Computers can do such a wide variety of things because they can be programmed.

Introduction to Structured Programming

CM1_CU1: Week 2

Objectives:

1. Define the basic terminologies on structured programming.

2. Differentiate hardware and software.

3. Demonstrate the conversion of number system.

Introduction to Structured Programming

➢ Terminologies
➢ Computer and Programming
➢ **Hardware and Software**
➢ Number system

What is Hardware?

HARDWARE

- the physical components of a computer. Computer Hardware is any part of the computer that we can touch these parts. These are the primary electronic devices used to build up the computer.

What is Software?

SOFTWARE

- a collection of instructions, procedures, documentation that performs different tasks on a computer system. we can say also Computer Software is a programming code executed on a computer processor. The code can be machine-level code or the code written for an operating system.

What are the Difference between hardware and software?

HARDWARE

◆ a physical parts computer that cause processing of data.

◆ It is manufactured.

◆ Hardware can not perform any task without software.

◆ As Hardware are physical electronic devices, we can see and touch hardware.

SOFTWARE

◆ a set of instruction that tells a computer exactly what to do.

◆ It is developed and engineered.

◆ software can not be executed without hardware.

◆ We can see and also use the software but can't actually touch them.

HARDWARE

- It has four main categories: input device, output devices, storage, and internal components.

- Hardware is not affected by computer viruses.

- It can not be transferred from one place to another electrically through network.

- If hardware is damaged, it is replaced with new one.

SOFTWARE

- It is mainly divided into System software, Programming software and Application software.

- Software is affected by computer viruses.

- But, it can be transferred.

- If software is damaged, its backup copy can be reinstalled.

Hardware and Software

HARDWARE
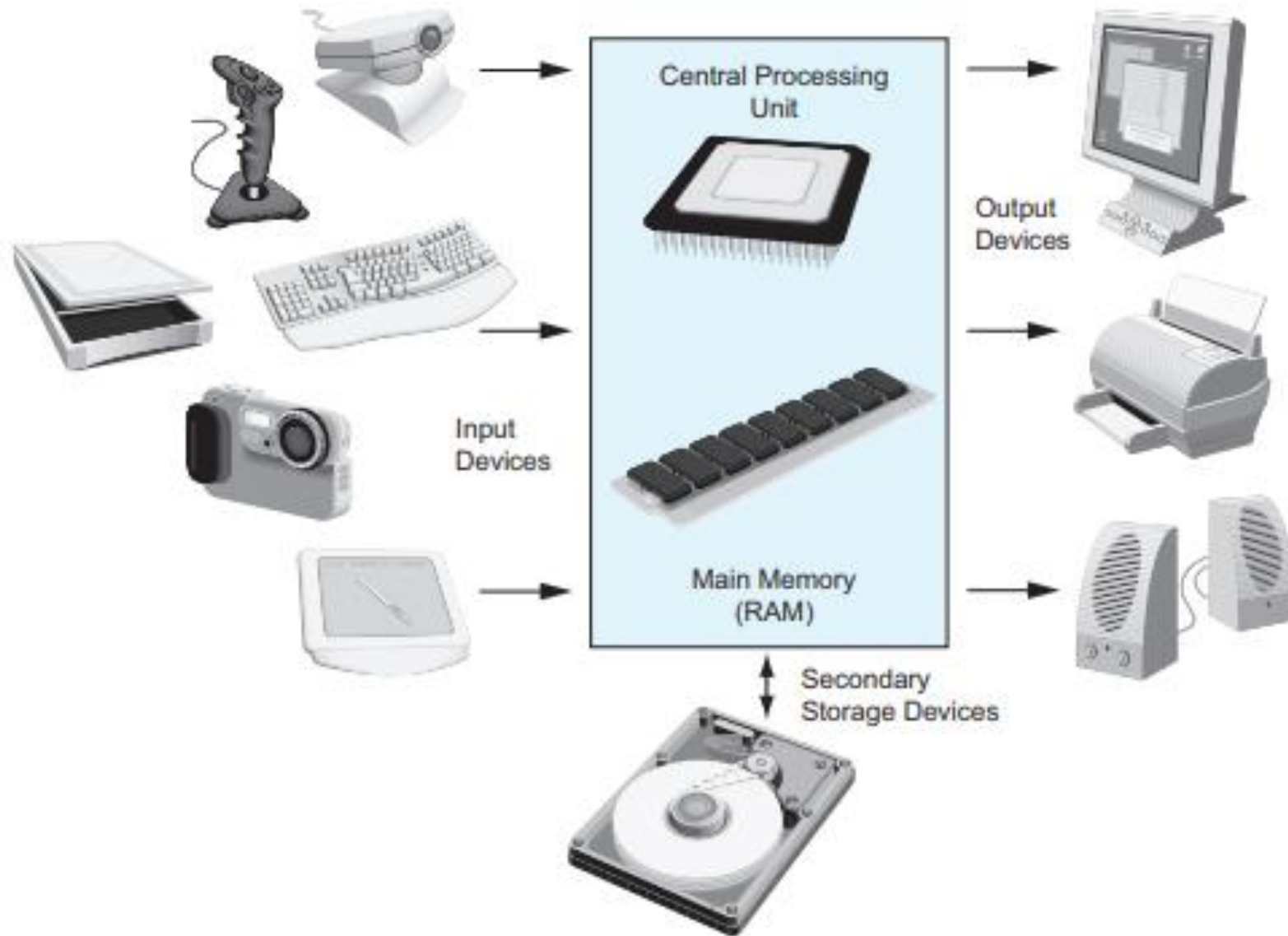
What are the types of Software?

