# MMGD0203
# MULTIMEDIA DESIGN

## Chapter 3
## Graphics and Animations

**Topics:**

- Definition of Graphics
- Why use Graphics?
- Graphics Categories
- Graphics Qualities
- File Formats
- Types of Graphics

- Graphic File Size
- Introduction to Animation
- Principles of Animation
- Types of Animation

## Definition of Graphics

- **Graphic** is a digital representation of non-text information such as chart, graph, illustration etc.

- Picture or image made with the assistance of computers.

- Many visual representations are generally much more effective at conveying information than text.

**Usages of Graphics**

- To add emphasis
- Direct attention
- Illustrate concepts
- Provide background content

**Advantages of Graphics in Multimedia**

- Convey information more quickly than when using text

- Make complex information simple

- Enhance online teaching and learning

- Enhance communication with some disabled groups, particularly those with learning difficulties or cognitive impairments

**Disadvantages of Graphics in Multimedia**

- Take longer to download

- Require the use of plug-ins that the user may not have or be able to install

- Create accessibility barriers for some users

**Graphics Categories**

- There are two categories of graphics :
  - **Vector**
  - **Bitmap**

**Vector Graphics**

- Images created with software that uses geometrical formulas to represent images.

- Composed of individual elements, eg, arc, line, polygon, with their own attributes that can be individually edited.

- Can be created using any drawing software, eg: Illustrator.
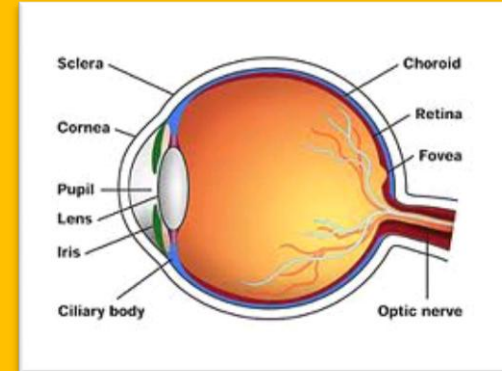
**Vector Graphics - Advantages**

- The ability to resize and rotate a graphic without distortions a major advantage of vector graphics.
- Another advantage is their smaller file size.

**Vector Graphics - Disadvantages**

- One of the drawbacks of vector graphics is that the more complex they are, the larger the file size and the longer they take to appear on the screen.

- Another disadvantage is that they cannot display photorealistic quality.

## Bitmap Graphics

- Bitmap graphics are also called **raster graphics**.

- A bitmap represents the image as an array of dots, called pixels.

- Bitmap graphics are resolution-dependent and generate large file sizes.

**Bitmap Graphics - Advantages**

- The bitmap can be more photorealistic.
- We can set the colour of every individual pixel in the image

**Bitmap Graphics - Disadvantages**

- Bitmaps are memory intensive, and the higher the resolution, the larger the file size.

- When an image is enlarged, the individual coloured squares become visible and the illusion of a smooth image is lost to the viewer.

**Bitmap Graphics**



Original image



After scaled up

**Bitmap Image Quality**

Three factors:

- Image Size
- Color Depth
- Resolution

**Image Size**

- Image size refers to the height and width of the image, measured in inches, centimeters, pixels, or any other unit of measure.

