Computer Graphics

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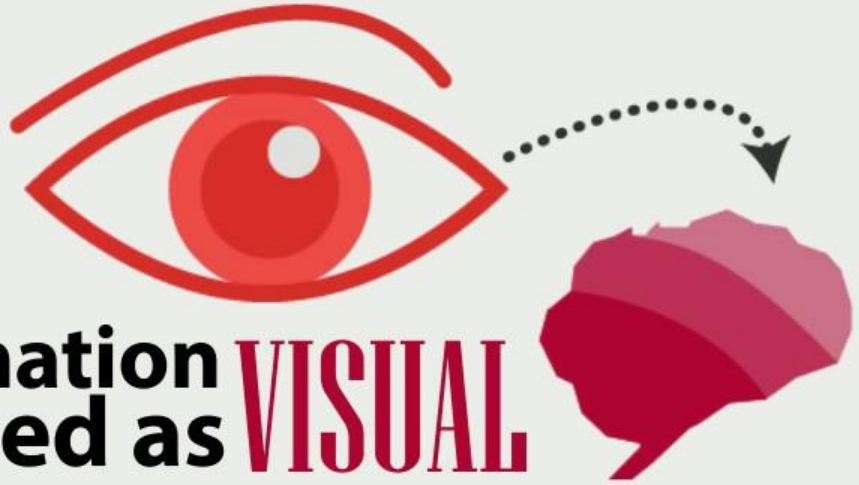
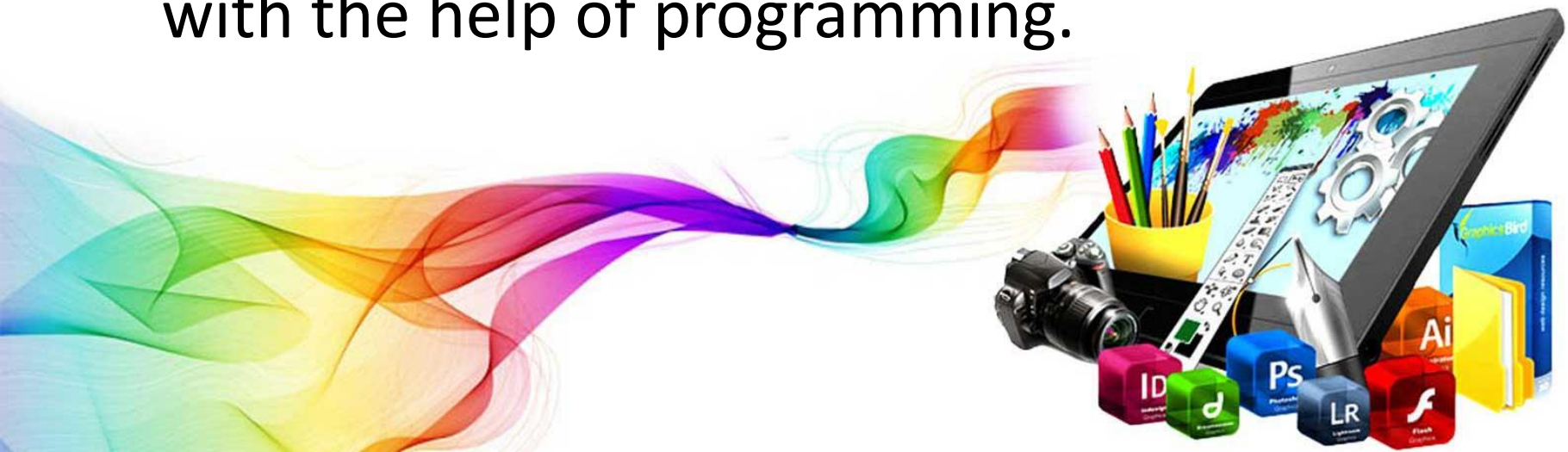


of the information is transmitted as VISUAL

What is Computer Graphics?

