Computer and Software Engineering Department

SE100L: Information and Communication Technologies Lab

Course Instructor: Hamza Shaukat Dated:
Lab Engineer : Asif Ali Semester: Fall 2023
Batch: BSEE 23

LAB 1 Fundamentals of Computer Hardware and Operating Systems

Name	Roll. No.	Total Marks (35)
Zunaira Abdul Aziz	BSSE23058	

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Signature: _____

1.1. Introduction

This lab demonstrates the functioning of basic input and output devices of computer, moreover this lab also introduces the student's operating systems and processing of CPU.

1.2. Lab Objectives

At the end of this lab, students will achieve the following goals:

- To study of basic input devices of computer
- To acquaint about introduction and functions of keyboard
- To know about central processing unit
- To know about central processing unit and it's functioning
- To know about computer output devices

1.3. Lab Equipment

- Lab PCs

1.4. Computer Fundamentals

1.4.1. Input Devices

Input devices serve the purpose of inputting data into computer systems. Among the commonly used input devices are the keyboard, mouse, scanner, trackball, joystick, webcam, and more.

1.4.1.1. Keyboard

A computer keyboard stands as one of the most widespread and essential input devices, utilized for feeding data into a computer system. Resembling a typewriter, it features keys encompassing alphabetic, numeric, and functional characters. The conventional US QWERTY keyboard is designed with 101, 104, or 107 keys, generating approximately 96 distinct characters.

1.4.1.2. Mouse

Meanwhile, a computer mouse, often referred to as a pointing device, constitutes another prevalent input mechanism. Frequently employed alongside personal computers, it allows the manipulation of an on-screen cursor by moving the mouse across a flat surface. Selections and movements are executed through the act of

clicking mouse buttons.

Figure SEQ Figure *
ARABIC 1: Computer mouse

1.4.1.3. Touch Pad

Touch pads, commonly encountered on laptops, emulate the capabilities of a mouse or trackball through a flat panel activated by finger movements. Swiping one's finger across the touchpad corresponds to cursor displacement on the screen, often accompanied by gesture support for tasks like document scrolling or image zooming. Usual touchpad configurations include buttons positioned beneath the touch-sensitive surface.

Figure SEQ Figure
* ARABIC 2:
Touchpad

1.4.1.4. Joy Stick

Primarily employed in computer gaming, joysticks are equipped with a stick affixed to a base, accompanied by various buttons each assigned distinct functions. This setup closely resembles an aircraft yoke, making joysticks

particularly suitable for flight simulation applications.

1.4.1.5. Scanner

Figure SEQ Figure
* ARABIC 3:
Joystick

Scanners, on the other hand, enable users to convert photographs or documents into digital format by inputting them into the computer. By placing the media onto the scanner's surface, an image file is generated, which can subsequently be opened and manipulated using computer software.

Figure SEQ
Figure * ARABIC
4: Scanner

1.4.2. Output Devices

An output device refers to a peripheral that receives data from a computer, typically for purposes of display, projection, or physical reproduction. Among the commonly used output devices are monitors, printers, and speakers.

1.4.2.1. Monitors

Monitors are the predominant output devices in computing. They are hardware components that present video and graphical information generated by the computer's video card. While akin to televisions, monitors usually exhibit much higher resolutions and are generally placed on desks rather than mounted on walls. Monitors can be referred to as screens, displays, video display terminals, video display units, or video screens. They commonly connect through ports like HDMI, DVI, VGA, USB, DisplayPort, or Thunderbolt, requiring

compatibility between the monitor and the computer's connection type.

1.4.2.2. Printers

Printers constitute another widely used output device, facilitating the transfer of computer data onto paper. Various printer technologies exist: **Daisy-wheel printers** employ a wheel with raised character shapes, pressed against an ink ribbon to create letter-quality prints. **Dot-matrix printers** form characters and illustrations by striking pins against an ink ribbon, generating dots that compose the imagery. **Inkjet printers** spray ink onto paper, delivering high-quality text and graphics. **Laser printers** use technology akin to photocopiers to produce high-quality text and graphics. **LCD & LED printers** utilize liquid crystals or light-emitting diodes instead of lasers to create images on the drum. **Line printers** swiftly print entire lines using chains of characters or pins, though with relatively lower print quality. **Thermal printers**, commonly found in calculators and fax machines, function by applying heated pins to heat-sensitive paper.

1.4.2.3. Speakers

Additionally, speakers serve as another form of output device, generating sound as an auditory output.

