistors (typical for that era), classified them under LSI (Large Scale Integration) technology. They were modern microprocessors for their time, realized as a single integrated circuit.

Motorola 68HC11

Motorola 68HC11 family devices combine a CPU, memory (EEPROM/EPROM, RAM), and peripherals (serial interfaces, timers, I/O ports) on a single chip. They were also fabricated using CMOS technology.

Like the Intel parts of the same era, the 68HC11 family represented a high level of integration, but at an 8-bit scale. With integrated peripherals and memory on-chip, the transistor count and complexity placed them firmly in the LSI range, possibly bordering on early VLSI territory. Compared to earlier generations of electronics that required multiple separate chips, the 68HC11 provided a complete computing system in a single IC.

PHYSICAL CHARACTERISTICS

Intel i960

These processors came in various standard packages. These packages typically measured a few centimeters on a side and weighed only a few grams. Their power consumption was relatively low—on the order of milliwatts to a few hundred milliwatts. No elaborate cooling solutions were needed.

Motorola 68HC11

These microcontrollers were packaged in standard IC packages, each only a few centimeters across and weighing just a few grams. Like the Intel device, these microcontrollers drew relatively little power—on the order of milliamps of current at

typical supply voltages—resulting in very low power dissipation.

SUMMARY:

- **Elementary Base:**
  - **Intel i960:** A 16-bit microprocessor, CMOS-based, considered LSI-level integration for its time.
  - **Motorola 68HC11:** An 8-bit microcontroller, also CMOS-based with LSI integration (CPU, memory, and peripherals on one chip).
- **Physical Characteristics:**
  - Both were small, light integrated circuits in standard IC packages. They consumed relatively little power and did not require complex cooling solutions.

ARCHITECTURE TYPE
Intel i960

The Intel i960 family is based on a RISC (Reduced Instruction Set Computer) architecture. This makes the i960 fundamentally a register-based architecture.

Motorola 68HC11

The Motorola 68HC11 microcontroller lineage is built upon the earlier 6800 architecture. This family is primarily accumulator-based.

ADDRESSING
Intel i960

Three-address machine, supporting instructions that specify two source operands and one destination operand explicitly, typical of RISC architectures.

Motorola 68HC11

One-address machine, with instructions typically involving one explicit operand and an implicit accumulator as the other operand and destination.

REGISTERS
Intel i960

Intel i960 includes a significant number of registers: general-purpose registers as well as specialized registers for certain functions.

Number of Registers:

- Global Registers: 16 registers
- Local Registers: 16 registers
- Control Registers: A set of specialized registers for system control, interrupt handling, and processor configuration.
- Total: 32 general-purpose registers plus several specialized control registers.

Register Widths:
All general-purpose registers are 32-bit wide. Specialized control registers vary in width but are typically 32-bit to match the processor's word size.

Motorola 68HC11

Motorola 68HC11 has registers as part of its Central Processor Unit (CPU). The architecture primarily features specialized registers, although a few have some general-purpose functionality depending on the context.

Number of Registers:

- Accumulators: A and B
- Index Registers: X and Y
- Stack Pointer (SP)
- Program Counter (PC)
- Condition Code Register (CCR), used for status flags.
- Total: 6 primary registers and one condition code register.

Register Widths:

- Accumulators: 8-bit
- Index Registers: 16-bit
- Stack Pointer: 16-bit
- Program Counter: 16-bit
- Condition Code Register: 8-bit