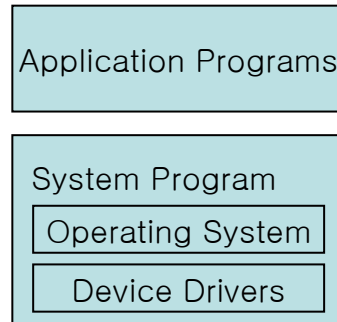


# An Overview of Computer Systems

# Overview of System Programming



- System Programming
  - Writing system programs
    - Direct control of HW
    - Using assembly
    - Implementing system utility or OS features
  - Using system programs
    - Application programming using OS services
    - I/O device control using device drivers

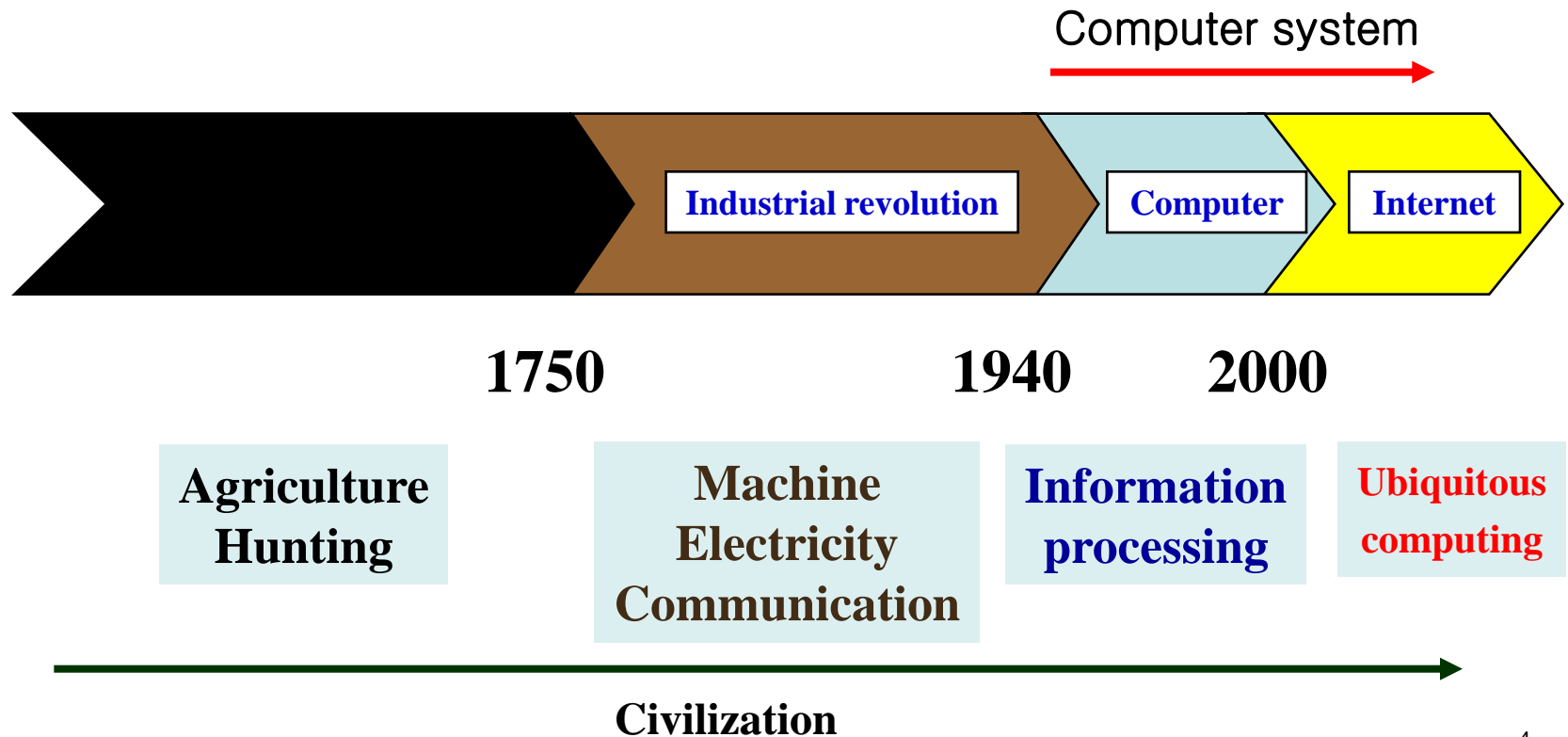
- Course topics
  - Assembly programming
  - Programming with OS services
  - Program execution logics
  - Computer communications and collaborations

# Overview of System Programming

- Example of system programming
  - Make program with assembly language which controls printer newly developed
  - Make program with C language which schedules processes of OS with new way and integrate it to OS
  - Improve memory management technique of OS
  - Make program which efficiently compresses files using file handling service program of OS
  - Make program which transmits files to other computers connected to the Internet
  - Make and add media-related runtime library to reinforce multimedia handling capabilities of OS

