IUBAT- INTERNATIONAL UNIVERSITY OF BUSINESS AGRICULTURE AND TECHNOLOGY

Founded 1991 by Md. Alimullah Miyan

Yearlong Countrywide Silver Jubilee Celebration (2016-2017)

1991-2016

CSC 347
Computer Hardware and Maintenance

Lecture 5
Input Devices: Keyboard and Mouse

Abhijit Saha, Ph.D.

Professor

Dept. of Computer Science and Engineering (CSE)

College of Engineering and Technology (CEAT)

IUBAT, Uttara, Dhaka

Email: asaha@iubat.edu

English is the First Language of IUBAT Campus

- This is mandatory for everyone including students in all interactions and communications as of January 1, 2014.

- If any student face difficulty, s/he is advised to contact Mr Nazmul Haque Khan (Room No: 224/A, Cell: 01727277166, Email: nazmul@iubat.edu, Ext: 460,) for arranging special spoken English training.

- Violation of English as the First Language in the Campus will lead to administrative and disciplinary action.

- All are urged to help each other to develop the Facility of Communicating in English as the First Language in the Campus

Keyboard Basics

- A keyboard's primary function is to act as an input device

- Variety of tasks can be done by using a keyboard
  - Prepare a document, use keystroke shortcuts, access menus, play games and so on

- Keyboards can have different keys depending on
  - the manufacturer,
  - the operating system they're designed for, and
  - whether they are attached to a desktop computer or part of a laptop

- Most keyboards have between 80 and 110 keys

Keyboard Basics (Cont')
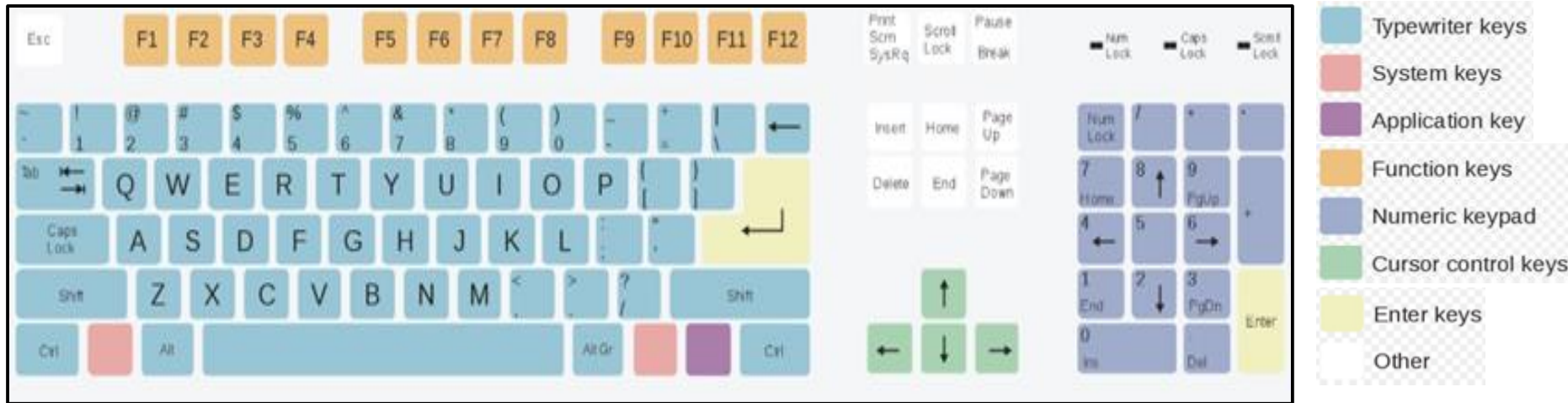
- **Typing keys:** include the letters of the alphabet, generally laid out in the same pattern used for typewriters known as QWERTY Layout. Others layout: ABCDE, QWERTZ, and AZERTY

- N**umeric keypad:** is a more recent addition to the computer keyboard, need for speedy data entry

- **Function keys:** Applications and operating systems can assign specific commands to the function keys

- **Control keys:** provide cursor and screen control. Windows/Apple/Linux keyboards have extra control keys

