Introduction to programmable computing devices

Computer = Com + putare

Putare = to reckon Com = intensify

A computer is a "reckoning" or computing device....

Computing devices:

"Ancient" computing device: the abacus

1822: Babbage's difference engine

Programmable devices:

Programmable machine = a device which function can be altered by a program

Mechanical piano/music box Mechanical loom

Instruction encoding: using HOLES !!!

How to encode instruction using numbers:

1 = add 2 = subtract and so on

Introduction to computer: storing instructions and information

Most common view (perception) of a computer (desktop computer)

Component of the computer by their functionality:

Input devices Output devices I/O devices

Computer System (the box)

Hardware and Software

Hardware = the physical parts of a computer Software = the computer programs that you run with a computer

Logical view of a computer:

I/O device | Input ----> Computer System ----> Output

Compute System = CPU + Memory

RAM memory:

Structure (address, memory cell) Operation (Store, recall)

- Calculator !

Storing information in computer using numbers:

Encoding = an agreement

Everything inside a computer are stored as numbers

Example:

Computer instruction: 0 = add, 1 = subtract, and so on

Sex info: 0 = male, 1 = female

Marital status: 0 = single, 1 = married, 2 = divorced, 3 = widowed

\$64,000 question:

What does 0 represent ???

Answer: context is needed to know what 0 represent !!!

Just like: You IS an English word. You is NOT used in the context of "Personal pronoun"

The computer memory and the binary number system

A memory device must have more than 1 states

The electrical switch is a memory device: on / off

One switch can be in one of 2 states

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off = 0 on = 1

N switches can be in 2^N states.

Representing numbers with switches: binary number system

Computer memory:

1 switch = bit (BInary digiT)
8 switches = byte
Each byte is assigned a unqiue address
like SSN
Adjacent memory cells can be combined to make
larger memory cells:
2 bytes = 16 bits
4 bytes = 32 bits
8 bytes = 64 bits
We need larger memory cells due to "overflow"

Introduction to the computer: how a computer executes instructions

Structure of CPU

Operation of the CPU

Pointers

Program flow

Branching

Types of instructions that a computer can execute:

Read/write memory Compute Branching

Entire programs consist of the 3 types of instructions !!!!

Computer Algorithms

Algorithm = a step-by-step procedure for solving a problem

Computer Algorithm:

is an algorithm that can be executed by a computer

Difference between instructing Humans and Computer (Machine):

A machine does not know how to remove a bulb

Computers have no common sense knowledge (really dumb)

A real life algorithm: Tell them to use 2 pieces of paper and follow instructions

Euclid Alg for finding Greatest Common Divisor.