# Progress of civilization and computer system

- Knowing history of computing
  - Make analyzing and understanding of the present state of computing technology more accurate
  - increase predictability of future technologies



# Progress of computer

## ■ Chronology

1945: John Neumann, come up with a logical framework for EDVAC  
1946: Eckert, Mauchly, ENIAC – The first electronic computer

1951: UNIVAC I – Census Bureau  
1964: IBM System 360

1977: Apple II PC  
1978: IBM PC/MS-DOS

1983: Begin of Internet – opening to the public of ARPANET

1990: Tim Berners-Lee – WWW  
1995: Microsoft Windows 95, GUI

EDVAC: Electronic Discrete Variable Automatic Computer  
ENIAC: Electronic Numerical Integrator and Computer

# Progress of computer

- Progress of information technology
  - information technology
    - mainframe computing → personal computing → distributed computing
  - electronic(semiconductor) technology
    - vacuum tube → transistor → integrated circuit
  - communication technology
    - analog voice → digital voice and data → digital multimedia
  - energy technology
    - engine, fossil fuel → electric power, nuclear fuel → battery, chemical fuel
- stage of progress of computer technology

| Generation | Period    | Technology                                | Major new product                            | Trend                             |
|------------|-----------|-------------------------------------------|----------------------------------------------|-----------------------------------|
| 1          | 1950–1959 | Vacuum tube                               | Public/military computer                     | Manufacturing technology          |
| 2          | 1960–1968 | Transistor                                | Commercial computer                          | Efficiency of manufacturing       |
| 3          | 1969–1977 | Integrated circuit                        | Mini computer                                | Improving business productivity   |
| 4          | 1978–1993 | LSI, VLSI                                 | PC, workstation                              | Information society               |
| 5          | 1994–     | Distributed computing, parallel computing | Client/server system, net/web, mobile device | Knowledge/network based society 6 |

# Changes in computing technology

- Things that have not changed during past 60 years
  - electronic computing
  - Von Neumann computing
  - basic features of computing
- Things that have changed during past 60 years
  - hardware material: vacuum tube → integrate circuit
  - processing unit : faster processing speed, larger memory device
  - data and user interface: text→ multimedia/graphic/hypertext
  - Computing method: centralized → parallel/distributed
  - Computer size: large computer → personal computer
  - Changes in the role and application of computer
    - mobile/ubiquitous/embedded/web/Internet computing
- Present state of system software
  - based on non changed computing principle
  - embrace various change and provide development infrastructure

# Changes in computing technology

- Change of computer hardware/software configuration technology
  - Technologies of computer and related field have been rapidly progressed during past 60 years.
  - According to progress of semiconductor technology, computers were faster, larger(capacity), smaller and cheaper. Software features enhanced and applications of it were rapidly widened.
  - In particular, configuration technology and application of software produced synergy and it became more active because of progress of Internet.
  - But, basic computer system didn't change and there were peripheral and functional changes and progress.
- Keyword of present computing technology
  - multimedia, Internet, web, information search, contents
  - mobile, ubiquitous, embedded
  - Fusion technology: IT/NT/BT/CT

