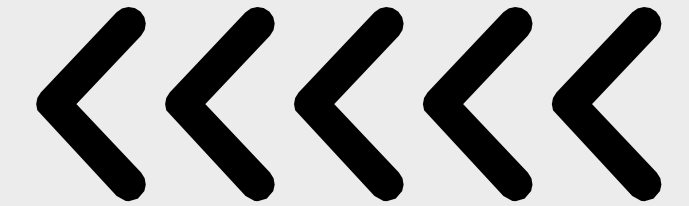
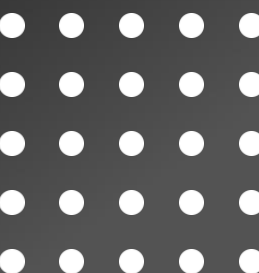
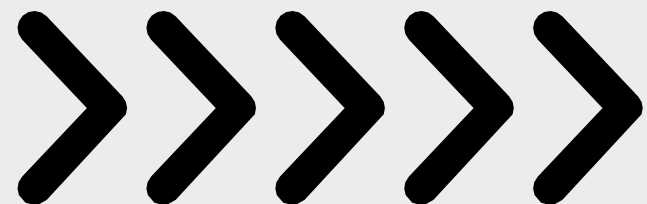


Computer Graphics & Multimedia Processing



INTRODUCTION TO COMPUTER GRAPHICS

Presented by M TSHUMA







Learning Outcomes

- By the end of this lecture, students should be able to:
- Define the term ***computer graphics***.
- Differentiate between **interactive and non-interactive graphics**.
- Distinguish between **vector and raster graphics**.
- Identify different types of **display hardware**.
- Recognize major application areas of **computer graphics**.





Introduction to Computer Graphics

- **What is Computer Graphics?**
 - It's producing pictures or images using computers.
 - Involves:
 - **Modeling:** Creating geometric representations of objects.
 - **Rendering:** Generating 2D images from 3D models.
 - **Animation:** Showing object motion over time.
 - Example: A 3D model of a car rendered for use in a driving game.
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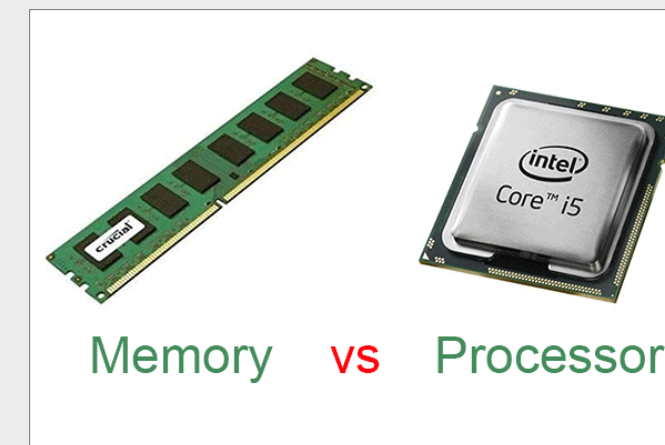
Graphics System Overview

- **Key Components:**

1. Input Devices



2. CPU and Memory



3. GPU (Graphics Processing Unit)



4. Output Devices





Types of Computer Graphics

1. Interactive Graphics

- User interacts with the display using devices like a keyboard, mouse, or controller.
- Example: Video games, drawing applications.

2. Non-Interactive Graphics

- Static content; no user interaction.
- Example: TV titles, movie credits.





Vector vs Raster Graphics

- Graphics can be broadly categorized into **vector** and **raster** (also called bitmap) formats. Each has unique characteristics, advantages, and best-use cases.

1. Raster Graphics

- Raster images are made up of a grid of tiny squares called **pixels**, each containing color information.
- Almost all current computer output devices, including CRTs, LCDs, LEDs, and plasma screens, use **raster graphics**
- **Key Features:**
 - I. **Pixel-based** – Resolution-dependent (quality decreases when scaled up).
 - II. **File formats:** JPEG, PNG, GIF, TIFF, BMP.
 - III. **Best for:** Photographs, detailed artwork, and images with complex color gradients.

Example: Adobe Photoshop





Vector vs Raster Graphics

2. Vector Graphics

- Vector graphics use **mathematical equations** (points, lines, curves) to create shapes, making them infinitely scalable.
- **Key Features:**
 - I. Resolution-independent** – No quality loss when resized.
 - II. File formats:** SVG, AI, EPS, PDF (for vectors).
 - III. Best for:** Logos, icons, typography, illustrations, and print designs
- **Example: Adobe Illustrator**





Hardware for Computer Graphics

1. Cathode Ray Tube (CRT)

- A **cathode-ray tube (CRT)** is a specialized vacuum tube in which images are produced when an electron beam strikes a phosphorescent surface.
- Beam-based display



2. Flat Panel Displays

- Flat-panel displays (FPDs) are thin, lightweight electronic displays that use technologies like LCD, LED, or OLED to show visual content.







Application – Engineering Design

- Used in architecture, civil, mechanical, and electronics.
 - Benefits:
 - Design visualization from various angles.
 - Reduced design cycles.
 - Integration with calculations.
 - Example: Aircraft wing airflow simulation.
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Application – Education & Training

- Used for visualization, simulation, and interaction in:
 - **Medicine** – Human anatomy models.
 - **Engineering** – Animated machinery demos.
 - **Fashion** – Digital pattern creation.
 - Example: Flight simulators for pilot training.
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Application – Medical Visualization

- Enhances diagnosis and surgical planning.
 - Examples:
 - CAT scans
 - MRIs
 - Simulated surgeries
 - Non-invasive imaging of internal organs.
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Application – Entertainment & Art

- **Animation:** Games, movies, simulations.
 - **Digital Art:** Artists use software to create paintings
 - Examples: Pixar animation, game characters
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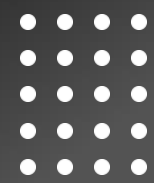
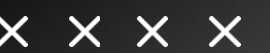
Application – Advertising & UX

- Interactive advertising boosts user experience.
 - Examples:
 - Renault Virtual Showroom.
 - Fendi VR Ads.
 - Uses 3D, AR, and animation to attract users.
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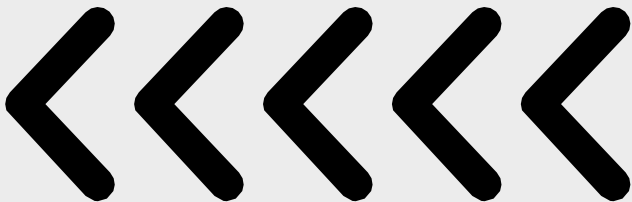


Summary

- Computer graphics involves modeling, rendering, and animation.
- Graphics can be interactive or non-interactive.
- Vector = scalable lines; Raster = pixel-based images.
- Hardware includes CRTs and flat-panel displays.
- Applications are widespread: engineering, education, medicine, entertainment, advertising.



Chinhoyi University of Technology



THANK YOU