- Alternatively, if the image size is measured in dots or pixels, then you know exactly how much image data exists because a 300 pixel by 500 pixel image contains 15,000 pixels no matter how many pixels you designate per inch.
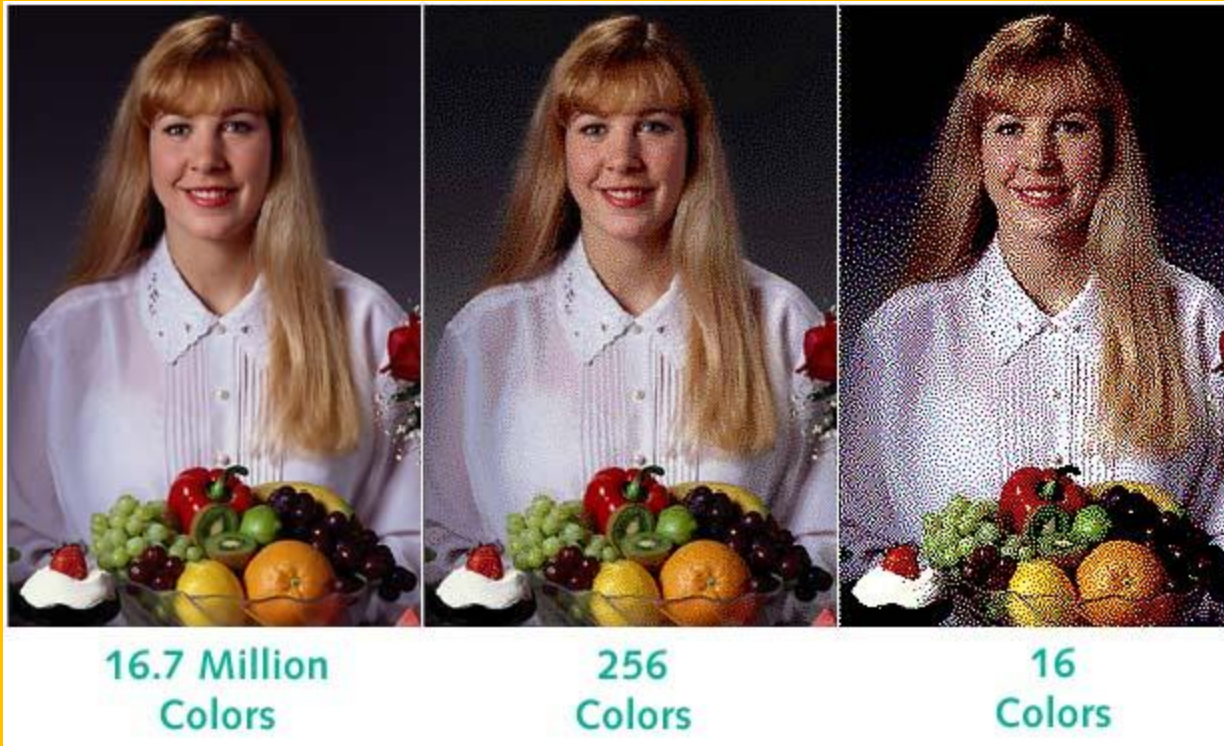
**Color Depth**

- Color Depth or Bit Depth refers to the number of bits used to describe the color of a single pixel.

- It determines the number of colors that can be displayed at one time.

## Color Depth

| Color Depth | No. of Colors |
|---|---|
| 1 bit | 2 |
| 2 bit | 4 |
| 4 bit | 16 |
| 8 bit | 256 |
| 16 bit | 65,536 |
| 24 bit | 16,777,216 |
| 32 bit | 16,777,216 + Transparent |

# Color Depth



16.7 Million Colors     256 Colors     16 Colors

**Resolution**

- The resolution of the image refers to the number of pixel in the image.

- It also refers to the sharpness and clarity of an image.

- You can think of a bitmapped image as a piece of graph paper, of any size, that has had each square filled in by a color.

- The squares are called dots or pixels.

## Resolution



HIGH RESOLUTION
300dpi IMAGE

LOW RESOLUTION
72dpi IMAGE

**Digital Image File Formats**

- Microsoft Bitmap (BMP)
- Joint Photographic Experts Group (JPEG)
- Tag Image File Format (TIFF)
- Raw Image Format (RAW)
- Portable Network Graphic (PNG)
- Graphic Interchange Format (GIF)
- Windows Metafile (WMF)

**Sources**

- Clip art
- Stock photographs
- Video images
- Still images
- Scanned images
- Photo CD's
- Screen-capture programs

**Calculate Digital Image File Size**

File size (byte) = $\dfrac{\text{(height x width x color depth)}}{8}$

**Calculate Bitmap Image File Size**

Example 1:

- A full screen graphic resolution (640 x 480 pixels) at an 8-bit color will yield the following file size:

$$(640 \times 480 \times 8) / 8 = 307200 \text{ bytes (b)}$$

**Calculate Bitmap Image File Size**

Example 2:

- A full screen graphic resolution (320 x 240 pixels) with 16-bit colors will yield the following file size:

    (320 x 240 x 16) / 8 = 153600 bytes (b)

**File Compression**

Two types of file compression:

- Lossless
- Lossy

**File Compression**

Lossless Compression

- Lossless compression algorithms reduce file size without losing image quality, though they are not compressed as small a file as a lossy compression file.

**File Compression**

Lossy Compression

- A lossy compression method is one where compressing data and then decompressing it retrieves data that is different from the original, but is close enough to be useful in some way.

- Lossy compression is most commonly used to compress multimedia data (audio, video, still images)

**Working with Graphics**

- Select the right kind of graphics for the job
- Select the right graphics tool for the job
- Select the minimum color depth that is appropriate to your application
- Set up your delivery system correctly.
- Select bitmap file formats for quality and portability
- Use vector graphics formats that are understood by your authoring system

**Animations**

- A simulation of movement created by displaying a series of pictures, or frames.

- Entertainment multimedia titles in general, and children's titles specifically, rely heavily on animation.

**Animations**

- Animations are useful in multimedia in the areas of entertainment, education, and training.

- They can be used to create simplified illustrations of a simulation or dramatization.

- They can be much easier to understand because they are less complex than video.

**Animations - Usages**

- Allows for real world processes to be modelled.
- Enriching graphical representations.
- Attracting attention.
- Visual interest.

**Types of Computer Animation**

- 2D animation
- 3D animation

**2D Animations**

- Two dimensional (2D) animation software adds movement and action to static images.

- These programs use either vector drawn or bitmapped images as objects.

- The motion of animation is perceived by the viewer from a series of frames.

- For the motion to appear smooth a minimum of 15 frames persecond (fps) is generally required.
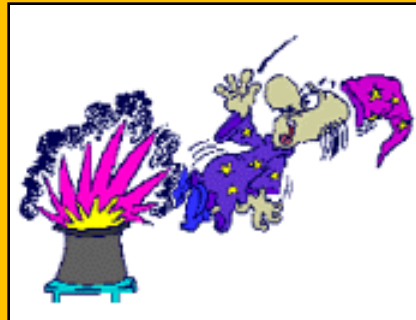
**2D Animations**

- 2D animation methods:
  - Cel Animation
  - Path Animation

**Cel Animation**

- Cel animation is based on a series of frames or cels in which the object is redrawn in each consecutive cel to depict motion.

- Cel comes from the word celluloid (a transparent sheet material) which was first used to draw the images and place them on a stationary background.
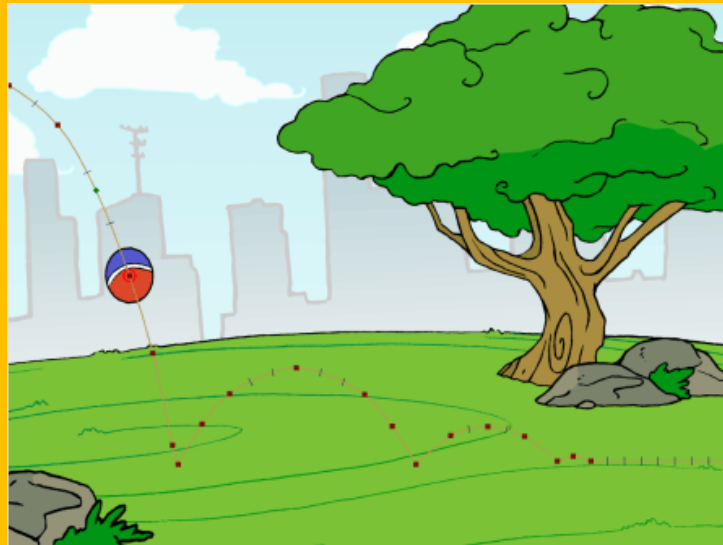
# Cel Animation

**Path Animation**

- Path Based animation is the simplest form of animation and the easiest to learn.