TYPES OF SOFTWARE
- Application Software
- System Software
- Programming Software

What is Application Software?

Application Software

- a software program or group of programs designed for end-users.

What are the types of Application Software?

Types of Application Software

➢ Word Processing Software
➢ Database Software
➢ Spreadsheet Software
➢ Multimedia Software
➢ Presentation Software
➢ Enterprise Software
➢ Information Worker Software
➢ Communication Software

Types of Application Software

➢ Educational Software
➢ Simulation Software
➢ Content Access Software
➢ Application Suites
➢ Software for Engineering and Product Development
➢ Email Software

What is System Software?

System Software

- provides a platform for other software and includes the programs managing the computer itself, such as the computer's operating system, file management utilities and disk operating system (or DOS).

System Software

The system's files consist of libraries of functions, system services, drivers for printers and other hardware, system preferences and other configuration files. The programs in system software encompass assemblers, compilers, file management tools, system utilities and debuggers.

What are the examples of System Software?

Examples of System Software

For desktop computers, laptops and tablets:
- ➢ Microsoft Windows
- ➢ MacOS (for Apple devices)
- ➢ GNU/Linux

For smartphones:
- ➢ Apple's iOS
- ➢ Google's Android
- ➢ Windows Phone OS

What is Programming Software?

Programming Software

- also known as a programming tool or software development tool, is a program that assists software developers or programmers with creating, debugging and maintaining other programs and applications.

What are the examples of Programming Software?

Examples of Programming Software

GitHub	GitLab
Android Studio	Visual Studio Code
Eclipse	Xcode
Notepad++	Atom

What are the other types of Software?

