

# Difference between Human and Computer

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- Computer
  - Computers perform complex computation or process large amount of data, control devices, communicate following a stored set of instructions at high speed and without mistaking
- Human
  - Human is able to perform computation without waiting for instruction, and to making appropriate response when the condition of these computations and judgements changes
  - From the experience on solving various problems, human is able to come up with faster methods
  - Human is able to process data which is hard to demonstrated in numeric values

# Computer's components

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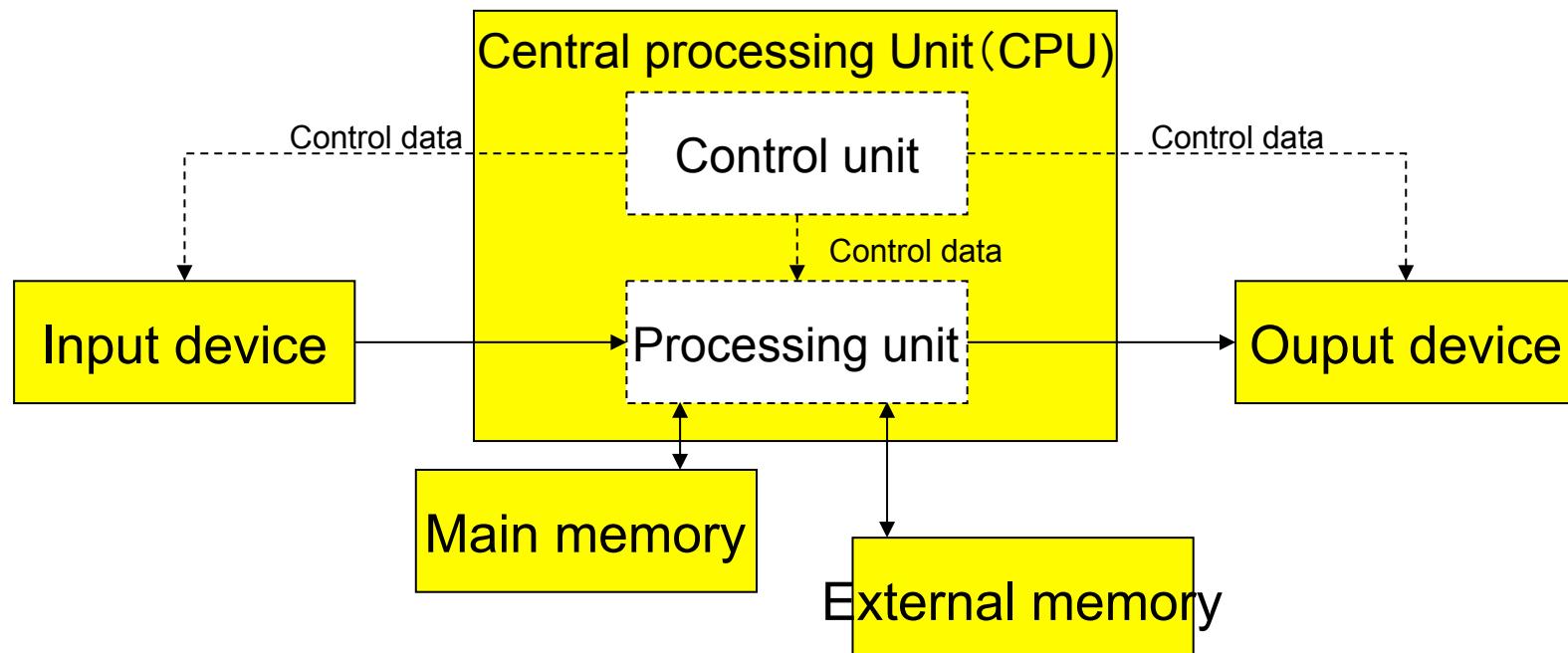
- Components
  - Hardware
    - Parts that contain electric circuits
  - Software (Program)
    - Things that make orders for hardware to run
- Hardware are not able to operate by themselves, however if software is installed, they can be used in various purposes



# Function and Structure of Hardware

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- There are 5 functions of a computer: input, output, storage, process, control