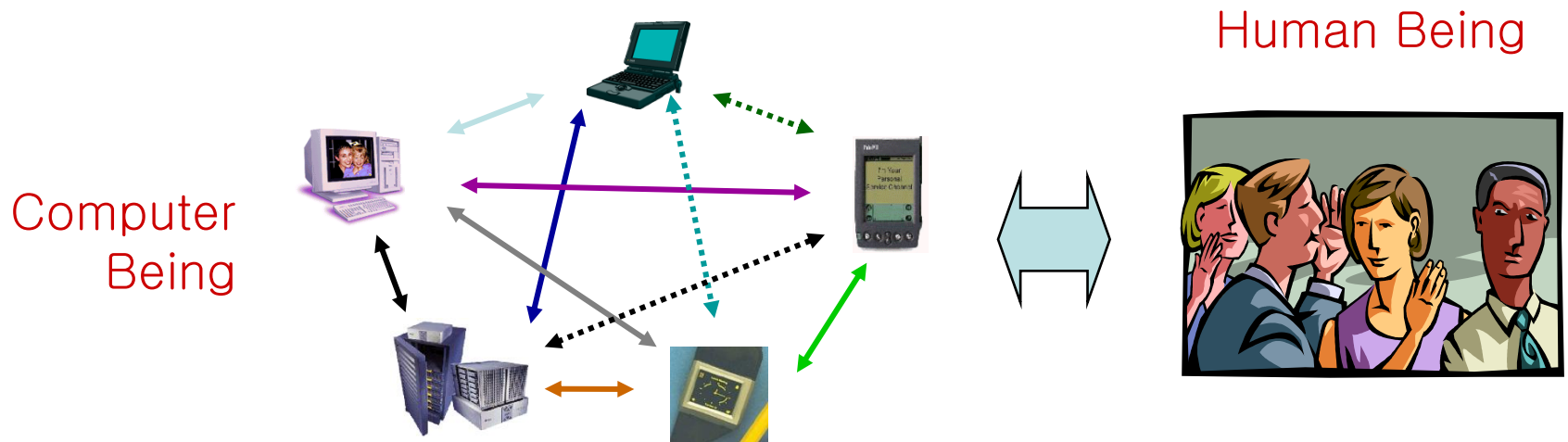


# Changes in computing technology

- Progress of computer system and software
  - independent system → network computing system, distributed system
  - single tasking system → multitasking system
  - single user system → multi user system
  - batch system → interactive system, online system
- People involved in operating a computer system
  - participants: user, programmer, operator, service provider
  - early days: user = operator = programmer
  - large computer age: user ≠ operator ≠ programmer
  - PC age: (user = operator) ≠ programmer
  - Internet age: (user = operator) ≠ programmer ≠ service provider

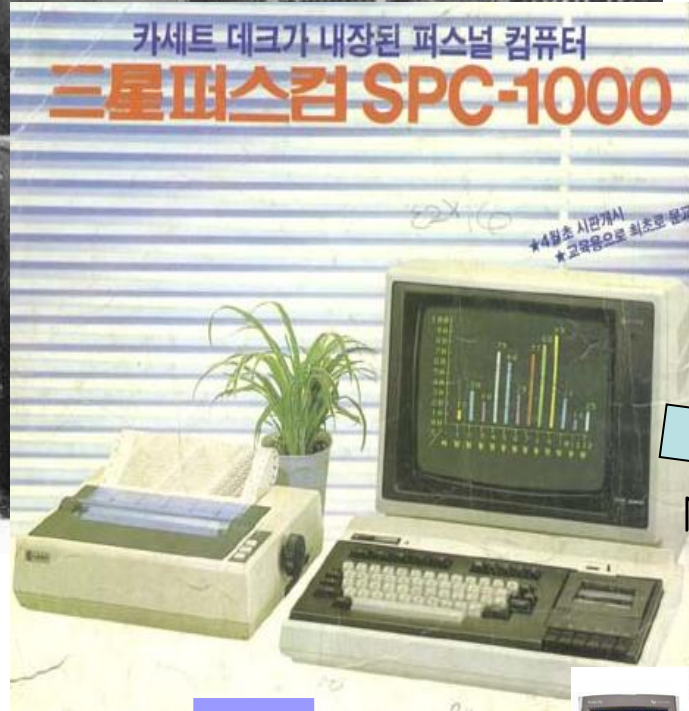
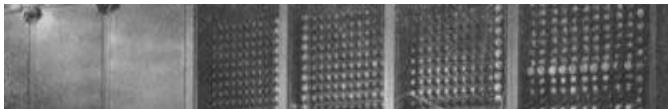
# New computer system

- “intercomputer”
  - Computer doesn’t exist by itself but has meaning from relationship between computers.
  - Network forms relationship between computers.



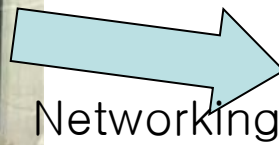
- Embedded Computer
  - computer which doesn’t like computer

# Pictorial View of Computer History



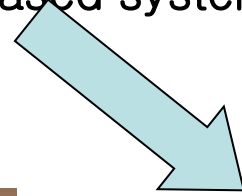
Improving Performance

- High Performance Computing
- Grid Computing



Networking

- Networked Computing
- teleconferencing
  - web-based systems



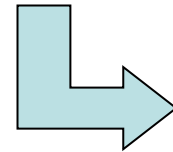
- Ubiquitous Computing
- Enjoy IT Anytime, Anywhere
  - U-city, U-Bus, etc.



Expanding Applications



Embedded Computing



Real-Time Ubiquitous Computing

# An Example of RT-Ubiquitous Systems (Real-Time Human/Object Tracking)

The image displays a Windows desktop environment with two primary windows open:

- Form1:** A window titled "Form1" with a menu bar containing "Record", "Settings", "Executable", "Current", "Publish", "Schedule", "File Se", and "Help". The main area is mostly blank, with a watermark for "My Screen Recorder Pro Trial Version" and the text "Please Register" overlaid. A taskbar at the bottom lists various applications including Fax, Live On Air 1.4 Second Edition, The Cricket Location.doc, OMNET++ Manual, Logitech QuickCam, cricket\_ver..., Nero StartSmart, InterVideo WinDVD 4, Shortcut to WinEdt.exe, Microsoft Outlook, usman\_Om..., Sharppath..., Product\_Fe..., and msp.exe.
- QuickCapture:** A window titled "QuickCapture" showing a live video feed of a person in a room. The video has a resolution of 640 x 480. Below the video are buttons for "Take a Picture", "Record a Video", and "Close", along with an "Options" dropdown menu. A timer in the bottom right of the video area shows "00:00 / 01:15".

