BTME 3060
Computer Aided Design
Lecture 4

2nd Year

III Semester

Galgotias University

2020-21

Unit I: Introduction to CAD

- Syllabus
  - Product Development Cycle
  - Introduction to CAD, Hardware and software requirement of CAD;
  - Graphics input devices- cursor control devices, **Digitizers, Scanners, speech oriented devices and touch panels,**
  - Graphics display devices- Refresh cathode ray tubes, Raster-scan displays, Random-scan displays, CRT Monitors;
  - Input devices- keyboard, joy-stick, mouse, scanner;
  - DVST, Flat- panel display, Hard copy devices - Printers and Plotters, dot matrix, inkjet, laser printers,
  - Graphics Standards – Neutral File formats –IGES, STEP,
  - Graphics software, Graphics functions,
  - output primitives- Bresenham's Algorithm and DDA.

Objective of the lecture

- understanding of the digitizer

- understanding of the scanner

- understanding of the speech oriented devices

- The basics of the touch panels

Digitizers

- A digitizer is a hardware device that receives analog information, such as sound or light, and records it digitally.

- Usually, the information is stored in a file on a computing device. This process is called digitization.

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- For example, a digital camera is a digitizer.

- Light enters through the camera lens, and the hardware and software inside the camera converts that information to binary data, and stores it an image file.

- The user may then transfer the file to a computer, where he or she can edit the image, print it out, or share it online.

Examples of digitizers

- Audio digitizer
  - Most computers have a microphone jack, where you can connect an analog microphone.
  - The analog input (the audio signal) is processed in the computer by a discrete sound card, or by audio hardware on the motherboard itself.
  - This data can then be used by software running on the computer.
  - Some audio digitizers are small hand-held devices, and some are expensive peripherals that provide professional-level conversion quality.
  - The microphone in a smartphone is another audio digitizer.

Examples of digitizers

- Digital Tablet
  - A tablet is a computing device that is controlled with a finger or a digital pen called a stylus.
  - A tablet is usually larger than a smartphone, but smaller than a computer monitor.
  - Some tablets have a screen, which is touched directly, and some tablets are peripheral devices, without screens, which attach to a computer.
  - The user can write, draw, and paint by touching the tablet.
  - Software converts the analog touch input to lines or pressure-sensitive brush strokes in a document.
  - The software may also perform handwriting recognition to convert handwritten text to typewritten words.
  - When dealing with graphics these tablets are often referred to as a graphics tablet.

Examples of digitizers

- **Accelerometer and gyroscope**
  - Digitizers inside smartphones and tablet computers can detect how fast the device is moving (an accelerometer), and the angle it's held (a gyroscope).
  - The analog information of motion and angular rotation is converted to data your apps can use in real time.
  - For example, using a gyroscope, a smartphone could be held up to the sky to receive information about the position of stars and planets.
  - The accelerometer helps reduce motion blur when you're taking a photo, and can trigger safety mechanisms if the device is accidentally dropped.

Scanner

- A scanner is a photographic device, usually stationary, which progressively captures image data.

- For instance, a flatbed scanner is a peripheral device that takes an image of a document or photograph.

- It does so by moving a camera beneath a transparent glass surface where the document is placed.

- A motion picture film scanner digitizes motion picture film frames by advancing the film one frame at a time, photographing the frames, and storing them as a sequence of digital images.

- A barcode scanner captures binary data by progressively scanning a laser across a printed barcode.

speech oriented devices-Categeries:

- Small-vocabulary/many-users.
  - These systems are ideal for automated telephone answering.
  - The users can speak with a great deal of variation in accent and speech patterns, and the system will still understand them most of the time.

- Large-vocabulary/limited-users
  - These systems work with a good degree of accuracy (85 percent or higher with an expert user) and have vocabularies in the tens of thousands.

- Conversion of speech to on-screen text or a computer command

Contd..

- Flow chart
  - speech->vibration in the air ->Analog to digital convertor (ADC) ->translate Digital data

- The system filters the digitized sound to remove unwanted noise, and sometimes to separate it into different bands of frequency.

- It also normalizes the sound, or adjusts it to a constant volume level

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Touch panels

- A basic touch screen has three main components:
  - Touch sensor;
  - Controller;
  - Software driver.

- A touch screen sensor is a clear glass panel with a touch responsive surface. The touch sensor/panel is placed over a display screen so that the responsive area of the panel covers the viewable area of the video screen.

- The sensor generally has an electrical current or signal going through it and touching the screen can cause a voltage or signal change. This change is used to determine the location of the touch to the screen.

Touch Screen Technology

- a)   Resistive touch screen⍰

- b)   Capacitive touch screen⍰

- c)   Infrared touch screen⍰

- d)   Surface acoustic wave (SAW) touch screen⍰

- e)   Strain gauge touch screen⍰ Optical imaging touch screen⍰

- f)   Dispersive signal technology touch screen

RESISTIVE TOUCH SCREEN

- The resistive system consists of a normal glass panel that is covered with a conductive and a resistive metallic layer.

- These two layers are held apart by spacers, and a scratch-resistant layer is placed on top of the whole setup.

- An electrical current runs through the two layers while the monitor is operational.

- When a user touches the screen, the two layers make contact in that exact spot.

- The change in the electrical field is noted and the coordinates of the point of contact are calculated by the computer.

- Once the coordinates are known, a special driver translates the touch into something that the operating system can understand, much as a computer mouse driver translates a mouses movements into a click or a drag.