1.4.3. Central Processing Unit and Components

The Central Processing Unit, often referred to as the CPU, stands as the computer's pivotal component, holding paramount importance. It assumes the role of the computer's brain, overseeing the reading and execution of program instructions. The CPU is composed of several integral segments: the Arithmetic and Logical Unit (ALU), the Control Unit, and the Memory Unit. The CPU comprises three essential components: the Arithmetic Logical Unit (ALU), the Control Unit, and the Memory Unit.

The Arithmetic Logical Unit (ALU) is tasked with carrying out both mathematical computations and logical operations. The Control Unit takes charge of managing input and output devices, orchestrating their interactions with the CPU. The Memory Unit serves as a repository for both program instructions and data.
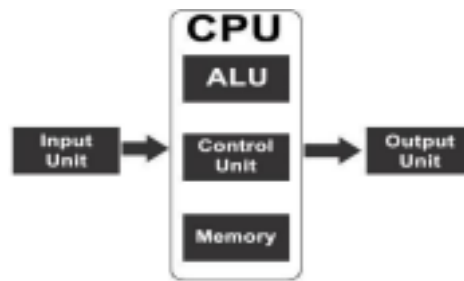
Figure   SEQ Figure * ARABIC 7:
Block diagram of computer

The CPU is composed of various integral units and processors. These components are as follows:

Processors: Programs requiring execution necessitate processors. These come primarily from two companies: Intel and AMD. These processors encompass a range of variants, including:

I) Intel Processors: Pentium Pro, Celeron, Pentium IV, Dual Core, Core 2 Duo, i3, i5, and i7 series processors, with 32 and 64-bit architectures.

II) AMD Processors: AMD Athlon, AMD FX™ processors, AMD Athlon™ processors, AMD A-Series APUs, AMD Athlon™ APUs, and AMD Sempron™ APUs.

Memory Unit: The memory unit is a pivotal element within the CPU, also referred to as the computer system's main memory. It temporarily stores data, program instructions, internal results, and final outputs before forwarding them to suitable output devices. This memory unit is composed of numerous memory locations where data is stored in binary format (0s and 1s). Computer memory is categorized into two types:

Primary Memory

Secondary Memory

Primary Memory:

RAM (Random Access Memory): Volatile and used for temporary storage. Data can be both read and written. Contents are lost when power is off or the system is shut down.

ROM (Read-Only Memory): Non-volatile and stores basic input/output instructions. Data can only be read, not written. Not affected by power loss.

Secondary Memory:

Secondary storage is employed when primary memory is insufficient for storing a large volume of data and instructions. It provides permanent storage and includes devices like computer hard disks, optical disks, magnetic storage, floppy disks, CDs, DVDs, etc.

Arithmetic Logic Unit (ALU): The ALU is a digital circuit essential for conducting arithmetic and logical operations. It constitutes a fundamental component of a computer's central processing unit (CPU). Modern CPUs incorporate intricate and potent ALUs. They interact with input registers, perform operations under the direction of the control unit, and store results in output registers. ALUs collaborate with memory and the control unit, undertaking numerous CPU operations.

Control Unit: The control unit, or CU, orchestrates operations within a computer's processor. It guides the logic unit, memory, and input/output devices in responding to program instructions. It transforms input data into control signals, dispatched to the central processor. This, in turn, governs connected hardware operations. The specific functions carried out by the control unit are contingent upon CPU type and architecture, as manufacturers exhibit variations in design. The diagram below exemplifies the processing of program instructions:

Diagram:

  Program Instructions → Control Unit Interpretation → Processor Operations and Communication with Hardware

1.4.4. Operating Systems

An operating system (OS) is a fundamental software component that manages and controls computer hardware and provides a platform for running applications. It serves as an intermediary between users and the hardware, facilitating the execution of various tasks and programs. The primary functions of an operating system include process management, memory management, file system management, device management, user interface, and security enforcement. Operating Systems like Windows, macOS, and Linux are examples of popular OSes used

for computers.

Windows:

Developed by Microsoft, Windows OS provides a user-friendly GUI and supports a wide range of applications. It offers various editions tailored for home users, businesses, and specialized environments.

MacOS:

Developed by Apple, macOS is used exclusively on Apple computers. It is known for its sleek design, integration with Apple's ecosystem, and strong focus on creative and multimedia applications.