Inside the Keyboard

- A keyboard is a lot like a miniature computer
  - It has its own processor and circuitry that carries information to and from that processor
  - A large part of this circuitry makes up the **key matrix**
  - The key matrix is a grid of circuits underneath the keys
  - When you press a key, it presses a **switch**, completing the circuit and allowing a tiny amount of current to flow through
  - The mechanical action of the switch causes some vibration, called **bounce**, which the processor filters out.
  - If you press and hold a key, the processor recognizes it as the equivalent of pressing a key repeatedly

Inside the Keyboard (cont')

– When the processor finds a circuit that is closed, it compares the location of that circuit on the key matrix to the **character map** in its read-only memory (ROM)

– A character map is basically a comparison chart or lookup table. It tells the processor the position of each key in the matrix and what each keystroke or combination of keystrokes represents

– For example, the character map lets the processor know that pressing the **a** key by itself corresponds to a small letter "a," but the **Shift** and **a** keys pressed together correspond to a capital "A."

Inside of a keyboard (Closer look)

A key of the keyboard

Transparent plastic contact layers

A little rubber piece

Three separate layers of plastic

an underside of one key

Keyboard Switches

- Keyboards use a variety of switch technologies

- In **Capacitive** switches, current constantly flows through all parts of the key matrix

- Each key is spring-loaded and has a tiny plate attached to the bottom of it

- When a key is pressed, it moves this plate closer to the plate below it

- As the two plates move closer together, the amount of current flowing through the matrix changes

- The processor detects the change and interprets it as a key press for that location