Other Types of Software

- Firmware
- Driver Software
- Freeware
- Shareware
- Open Source Software
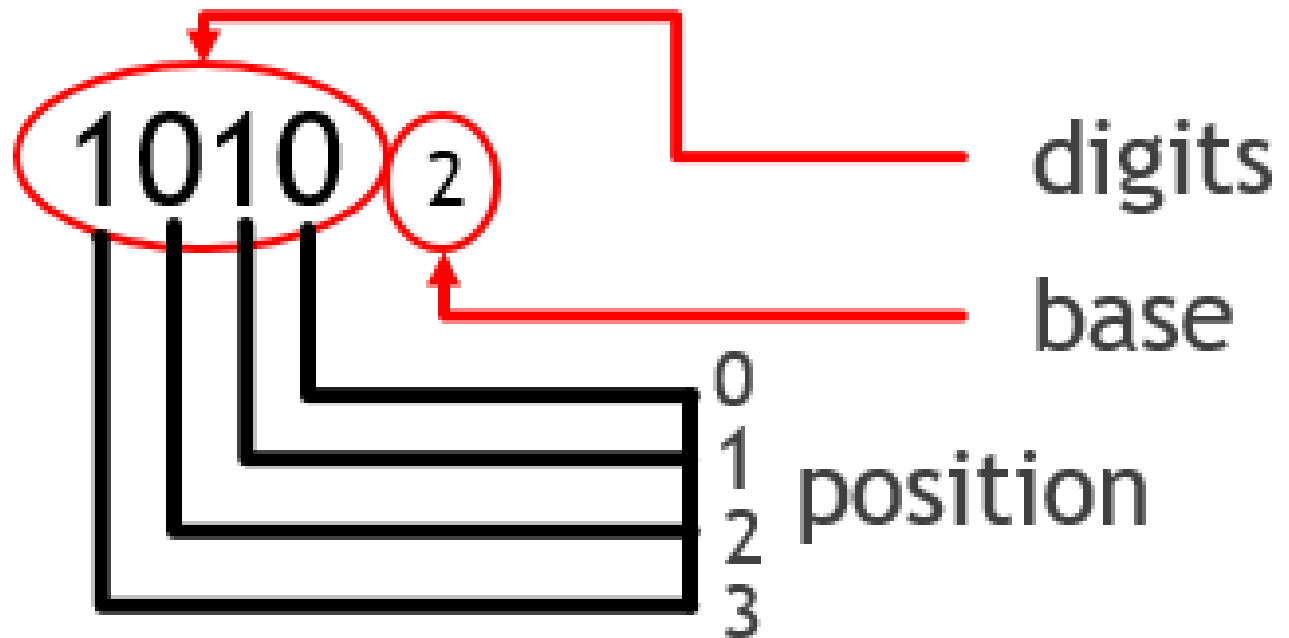- Closed Source Software
- Utility Software

What is Number System?

Number System

the representation of numbers by using digits or other symbols in a consistent manner.

Number System

The value of any digit in a number can be determined by a digit, its position in the number, and the base of the number system.

What are the types of Number System?

What is Binary Number System?

Binary Number System

➤ The binary number system uses only two digits: 0 and 1.

➤ The numbers in this system have a base of 2.

➤ Digits 0 and 1 are called bits and 8 bits together make a byte.

Example: 10001_2 , 111101_2 , 1010101_2

What is Decimal Number System?

Decimal Number System

➢ The decimal number system uses ten digits: 0,1,2,3,4,5,6,7,8 and 9

➢ Base number as 10

➢ The decimal number system is the system that we generally use to represent numbers in real life.

➢ If any number is represented without a base, it means that its base is 10.

Example: 723_{10} , 32_{10} , 4257_{10}

What is Octal Number System?

Octal Number System

➤ The octal number system uses eight digits: 0,1,2,3,4,5,6 and 7
➤ Base of 8
➤ The advantage of this system is that it has lesser digits when compared to several other systems, hence, there would be fewer computational errors.

Example: 72_8 ,35_8 ,141_8

What is Hexadecimal Number System?

Hexadecimal Number System

➢ The hexadecimal number system uses sixteen digits/alphabets: 0,1,2,3,4,5,6,7,8, 9 and A,B,C,D, E, F

➢ Base number as 16

➢ Here, A-F of the hexadecimal system means the numbers 10-15 of the decimal number system respectively. This system is used in computers to reduce the large-sized strings of the binary system.

Example: $7B3_{16}$,$6F_{16}$,$4B2A_{16}$

Conversion Rules of Number Systems

Conversion of Binary / Octal / Hexadecimal Number Systems to Decimal Number Systems

Example:
Convert 100111_2 into the decimal system.
Step 1: Identify the base of the given number.
Here, the base of 100111_2 is 2.