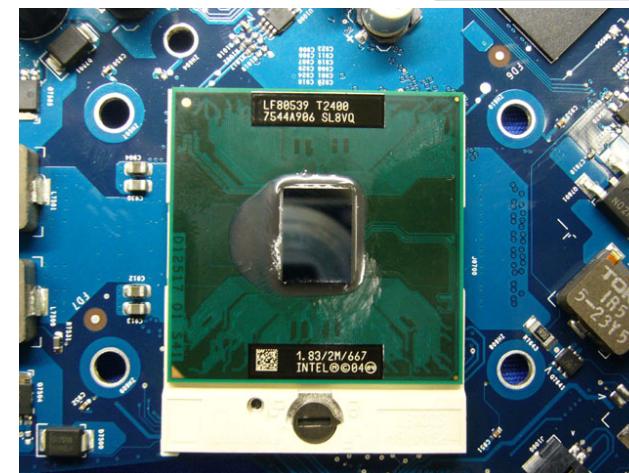
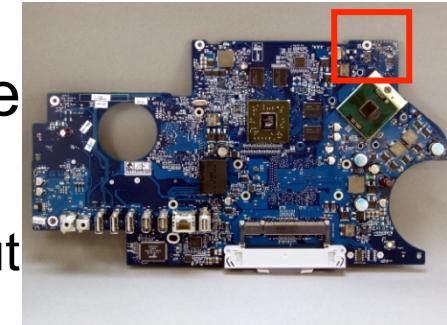


# General view and function of Hardware

## CPU 1

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- Central Processing Unit
- Controlling: control the instruction set and the operation of devices that build up the computer
- Processing : interpret instructions and execute
  - Is constructed from processing unit and register
  - Processing unit uses data from register to carry out
    - 1. Data is sent from main memory or other storage to register
    - 2. Calculation is carried out with the data stored in register
    - 3. From register result is sent back to main memory or other storage



# General view and function of Hardware

## CPU 2

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- Clock
  - In order to synchronize the timing of the operation of every parts in CPU, clock signal is sent at fixed interval
  - Clock signal set the pace for every processes that are executed on CPU
  - The shorter the interval of clock signal is, the faster that CPU can process
- Clock frequency(Hz)
  - Is the rate of cycles per second of clock signal (How many times clock signal is sent in one second)
  - Generally, the higher the frequency, the faster CPU

# General view and function of Hardware Storage devices

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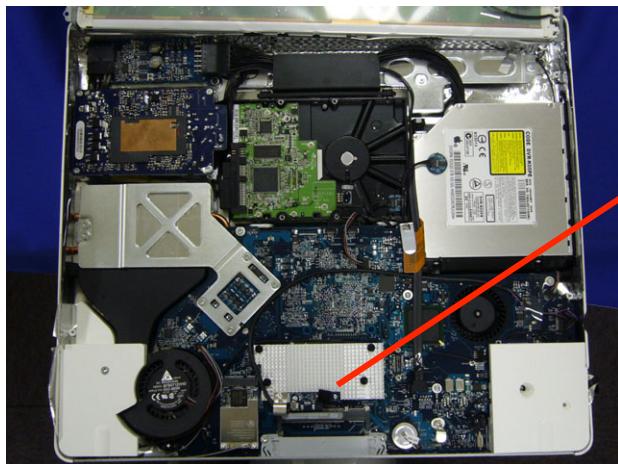
- 2 main types of Storage device
- Primary storage (main memory)
  - Read and write speed is fast
  - Data being stored here will be lost when the power is turned off
- Secondary storage (external memory)
  - Read and write speed is much slower
  - Data being stored here will NOT be lost when the power is turned off

# General view and function of Hardware

## Main memory

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- Read and write speed is fast
- Data being stored here will be lost when the power is turned off