- Computer graphics is the display, storage & manipulation of images and data for the visual representation of a system
- Computer graphics is an art of drawing pictures, lines, charts, etc. using computers with the help of programming.

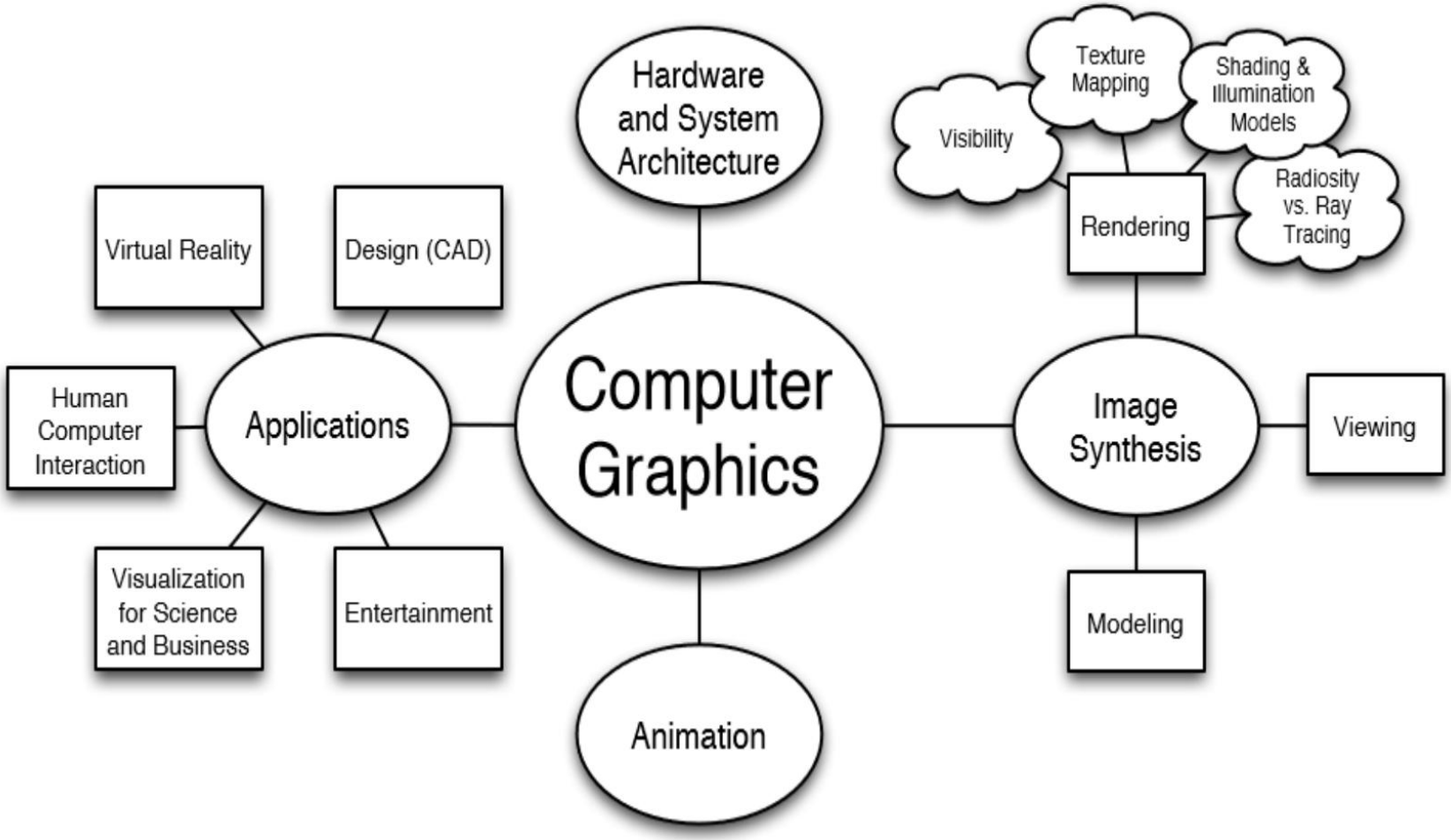


Digital Image Vs. Graphics

- CG (Computer Graphics) refers to processing of creating a new image from Geometry , Lighting parameters , Materials and Textures .Using a Computer or any other digital media.