- It moves an object along a predetermined path on the screen.

- The path could be a straight line or it could include any number of curves.

- Often the object does not change, although it might be resized or reshaped.

# Path Animation

**3D Animations**

- Creating 3D animation is considerably more complex than 2D animation.
- It involves two steps :
  - modeling
  - rendering

**3D Modeling**

- **3D modeling** is the process of developing a mathematical, wireframe representation of any three-dimensional object (either inanimate or living) via specialized software.
- The product is called a **3D model**.
- Models may be created automatically or manually.

## 3D Modeling
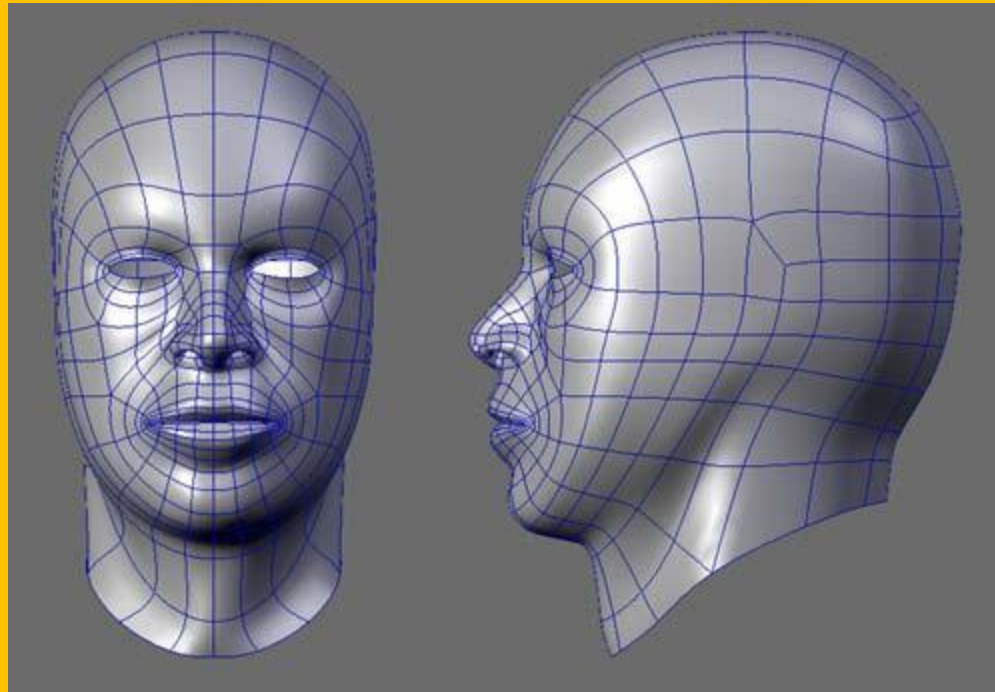
**3D Rendering**

- **3D rendering** is the 3D computer graphics process of automatically converting 3D wire frame models into 2D images with 3D photorealistic effects on a computer.

- Rendering may take from seconds to days for a single image/frame.

- In general, different methods are better suited for either photo-realistic rendering, or real-time rendering.