A memory slot

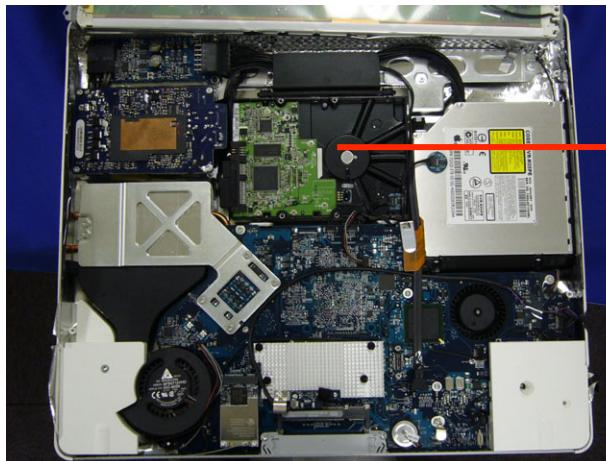


A main memory

# General view and function of Hardware

## External memory 1

- Hard disk
  - Reads and writes data to a rotating magnetic disk
  - Data is stored into many concentric ring disks inside
  - A head (silver, pointed triangle) moves above the disks to read and write data or change track



Hard disk  
outside



Hard disk inside

画像出展 : Impress PC Watch Intel Core搭載iMacハードウェアレポート  
<http://pc.watch.impress.co.jp/docs/2006/0117/imac01.htm>  
<http://pc.watch.impress.co.jp/docs/2006/0119/imac02.htm>

# General view and function of Hardware

## External memory 2

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- Other external storage
  - Floppy disk
  - USB flash disk
  - CD-ROM / CD-R / CD-RW
  - DVD



DVD Drive

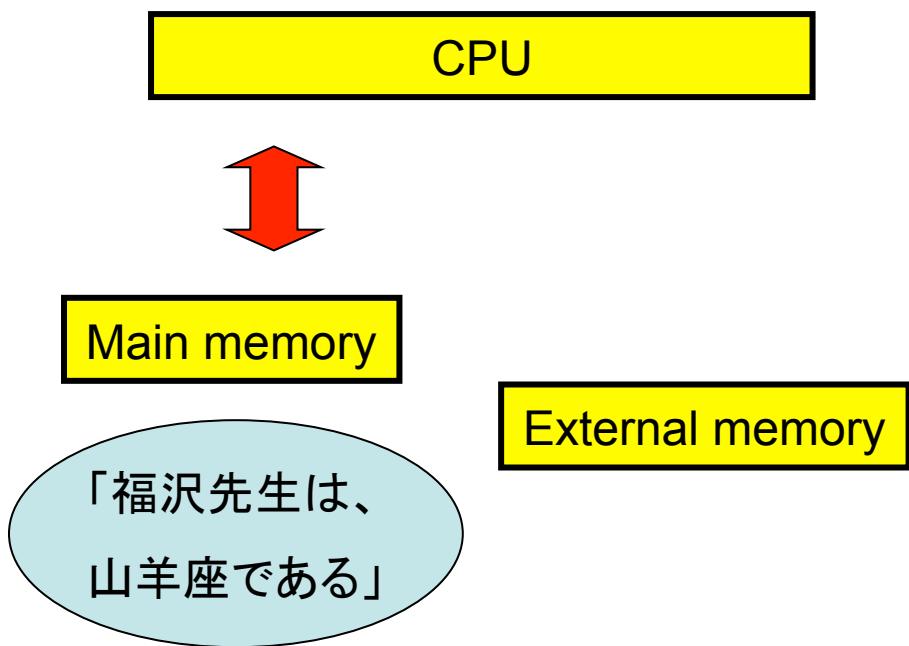
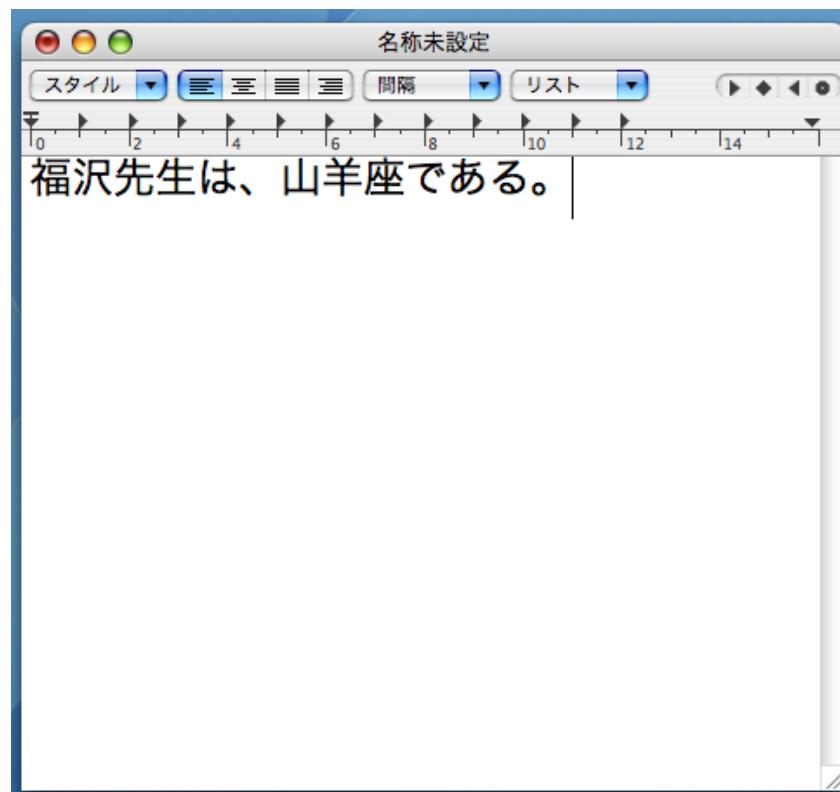
# General view and function of Hardware Performance of Storage Device