A large, semi-transparent watermark is overlaid across the bottom of the image, reading: "This registered version won't have the watermark".

# No Real-Time Consideration

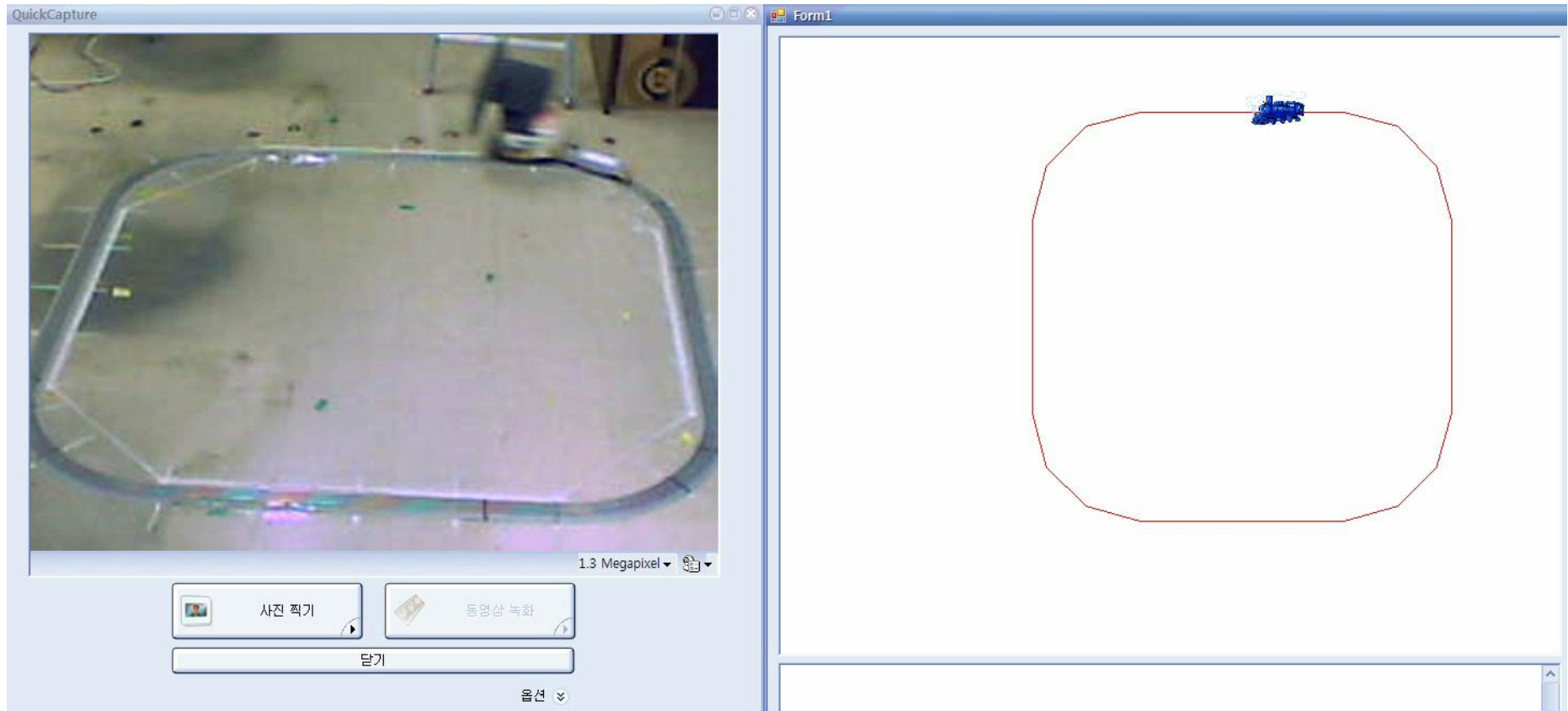


# Our New Method

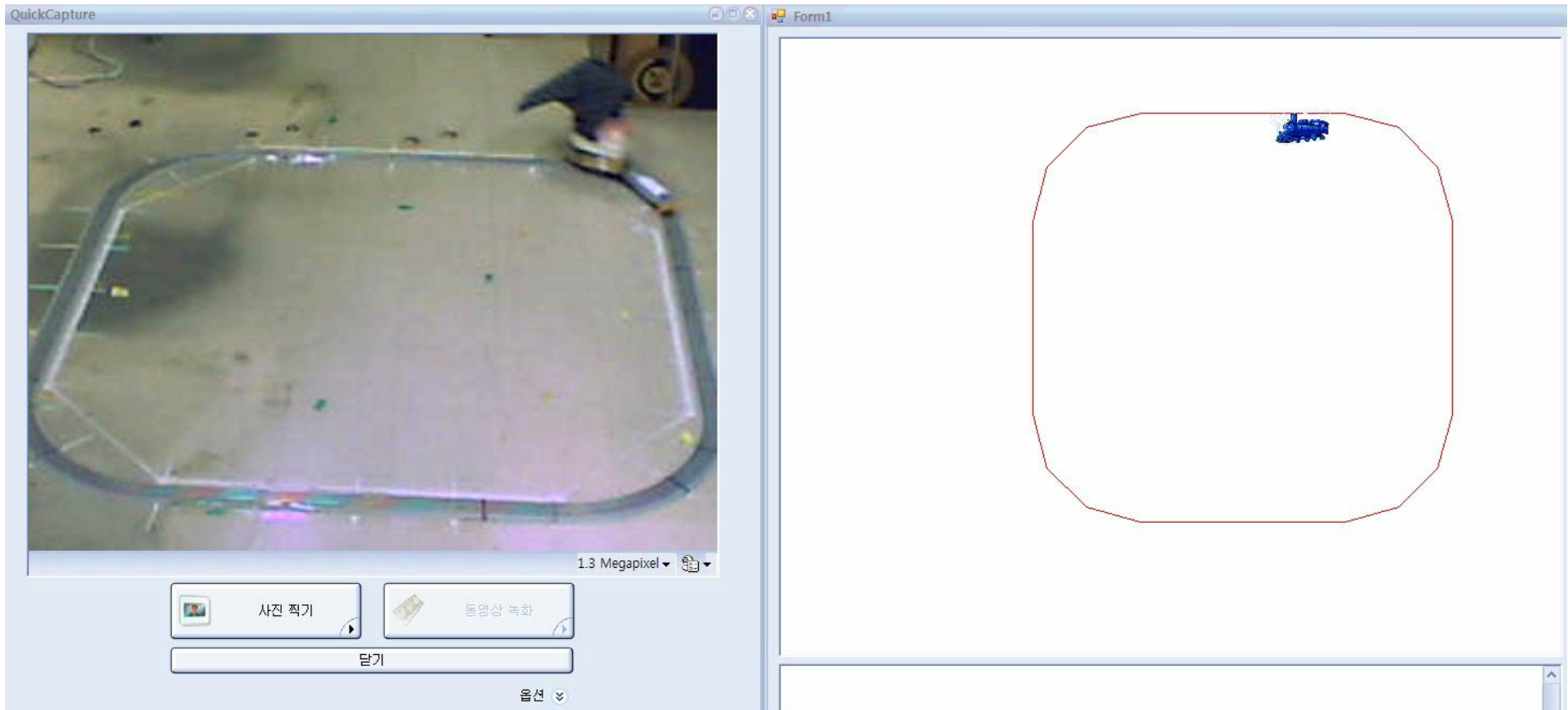




# 3-D Problem



# 3-D Blocking Solved!

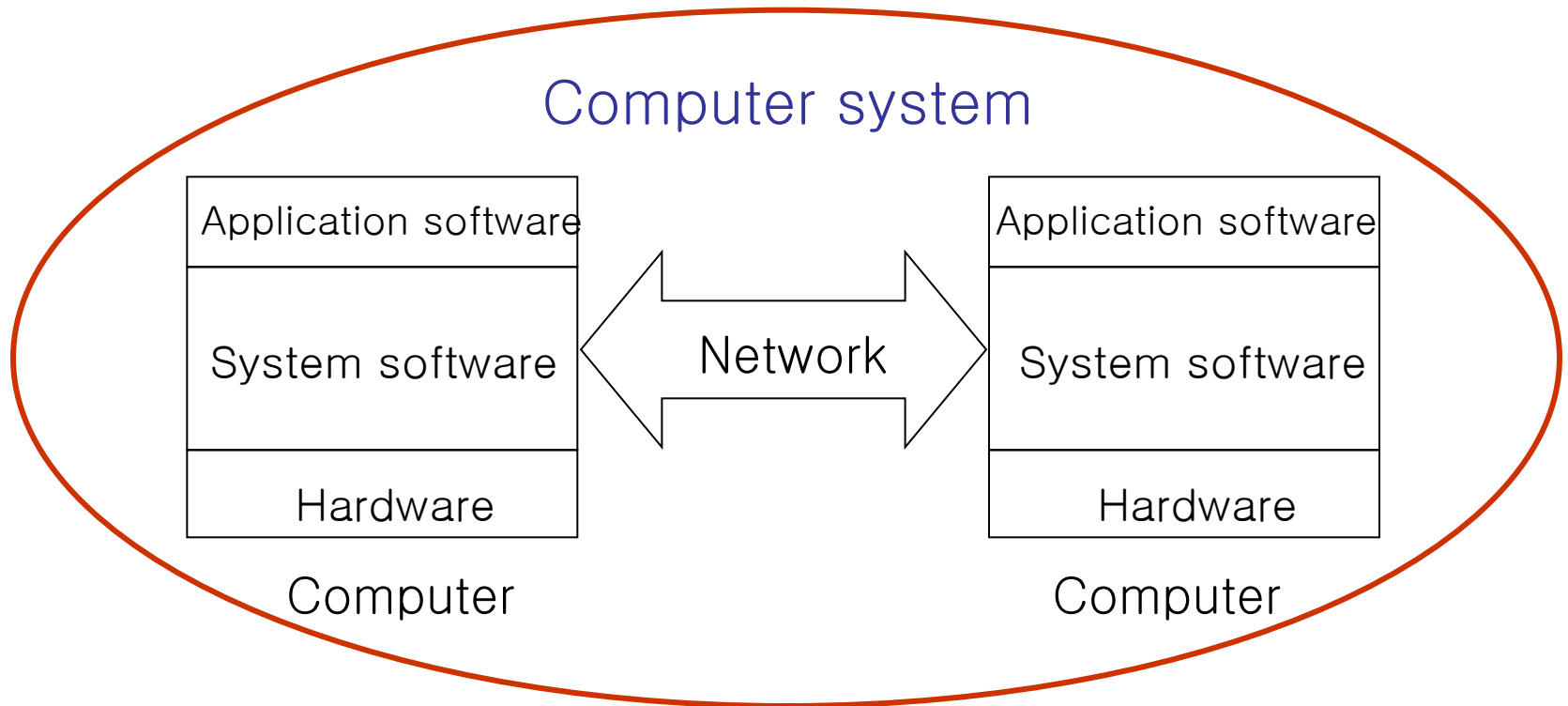