- Capacitive switch keyboards are expensive, but they have a longer life than any other keyboard
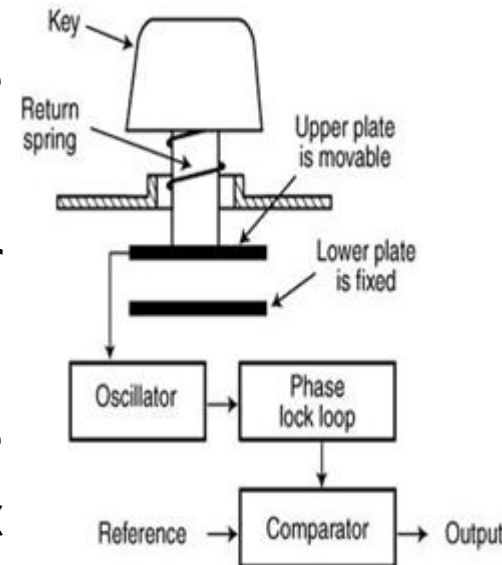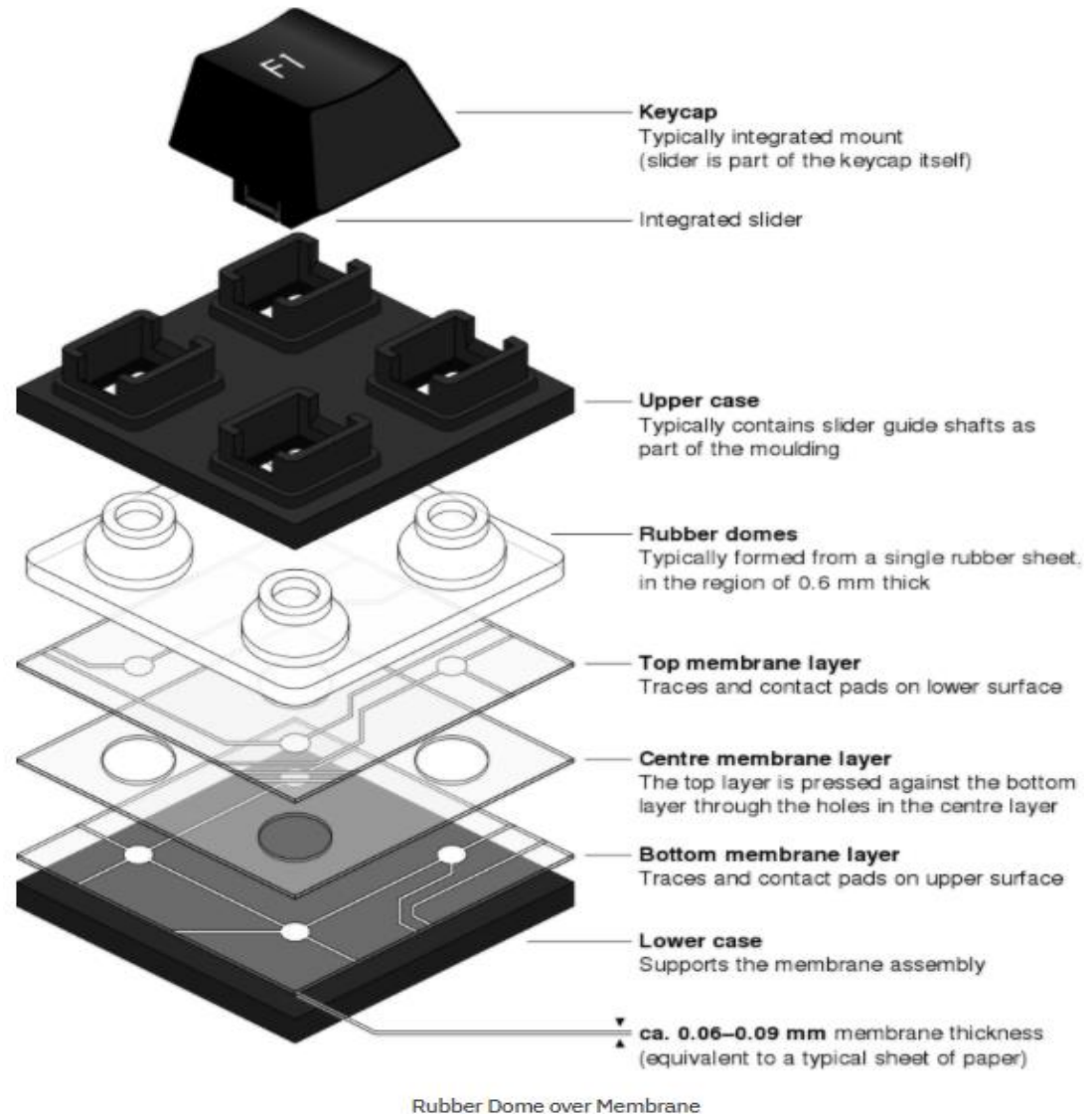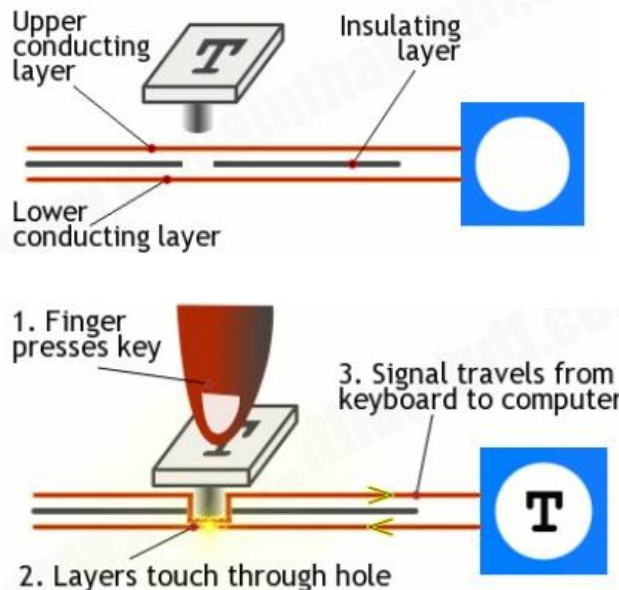
Keyboard Switches (Cont')

- Mechanical key switches include:

  - Rubber dome

  - Membrane

  - Metal contact

  - Foam element

Upper conducting layer

Insulating layer

Lower conducting layer

T

1. Finger presses key

3. Signal travels from keyboard to computer

T

2. Layers touch through hole

Keycap
Typically integrated mount
(slider is part of the keycap itself)

Integrated slider

Upper case
Typically contains slider guide shafts as part of the moulding

Rubber domes
Typically formed from a single rubber sheet, in the region of 0.6 mm thick

Top membrane layer
Traces and contact pads on lower surface

Centre membrane layer
The top layer is pressed against the bottom layer through the holes in the centre layer

Bottom membrane layer
Traces and contact pads on upper surface

Lower case
Supports the membrane assembly

ca. 0.06—0.09 mm membrane thickness (equivalent to a typical sheet of paper)

Rubber Dome over Membrane

Keyboard Interfaces

- **Connects to PC**
  - **KEYBOARD**
  - **KEYBOARD CONNECTOR**

- Inside keyboard a processor and circuit which carry information to or from that processor.