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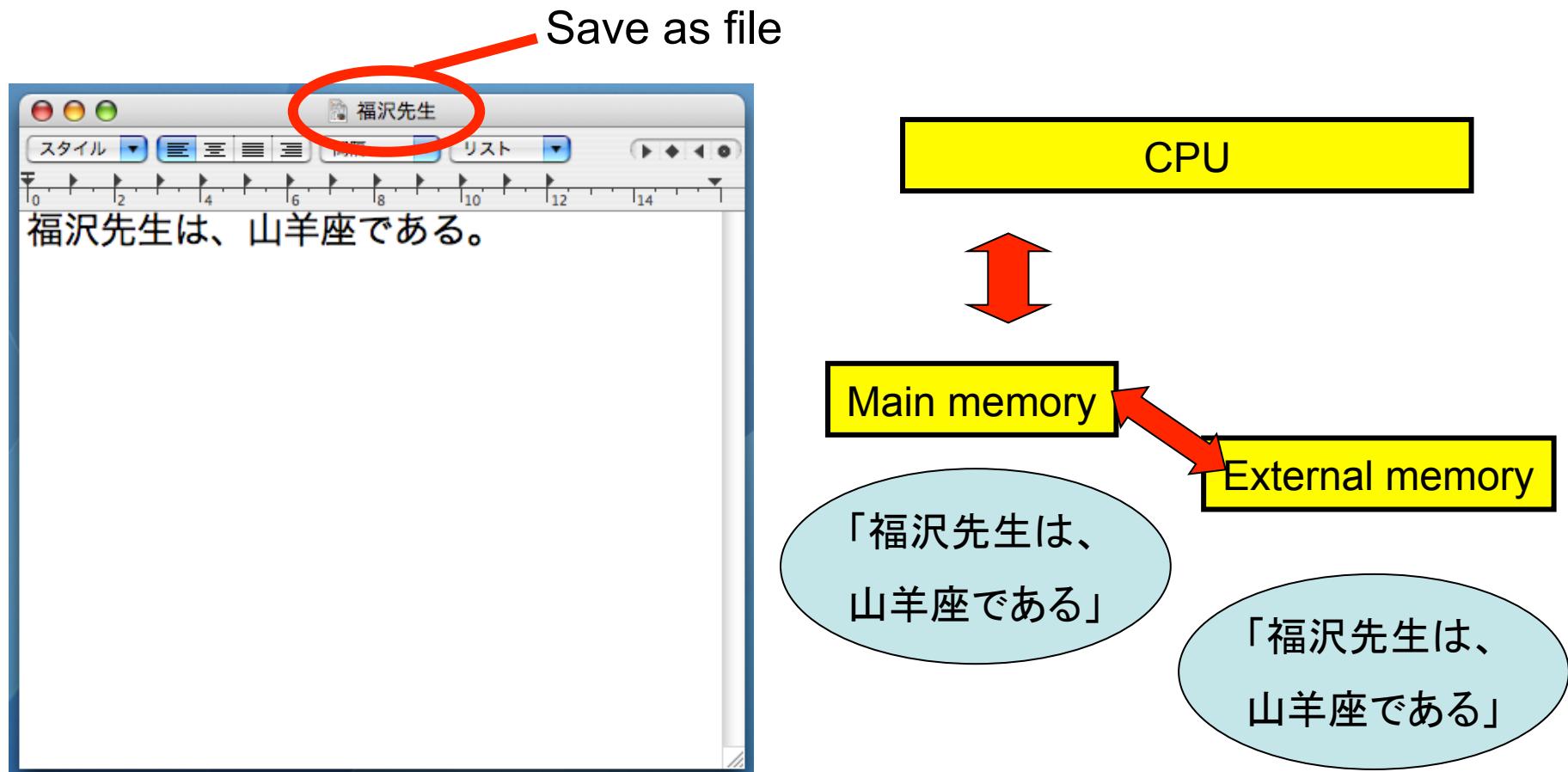
- Capacity
  - How many bytes of data can be stored?
- Speed
  - How many bits of data can be read/written in 1 second?
  - Main memory is usually several hundreds of thousands times faster than secondary storage.