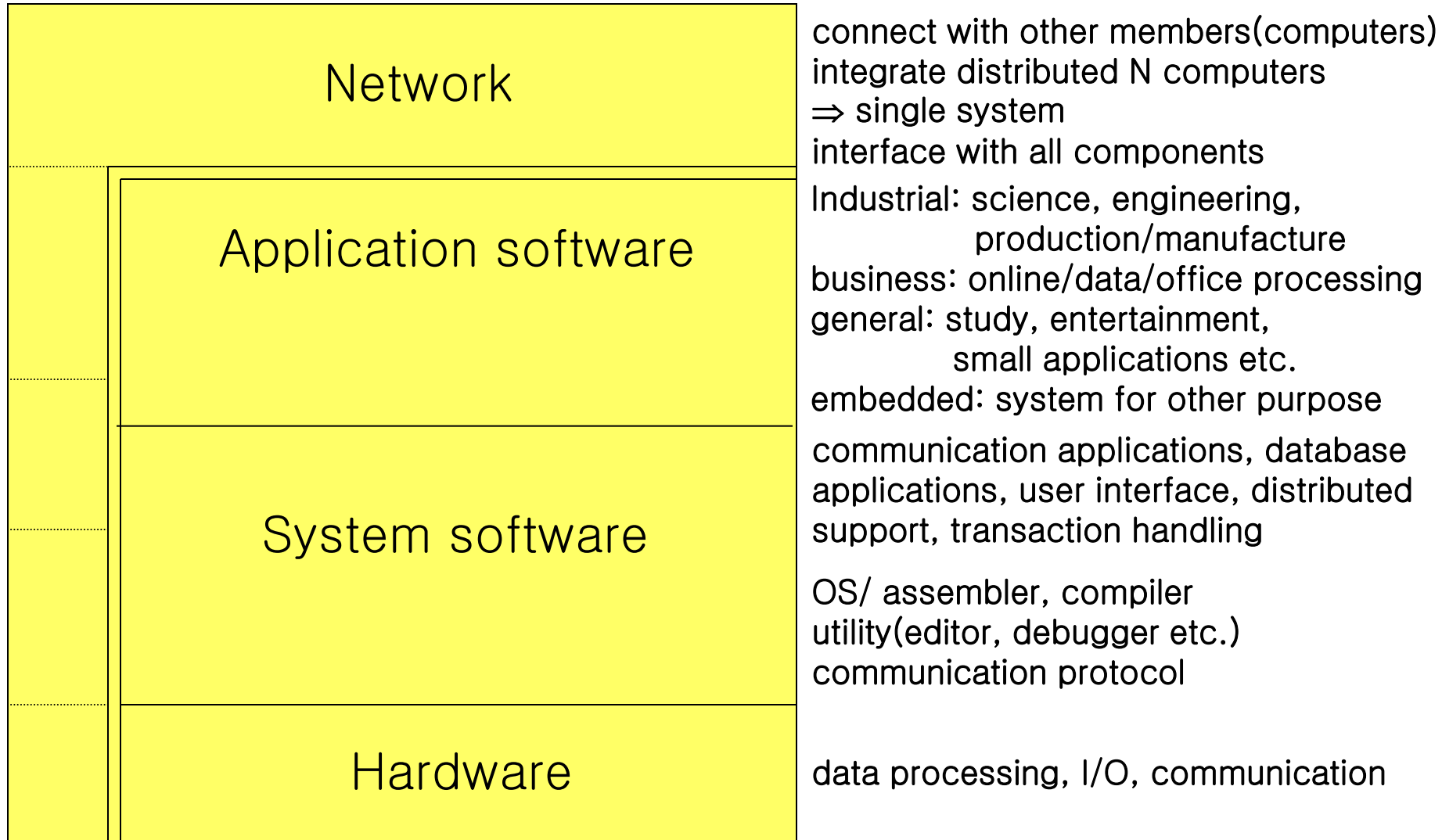
# To build such systems

- We need a *holistic understanding* about computer systems
  - Hardware
  - System software
  - Applications
  - Computer Networking

# Configuration of computer system



# Components and functions of computer



# Example of computer system configuration

## Hierarchical computer system

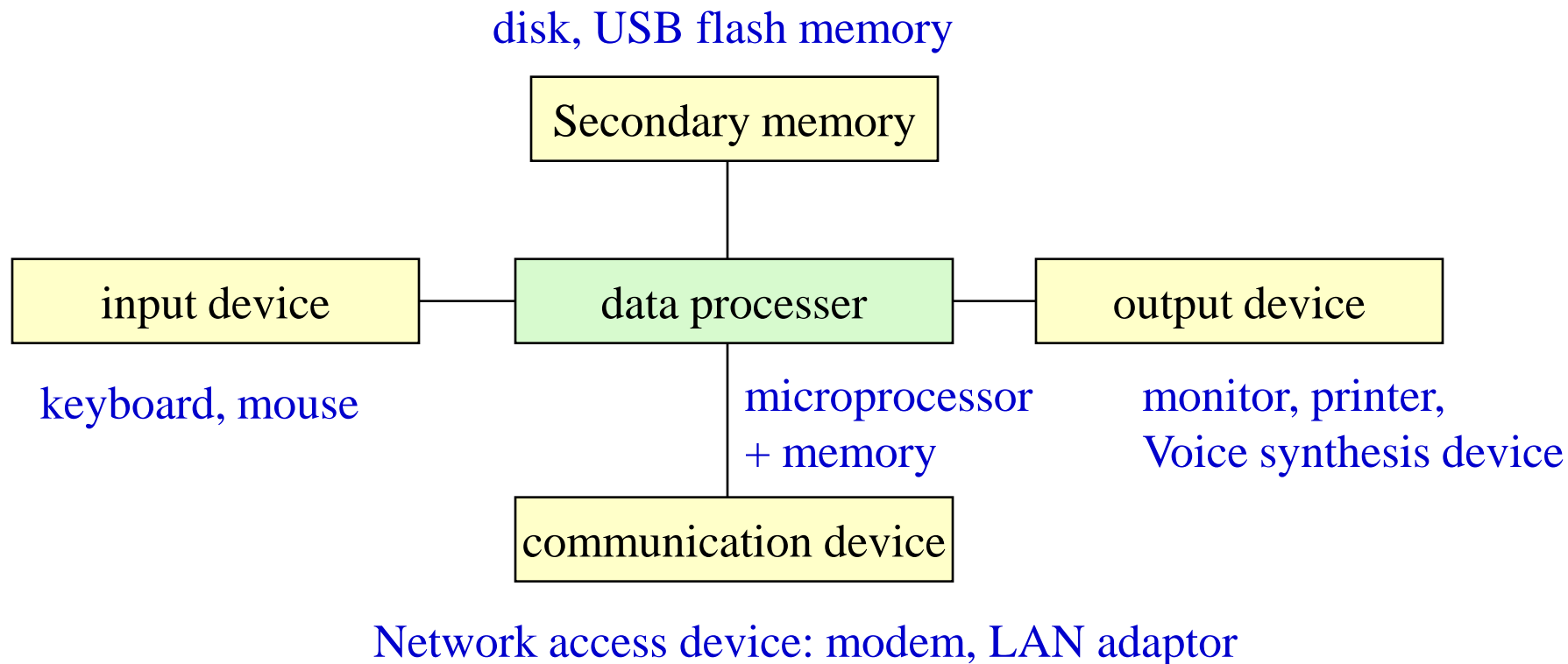
## Components

## Example

|                             |                                                  |                                                 |
|-----------------------------|--------------------------------------------------|-------------------------------------------------|
| <b>Application software</b> | <b>Application software</b>                      | <b>stock analysis,<br/>Aircraft design</b>      |
| <b>System software</b>      | <b>Compiler, middleware<br/>Operating system</b> | <b>C compiler , UNIX,<br/>Windows XP, Corba</b> |
| <b>Hardware</b>             | <b>CPU, memory , disk</b>                        | <b>Pentium, VGA<br/>terminal, hard disk</b>     |