- While DIP(Digital Image Processing) is the process of manipulating an image acquired through some device . The image too often will be acquired from photographs, scanners , medical equipment

CG in a Nutshell



Applications of CG

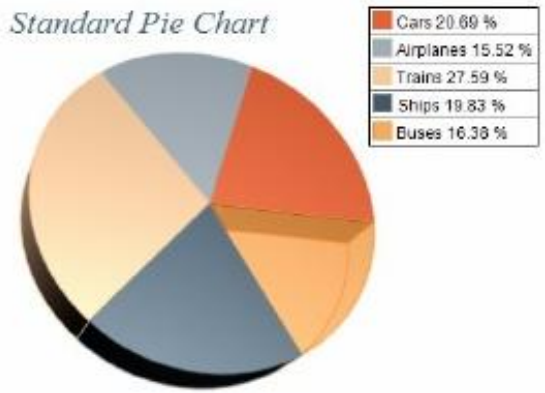
- Computer Aided Design (CAD)
- Presentation Graphics
- Entertainment (animation, games)
- Education & Training
- Computer Art
- Scientific Visualization
- Image Processing
- Graphical User Interfaces

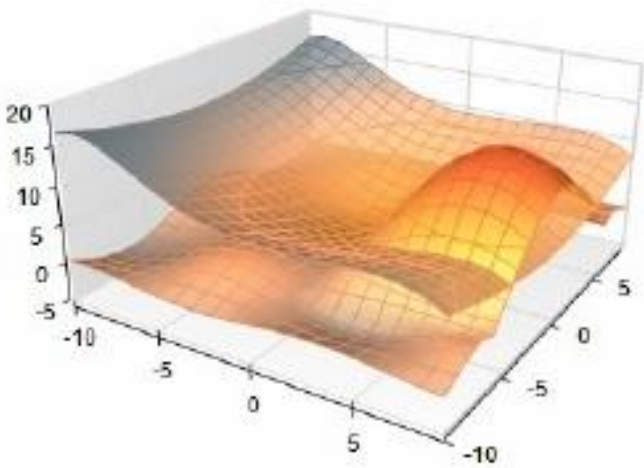
Computer Aided Design (CAD)

- Used in design of buildings, automobiles, aircraft, watercraft, spacecraft, computers, textiles & many other products
- CAD package provides standard shapes
- Animations are also used in CAD applications
  - AutoCAD
  - Google Sketch up

Presentation Graphics

- Summarize financial, statistical, mathematical, scientific, economic data for research reports, managerial reports
- Presentation Slides
  - Bar charts, Line graphs, Pie charts etc.





Entertainment

- Movie Industry
  - Used in motion pictures, music, videos, and
  - television shows.
  - Used in making of cartoon animation films

Movie

Entertainment

- Games
  - Interactivity
  - Realistic vs Fictional Graphics
  - Huge revenue industry