# Main memory and external memory's role

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# Main memory and external memory's role



# General view and function of Hardware

## Input device

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- To deliver user's intention to computer
- To insert data into computer
- Keyboard
- Pointing devices
  - Mouse
  - Touchpad
  - Pen tablet
- Scanner
- Microphone

画像出展 The Apple Store  
<http://store.apple.com/0120-APPLE-1/WebObjects/japanstore.woa/wa/RSLID?nnmm=main&mco=EC571521>



# General view and function of Hardware Output device

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- To display processed result to user
- Display
  - LCD
  - CRT
- Printer
- Speaker



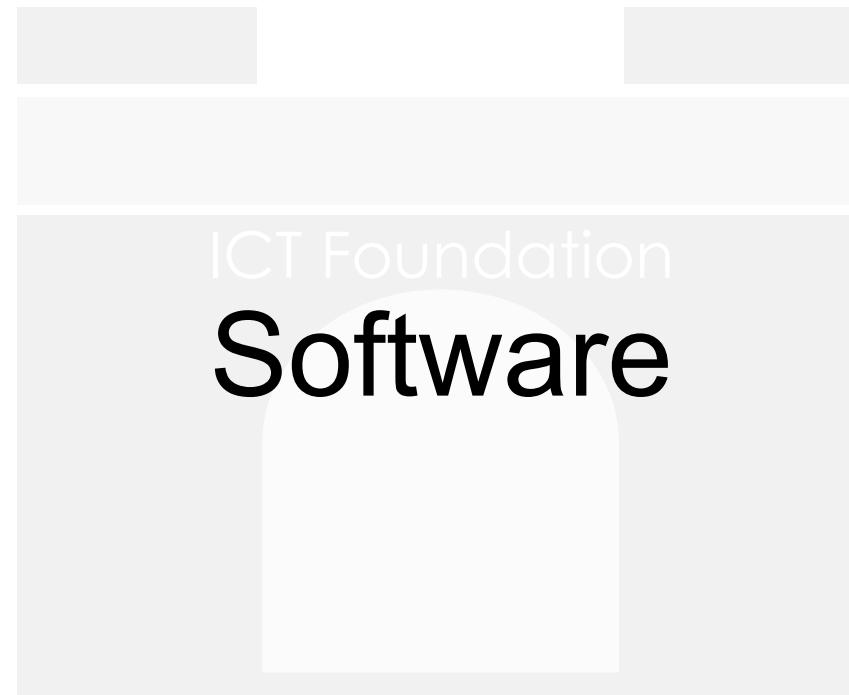
画像出展 The Apple Store  
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# 【Exercise】

## Let's check your PC's specification

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- Check the specification of your PC and fill out the form
  - Manufacturer, Model name
  - HDD or SSD(capacity), CPU(type, frequency), memory(capacity), OS
  - Weight, display(size, resolution), External drive(type, format), battery lifetime
  - Dimension (width x height x depth)
- Let's compare with others'