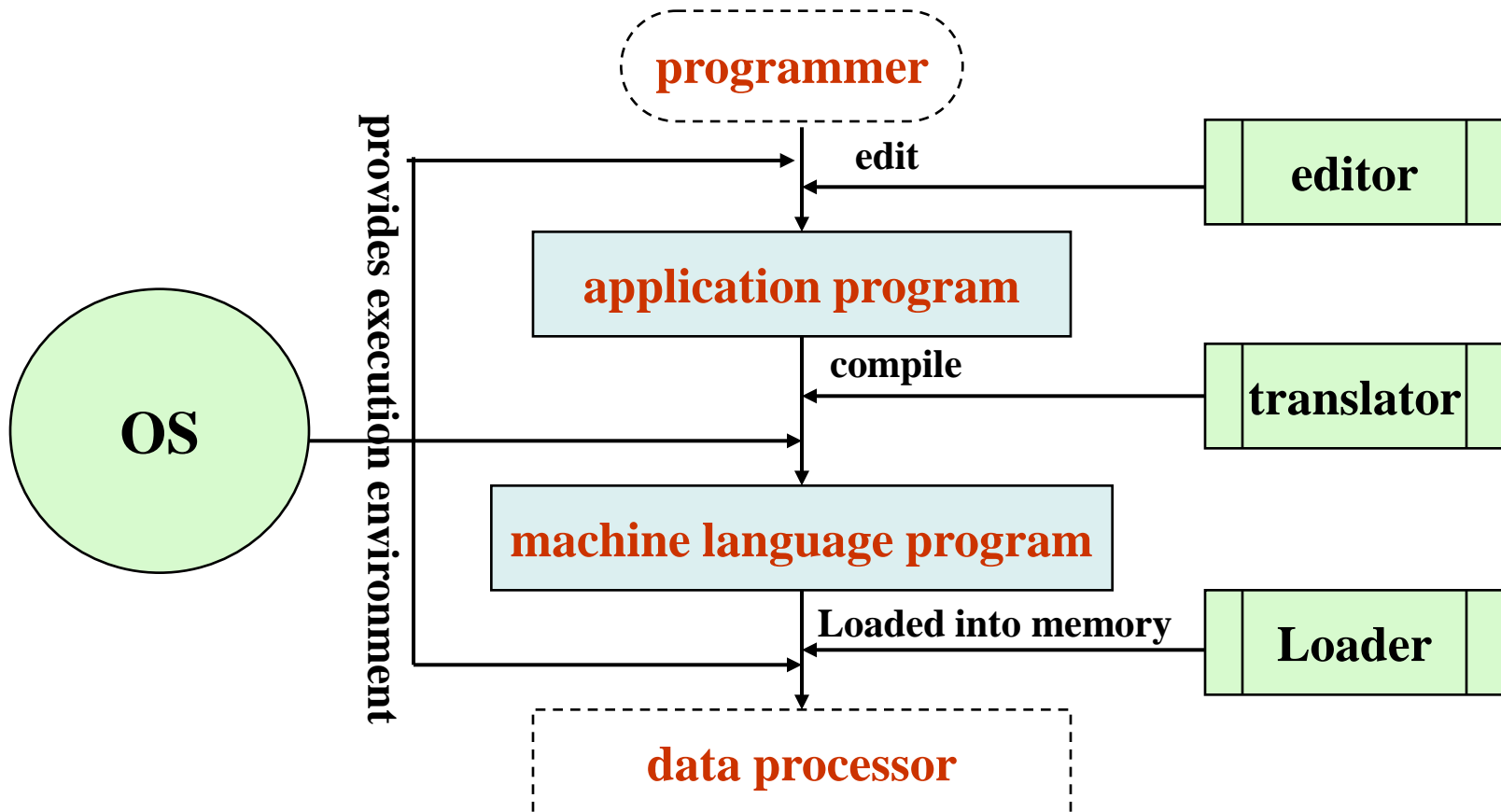
# Configuration of computer hardware

- Major components
  - I/O devices, processor, memory devices



# Configuration of computer hardware

- System software and application software



# Closing – computer and vehicle

- Metaphor
  - Will(Thought) of running car? driver
  - Will(Thought) of running computer? software
- Computer hardware
  - provide motive power by calculation by structure of machine
  - like a car
- Computer software
  - fruit of knowledge and wisdom of human(programmer)
  - projection of human's mind
  - representative of human