Conversion of Binary / Octal / Hexadecimal Number Systems to Decimal Number Systems

Step 2: Multiply each digit of the given number, starting from the rightmost digit, with the exponents of the base. The exponents should start with 0 and increase by 1 every time as we move from right to left. Since the base here is 2, we multiply the digits of the given number by $2^0, 2^1, 2^2$ and so on from right to left.

Conversion of Binary / Octal / Hexadecimal Number Systems to Decimal Number Systems
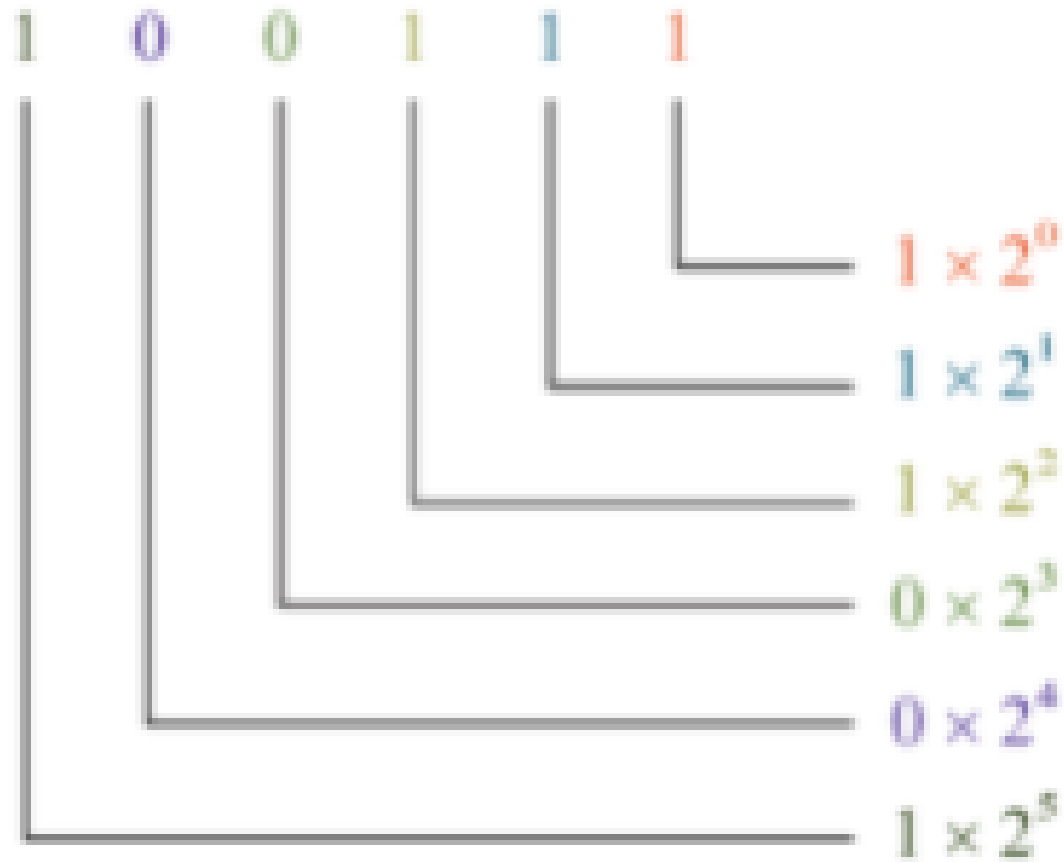
1   0   0   1   1   1

$$1 \times 2^0$$

$$1 \times 2^1$$

$$1 \times 2^2$$

$$0 \times 2^3$$

$$0 \times 2^4$$

$$1 \times 2^5$$

Step 3: We just simplify each of the above products and add them.

$$1 \quad 0 \quad 0 \quad 1 \quad 1 \quad 1$$

$$1 \times 2^0 = 1 \times 1 = 1$$

$$1 \times 2^1 = 1 \times 2 = 2$$

$$1 \times 2^2 = 1 \times 4 = 4$$

$$0 \times 2^3 = 0 \times 8 = 0$$

$$0 \times 2^4 = 0 \times 16 = 0$$

$$1 \times 2^5 = 1 \times 32 = 32$$

Sum: 39

Number system

Conversion of Binary / Octal / Hexadecimal Number Systems to Decimal Number Systems