# 3D Rendering
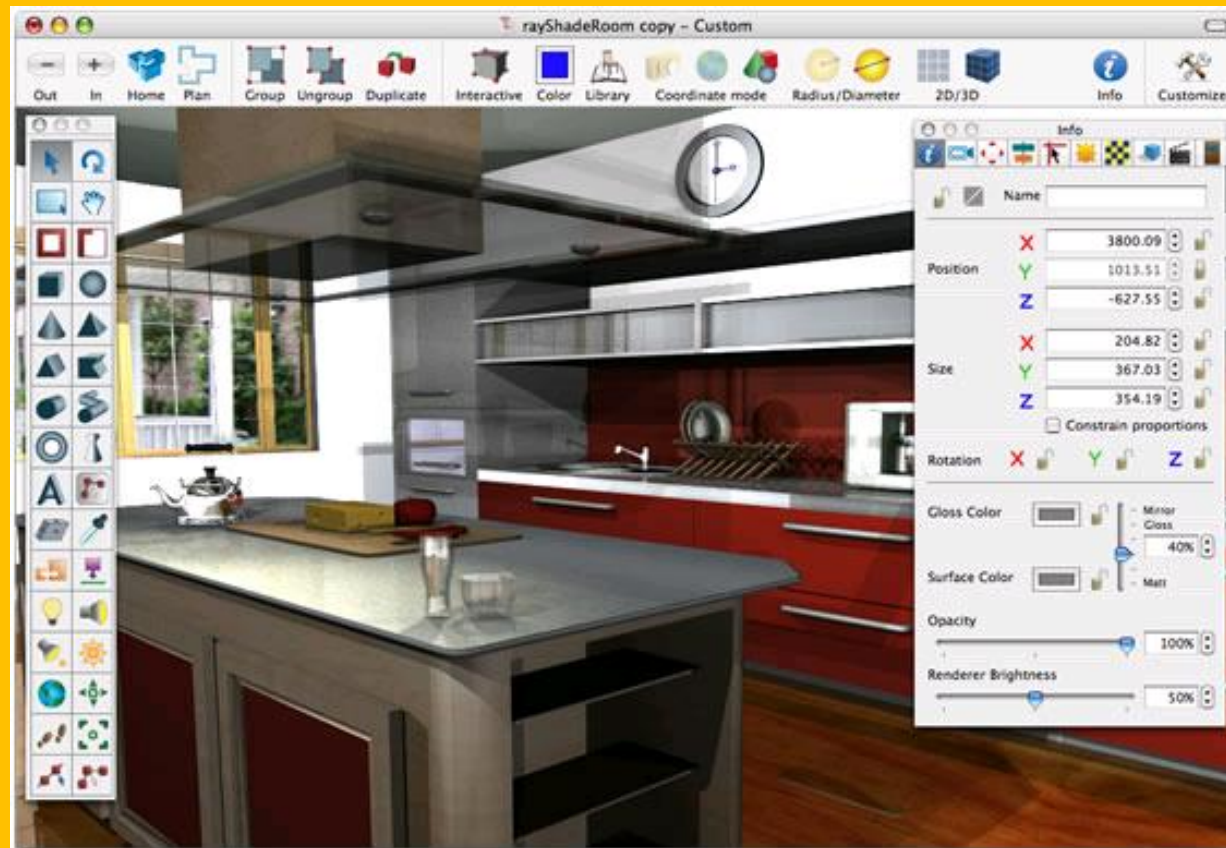
**Animation File Formats**

- Graphic Interchange Format (GIF)
- Flash FLA Project File Format (FLA)
- Flash (SWF)
- Multi-image Network Graphics (MNG)

**Difference between Animation and Video**

- Note the difference between animation and video.

- Video takes continuous motion and breaks it up into discrete frames.

- Animation starts with independent pictures and puts them together to form the illusion of continuous motion.

## Tutorial

1. What are the two categories of computer graphic? Briefly explain each one of them,
2. Explain advantages and disadvantages of vector graphic.
3. What are the three factors that affect the quality of graphics?
4. Give four examples of image file format.
5. Describe any four guidelines when working with graphic.
6. Explain the difference between graphic and animation.
7. Explain the difference between CEL animation and PATH animation.
8. What are the two processes used to create 3D animation?
9. Calculate the image file size for the followings:
   a. Image size = 320 x 250, color depth = 16 bit
   b. Image size = 600 x 400, color depth = 8 bit
   c. Image size = 200 x 550, color depth = 24 bit