- Keyboard controller is single chip contains memory RAM, processor ROM(control operations of keyboard)

- **Key matrix**: row and columns made up wires and each key act like switch

- Key matrix is grid of circuits when key is pressed the row wire makes contact with column wire and completes the circuit . Key matrix passes current to keyboard controller

- Keyboard controller will detects the closed circuit and registers the key press and controller read the key pressed

Keyboard Interfaces (Cont')

- **KEYBOARD CONNECTOR**

- Interface between keyboard and pc

  – AT keyboard connector(DIN5)

  – PS2 keyboard connector or (MIN-DIN6)

  – USB connector

- AT keyboard connector(DIN5)

  – Uses 5 pins: KBDCLK(provide clock pulse), KBDAT(send/recv data), KBRST (reset keyboard internal buffer), GND(ground), VCC(+5v provides power to keyboard)

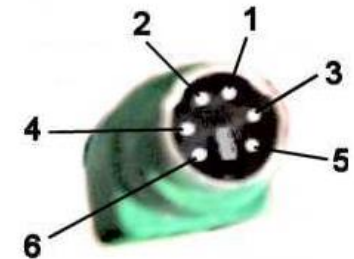- PS2 keyboard connector or (MIN-DIN6): With 6 pins

AT keyboard connector (DIN5)

Connector Pin #	Purpose
Pin 1	KBDCLK (clock)
Pin 2	KBDAT (data)
Pin 3	KBRST (reset, not used)
Pin 4	GND
Pin 5	VCC (+5V)
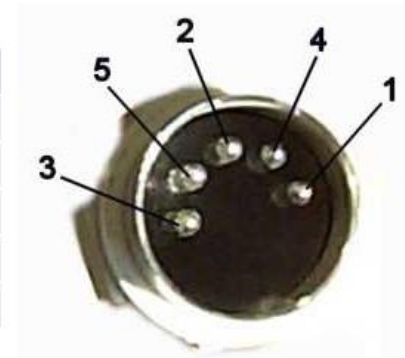
PS/2 keyboard connector (MINI-DIN6)

Connector Pin #	Purpose
Pin 1	KBDAT (data)
Pin 2	not used
Pin 3	GND
Pin 4	VCC (+5V)
Pin 5	KBDCLK (clock)
Pin 6	not used

- **USB keyboard connector :** uses 4 pins VDC(+5V), DATA- it carries –ve data signal, DATA+ it carries +ve data Signal,

Keyboard Problems and Solutions

Problem	Solution
The keyboard is unresponsive.	•Always check the connections. Make sure they are firm and properly in their designated ports. •Keyboards are commonly connected to computers through a PS/2 connector or a USB cable •Turn off your computer disconnect the keyboard and reconnect it. Turn the computer back on. •If your keyboard is still unresponsive, retry the following steps using a different port (for USB only). •If the above does not result in a responsive keyboard, you will need to contact your technology coordinator for a replacement keyboard. •NOTE: If your mouse and keyboard have the same connector, make sure you did not plug the keyboard into the mouse port and vice versa. They are usually color-coded.
Keyboard keys are getting stuck or are difficult to push.	•People do not realize but cleaning your keyboard is vital to keeping your keyboard running smoothly and properly. •To start cleaning a keyboard first unplug it or turn off your computer. You may use compressed air on a computer keyboard as all kinds of dirt and dust can fall in between keys. NOTE: Please read the compressed air container as it is dangerous to spray the canister while on its side as it will release extremely cold air that can damage the inner workings of your keyboard. •Then spray alcohol, or a type of cleaner onto a cloth (NOT ON THE KEYBOARD ITSELF. THIS WILL ALMOST CERTAINLY BE WORSE FOR YOUR KEYBOARD). Individually rub the keys with the cloth for best results.