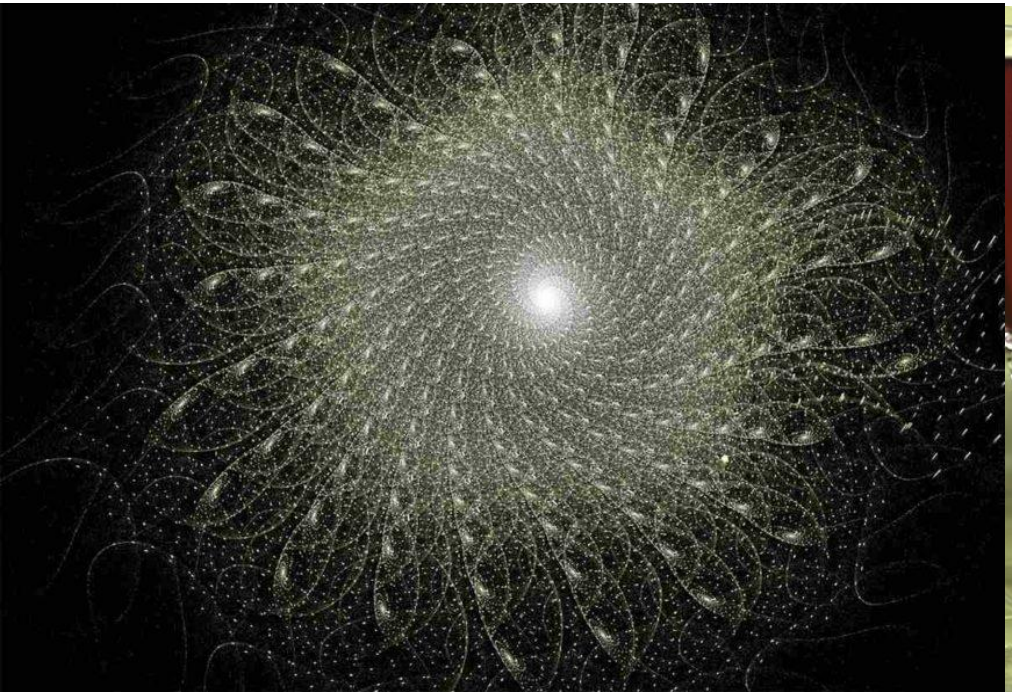
Education and Training

- Computer generated models of physical, financial and economic systems are used as educational aids.
- Models of physical systems, physiological systems, population trends, or equipment such as color-coded diagram help trainees understand the operation of the system
- Specialized systems used for training applications
  - Simulators for practice sessions or training of ship captains
  - Aircraft pilots
  - Heavy equipment operators
  - Air traffic-control personnel

Computer Art

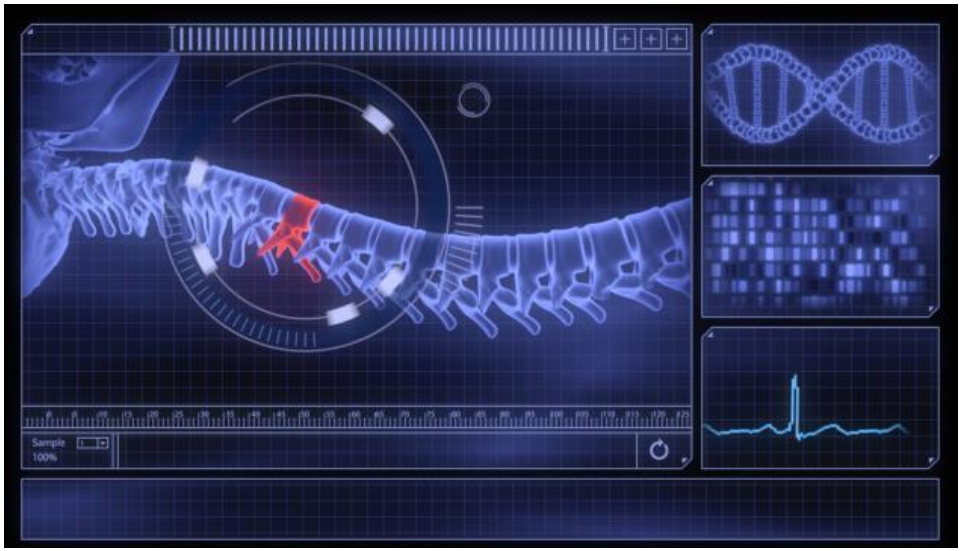
- Computer art typically refers to any form of graphic art or digital imagery which is produced with the aid of a computer
- Used in Fine Art & Commercial Art
- Includes artist's paintbrush programs, paint packages, CAD packages and animation packages
- These packages provides facilities for designing object shapes & specifying object motions.
- Cartoon drawing, paintings, product advertisements, logo design and branding

