

Instruction Sets Continued from last time ...

wk 8 20th Nov 2015 4pm
Computer Systems

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CONTINUED FROM PREVIOUS
SESSION ...

Multilevel indirect addressing

Register addressing

- access is fast, try to keep variables in registers as much as possible. There are few registers with little space.

Register Indirect addressing

Displacement addressing

4 different types - see slide

Scaled Displacement addressing - "byzantine"!
aka 'striding'!

If you are writing programmes this probably doesn't concern you, but if you are writing the actual languages to be compiled or are building hardware it matters.

Semantic separation of opcode and operands.

Orthogonality:

complete: if same set of instructions for each set of numbers (real, int, fpu etc) then 'complete'

wk 8 25th Nov 2015 4.20pm

MEMORY + RAM

Location - on the CPU just 16k to a few MB. Fast because close. but small.

external - main RAM, ROMs.

Capacity - 'word size' - collection of bits,

1 byte = 8 bits

Unit of transfer - governed by data bus width internally but externally you will receive a larger block surrounding the information you wanted.

Access Methods ①

- Ⓐ sequential aka racetrack - can be very slow if not accessed in correct order.
- Ⓑ Direct - most common
- Ⓒ RANDOM - RAM
- Ⓓ Associative - cache

Registers in CPU

There is usually quite a lot of RAM on the controllers for hard drives.

PERFORMANCE

Access Time + Memory Cycle (and recovery)

+ Transfer time.

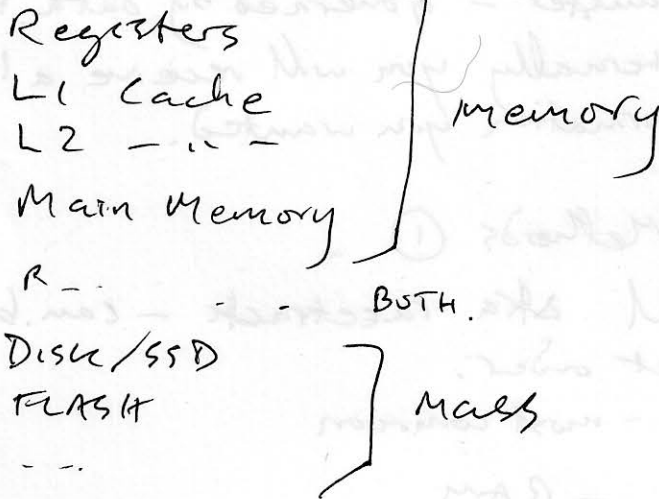
Physical Types

- Semiconductor - RAM - sensitive to radiation
- Magnetic + Bubble - still under development
- Optical - Future tech...

Physical Characteristics

Core memory - magnetic ring for each bit
high current.

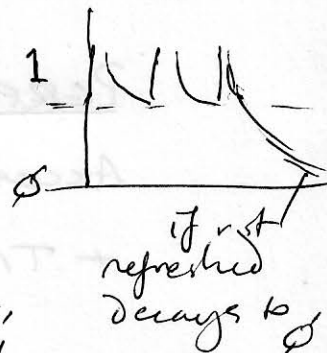
Memory:
see
slide 15/16



Locality of Reference
Because during operation

Dynamic RAM

- bits stored as charge in capacitors + require refreshing
- simple to make and small.
- needs refresh circuit - keeps charge at '1' 1



Static RAM

- good for cache, but larger + more expensive, bits stored as switches so no decay or refresh

ROM - Read Only Memory,
permanent storage, systems programs (BIOS)
cheap, good for dishwashers etc.

Types of Rom

see slides 25, 26, 27, 28

Data path

old SIMM - 32 bit

DIMM - 64 bit

some specialized up to 256 bit (Sition Graphics)

DDR RAM

DDR 2 - higher speed

DDR 3 - wider output bus

DDR 4 - about to be released, very fast