Linux:

Linux is an open-source OS that comes in various distributions (distros). It is highly customizable and widely used, from servers to personal computers. Popular Linux distros include Ubuntu, Fedora, and Debian.

1.5. Lab Tasks

1. List various input devices? **[5 marks] Keyboard**

   Mouse

   Touch Pad

   Joy Stick

   Scanner

2. Explain the functions of input devices? **[5 marks] The function of input devices is to input data into the computer systems. Keyboard is used to feed data into the computer system. Mouse is used as a pointing device. it is used to direct and navigate through the files and monitor. Scanners are to convert photographs or documents into digital format by inputting them into the computer. Webcams are used for video conferences or gaming purposes etc.**

3. Detail the functions of keyboard function keys? **[5 marks]**

   F1 is used to display the Help screen over almost all programs. F2 key allows you to change the name of a specific file or folder. F3 is used to launch a search function for a currently active application. F4 is used to close the currently active window with Alt. F5 is used to refresh or reload pages or document windows.

4. Enumerate the components of a CPU? **[5 marks] The CPU has three important components which are the Arithmetic Logical Unit (ALU), the Control Unit, and the Memory Unit. The ALU is used to carry out both mathematical computation and logical operations. The memory unit is the computer system's main memory. The CU guides the logic unit, memory, and input/output devices in responding to program instructions.**

5. Explain the primary function of the ALU? **[5 marks] It carries out both Mathematical and logical operations within the computer system. ALU collaborates with Control Unit and Memory Unit undertaking numerous CPU's operations. It also performs operations under the direction of the control Unit and stores results in output registers. They also interact with input registers.**

6. Define the primary roles of RAM & ROM? **[5 marks] RAM is Random Access Memory and is used for temporary storage of data. It is Volatile. ROM is Read Only Memory which is non-volatile and is used to store both input instructions as well as output instructions.**

7. Describe how computers contribute to the progress of current technology?**[5 marks]**

Computers contribute to the progress of current technology by helping us in daily tasks like helping us access calendars, time or everyday news or entertainment. Computers are widely being used in education (schools, homeschooling university). It also contributes to the employment sector in IT departments providing more jobs and contributing to the country's overall economy. One of the most prominent advantages of computer technology is the ability to communicate with others in real time. Whether it's sending an email, making a phone call, or video chatting with someone across the globe, computers have made communication quick and easy.

8. Tell about your smartphone operating system

I use Huawei F9. Huawei has launched its own operating system known as HarmonyOS.

Assessment Rubric

Performance	Exceeds expectation (5-4)	Meets expectation (3-2)	Does not meet expectation (1)	Mark
1. Realization of Experiment	Selects relevant equipment to the experiment, develops setup diagrams of equipment connections or wiring.	Needs guidance to select relevant equipment to the experiment and to develop equipment connection or wiring diagrams.	Incapable of selecting relevant equipment to conduct the experiment, equipment connection or wiring diagrams.	
2. Teamwork	Actively engages and cooperates with other group Members in an effective manner.	Cooperates with other group members in a reasonable manner.	Distracts or discourages other group members from conducting	
3. Conducting Experiment	moving parts, and ensures smooth operation and process.	moving parts, and operates the equipment with minor error.	appropriate equipment, and equipment operation is substantially wrong.	
4. Laboratory Safety Rules	Respectfully and carefully observes safety rules and procedures	Observes safety rules and procedures with minor deviation.	Disregards safety rules and procedures.	
5. Data Collection	Plans data collection to achieve experimental objectives, and conducts an orderly and a complete data collection. Does proper calibration of equipment, carefully examines equipment	Plans data collection to achieve experimental objectives, and collects complete data with minor error. Calibrates equipment, examines equipment Unable to calibrate	Does not know how to plan data collection to achieve experimental goals; data collected is incomplete and contain errors.	
6. Data Analysis Accurately	conducts simple computations and statistical			

analysis using collected data; correlates experimental results to known theoretical values; accounts for measurement errors and parameters that affect experimental results.

7. Computer Use Uses computer to collect and analyze data effectively. Conducts simple computations and statistical analysis using collected data with minor error; reasonably correlates experimental results to known theoretical values; attempts to account for measurement errors and parameters that affect experimental results.

Uses computer to collect and analyze data with minor error. Unable to conduct simple statistical analysis on collected data; no attempt to correlate experimental results with known theoretical values; incapable of explaining measurement errors or parameters that affect the experimental results.

Does not know how to use computer to collect and analyze data.

Total