| Problem	Solution
You want to create a keyboard shortcut for a command.	•Sticky keys are a type of shortcut developed by Microsoft that allows the user to press one key for a command that normally has you pressing 2 or more. For example: Instead of having to press three keys at once (such as when you must press the CTRL, ALT, and DELETE keys together to log on to Windows), you can press one key at a time by turning on Sticky Keys. •To turn on Sticky Keys you can press the Shift key 5 times in a row. The computer then shows a box with further instructions along with a loud "beep". •To turn it off you may press both shift keys at the same time.
Page Up/Page Down Keys Are Locked.	•Your "Scroll Lock" function may be engaged. Press the Scroll Lock Key once. Check the LED light on the keyboard to see it is off.
Letters are all in Capitals.	•Your "CAPS LOCK" key has been activated. Press the "CAPS LOCK" Key once to fix this problem. Check the LED light on the keyboard to see that it is off.
Multiples of the same letters appear when you hit the key once.	•If more than one of the same letter or number appears when you press a key once, this is called "key bounce." •One way to decrease these problems is to reduce the key repeat rate and/or repeat delay, in your computer's operating system. •This can be decreased in the "Keyboard" section of the Control Panel.

Mouse

- **Mechanical Mouse:** Mechanical Mouse uses ball for the movement of cursor on the computer screen. When the ball is rolled in any direction, a sensor of the mouse detects it and also moves the mouse pointer in the same direction.

- **Optical Mouse**: Optical Mouse uses Laser rays for the movement of cursor on the computer screen. It is an advanced pointing device. Movement is detected by sensing changes in the reflected light rather than the motion of a rolling sphere.

- **Cord-Less Mouse :** Cord-Less Mouse is battery driven and does not need any wire for the physical connection with the motherboard. It transmits data through infrared or radio signal.

Mouse (Cont')

Ball-Type Mice

1. Switch detects clicks of left mouse button.
2. Switch for middle button.
3. Switch for right button.
4. Old-style connection to PS/2 socket on computer.
5. Chip turns back-and-forth (analog) mouse movements into numeric (digital) signals
computer can understand.
6. X-axis wheel turns when you move mouse left and right.
7. Y-axis wheel turns when you move mouse up and down.
8. Heavy rubber wheel.
9. Spring presses rubber ball firmly against X- and Y-axis wheels so they register
movements properly.
10. Electrolytic capacitor
11. Resistors.
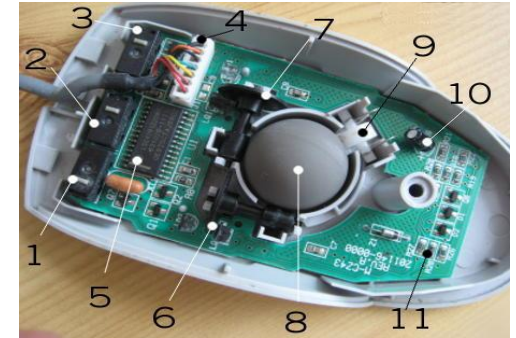
Mouse (Cont')

Optical Mice

1. An LED at the back generates red light and shines it horizontally, from the back of the mouse toward the front

2. A plastic light guide channels the light from the LED at an angle, down onto the desk.

3. A light-detector chip measures light reflected back up from the desk, converting the analog movements of your hand into digital signals that can be sent to your computer.

4. The scroll wheel at the front of the mouse is mounted on a switch mechanism that detects both how much it's rotated and whether you've pressed it (it functions like the central button of a conventional mouse). Rotations of the scroll wheel can be detected in a variety of different ways. Some mice use potentiometers (broadly, variable resistors), similar to the volume control on a radio but able to turn around multiple times. Others use various kinds of rotary switches or optical (rotary) encoders to convert analog wheel movements to digital signals.

5. A microswitch detects when you press the right mouse button. There's an identical switch on the other side to detect the left mouse button.

6. The USB cable connection carries digital information from the mouse to your computer.