$100111 = (1 \times 2^5) + (0 \times 2^4) + (0 \times 2^3) + (1 \times 2^2) + (1 \times 2^1) + (1 \times 2^0)$

$\quad = (1 \times 32) + (0 \times 16) + (0 \times 8) + (1 \times 4) + (1 \times 2) + (1 \times 1)$

$\quad = 32 + 0 + 0 + 4 + 2 + 1$

$\quad = 39$

Thus,

$\therefore 100111_2 = 39_{10}$

Conversion of Decimal Number System to Binary / Octal / Hexadecimal Number System

Example:
Convert 4320_{10} into the octal system.
Step 1: Identify the base of the required number. Since we have to convert the given number into the octal system, the base of the required number is 8.

Conversion of Decimal Number System to Binary / Octal / Hexadecimal Number System

Step 2: Divide the given number by the base of the required number and note down the quotient and the remainder in the quotient-remainder form. Repeat this process (dividing the quotient again by the base) until we get the quotient to be less than the base.

Conversion of Decimal Number System to Binary / Octal / Hexadecimal Number System

$$8 \mid 4\ 3\ 2\ 0$$

$$8 \mid 5\ 4\ 0 - 0$$

$$8 \mid 6\ 7 - 4$$

$$8 \mid 8 - 3$$

$$1 - 0$$

Conversion of Decimal Number System to Binary / Octal / Hexadecimal Number System

Step 3: The given number in the octal number system is obtained just by reading all the remainders and the last quotient from bottom to top.

Conversion of Decimal Number System to Binary / Octal / Hexadecimal Number System

$$8 \mid 4\,3\,2\,0$$
$$8 \mid 5\,4\,0 - \boxed{0}$$
$$8 \mid 6\,7 - \boxed{4}$$
$$8 \mid 8 - \boxed{3}$$
$$\boxed{1} - \boxed{0}$$
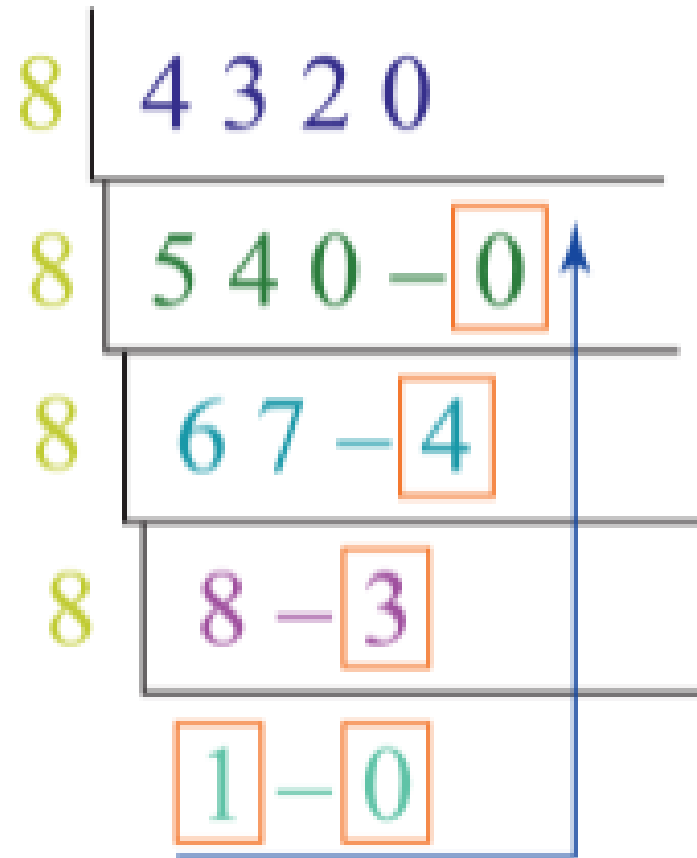
$$\therefore 4320_{10} = 10340_8$$

Any Questions?

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