# Software (Program)

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- Hardware can not operate themselves (computer will be just a box if there is no software installed)
- A sequence of instructions that a computer can interpret and execute is called program
- Many data can be used in many ways by installing programs

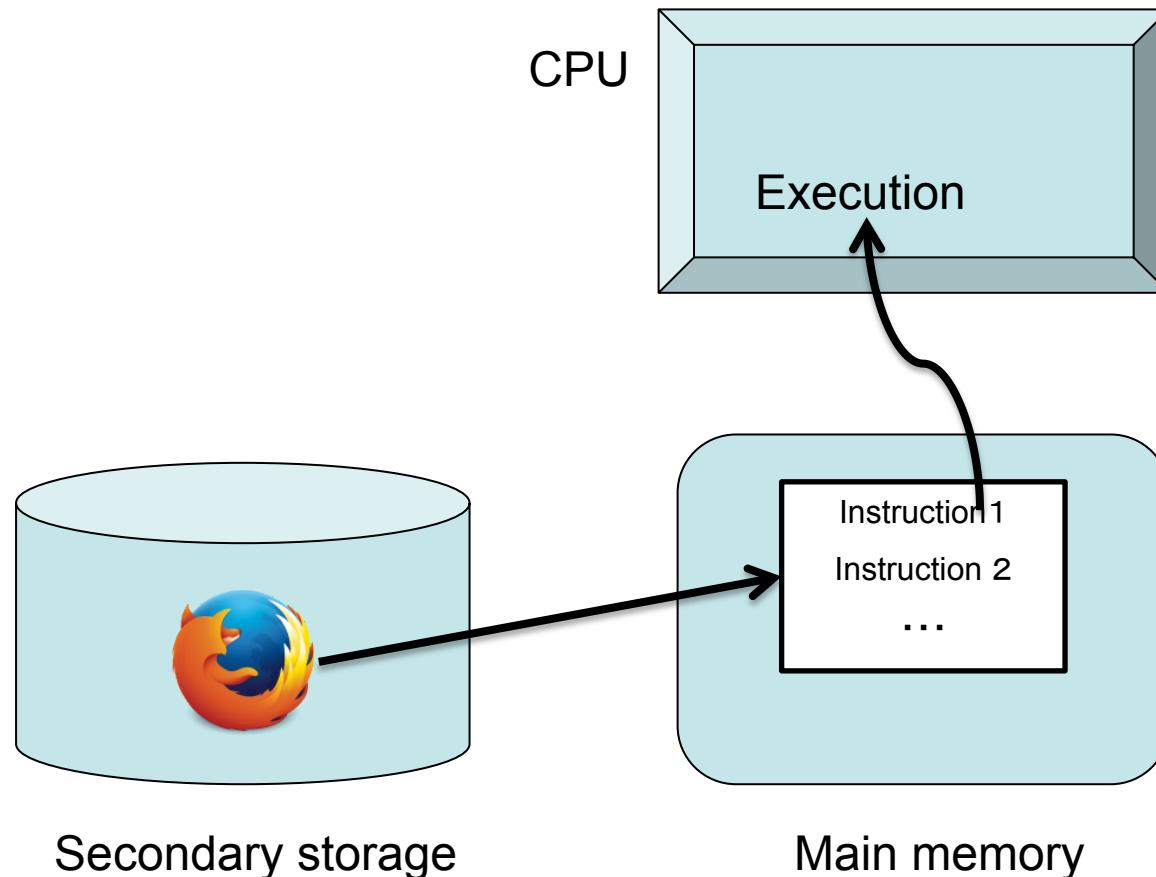
# What is the different between a computer and a calculator?