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- **Advantages:**
  - Can activate with virtually any object (finger, stylus, gloved hand, pen, etc.)
  - Has tactile feel
  - Lowest cost touch technology
  - Low power consumption
  - Resistant to surface contaminants and liquids (dust, oil, grease, moisture.

- **Disadvantages:**
  - Lower image clarity compared to other touch technologies
  - Outer polyester film is vulnerable to damage from scratching, poking and sharp object
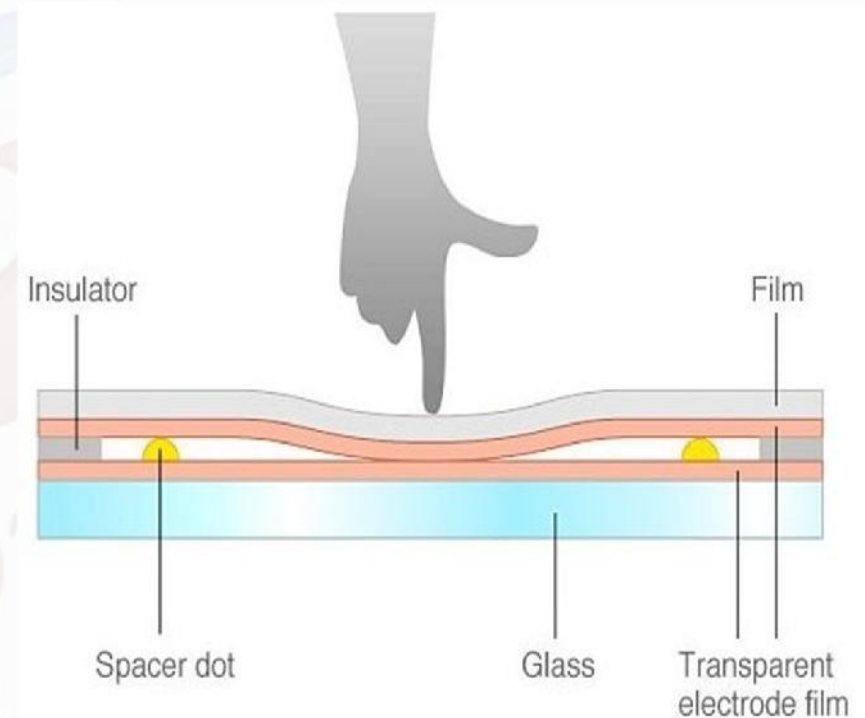
Capacitive Touch panel

- Surface Capacitive touch screen is the second most popular type of touch screens on the market.

- In a surface capacitive touch screen monitor, a transparent electrode layer is placed on top of a glass panel.

- This is then covered by a protective cover. When an exposed finger touches the monitor screen, it reacts to the static electrical capacity of the human body.

- Some of the electrical charge transfers from the screen to the user.

- This decrease in capacitance is detected by sensors located at the four corners of the screen, allowing the controller to determine the touch point.

- Surface capacitive touch screens can only be activated by the touch of human skin or a stylus holding an electrical charge.

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- Advantages:
  - Better image clarity than Resistive Touch
  - Durable screen
  - Excellent resistance to surface contaminants and liquids (dust, oil, grease, water droplets)
  - High scratch resistance

- Disadvantages:
  - Requires bare finger or capacitive stylus for activation
  - Sensitivity to EMI/RFI
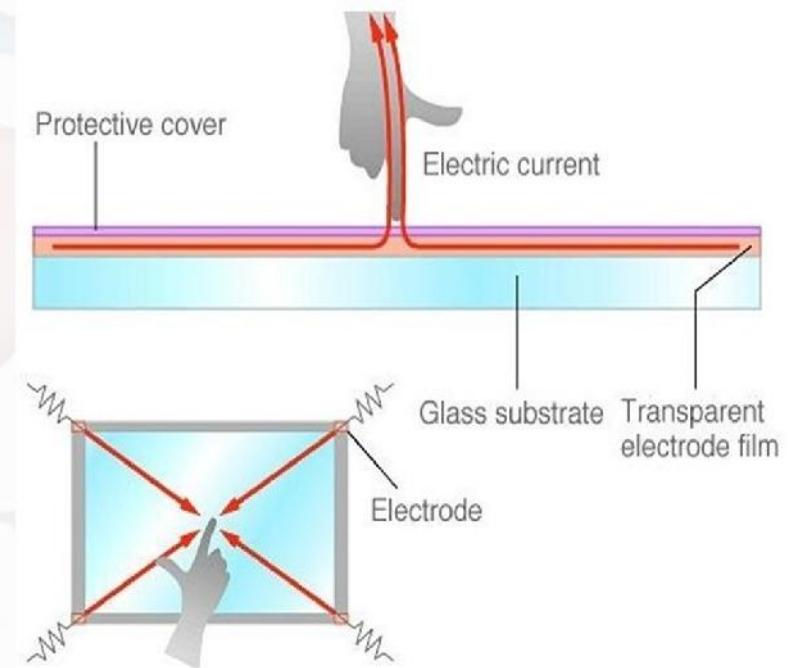
Summery

- There are many other input devices such as digitizer, scanner

- Speech oriented devices are one of the earliest input devices used

- Touch panels are latest technology that has been used for the input devices

Questions

- Explain the functioning of the digitizer

- What do you understand by the scanner

- Explain the speech oriented devices

- What do you understand by the touch panel

Text books

- QCAD - an Introduction to Computer-Aided Design by Andrew Mustun

- An Introduction to CAD for VLSI by Stephen M. Trimberger

Thank you.