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- Both of them can calculate
- Calculator
  - Procedures and data are in user's mind
  - Users input data following the procedures
  - Input speed is slow
- Computer (= calculator + memory)
  - Program and data are stored inside (which is called von Neumann architecture)
  - Followed by that program, CPU will execute the calculation
  - Can operate in high speed

# Execution of Software Invoking Application

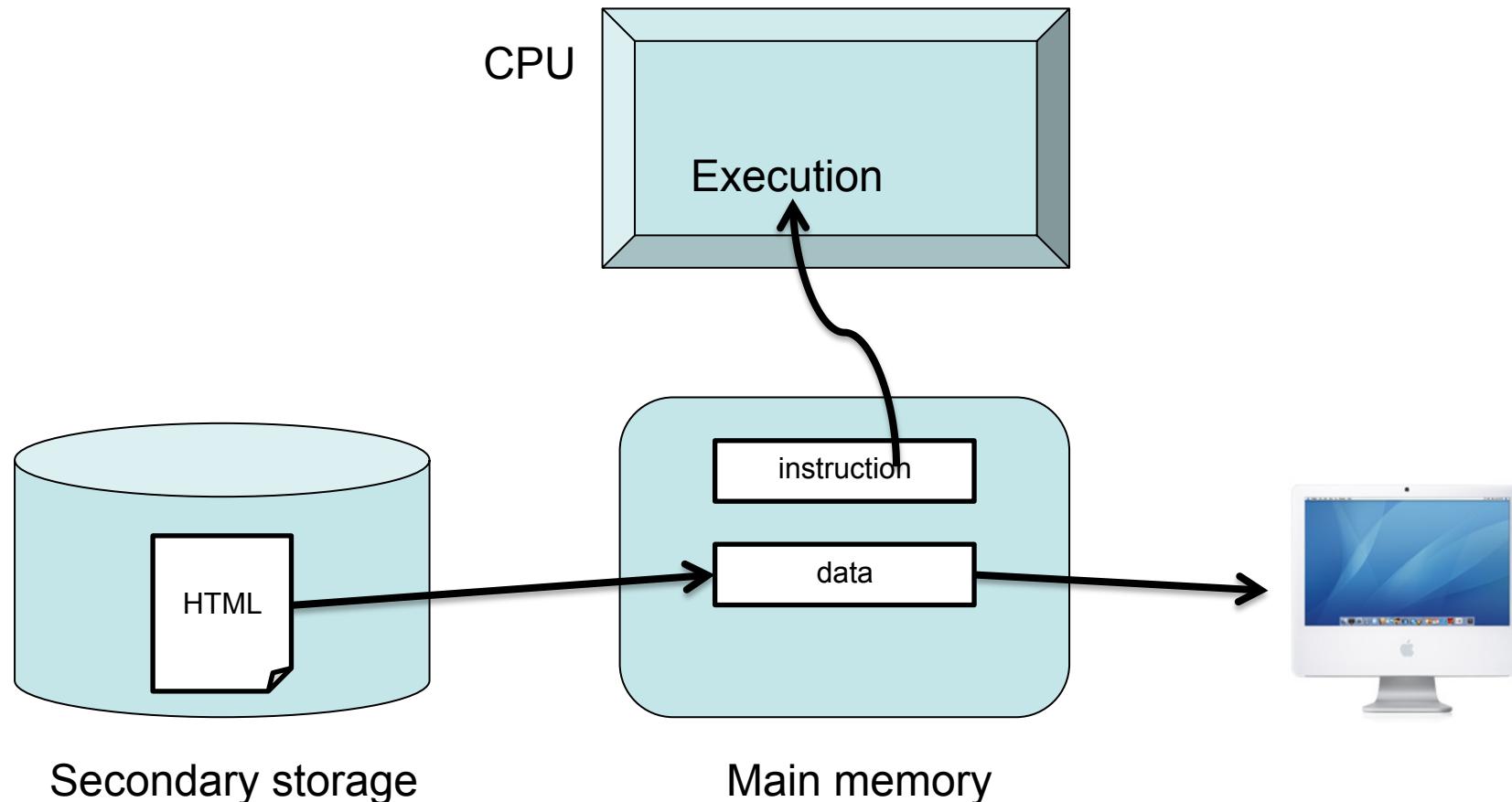
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# Execution of Software

## Input/Output of Data

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# Basic Software and Application Software

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- Application software
  - Is called “application”
  - Is used for specific purpose and work
  - Word processor Software, Spreadsheet Software, Mail Software
- Basic Software
  - Operating System (OS)
    - Is used to help applications run smoothly
  - Language Processor(Compiler)
    - Provides function which is used to make program