Computer Art



Visualization

- Visualization is the process of representing data graphically and interacting with these representations in order to gain insight into the data.
- Scientific Visualization
  - Producing graphical representations for scientific, engineering, and medical data sets
  - Scientists, engineers, medical personnel, business analysis, and others often need to analyze large amounts of information or to study the behavior of certain processes.



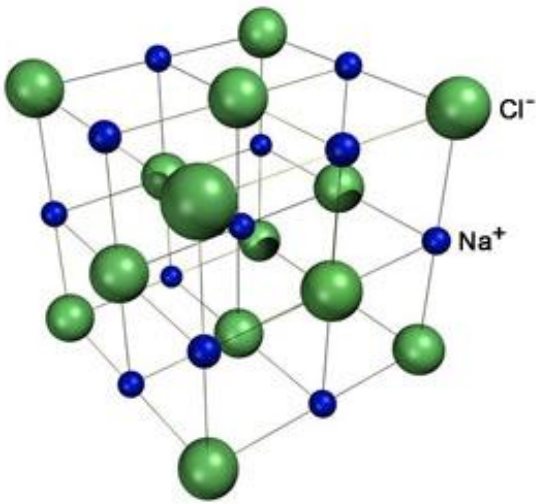
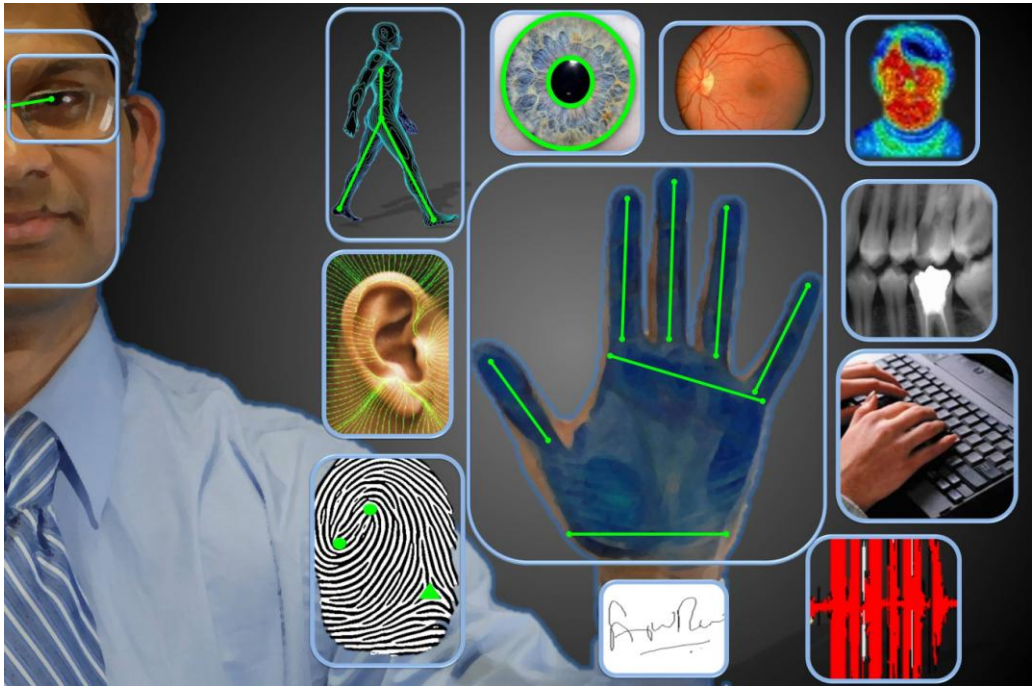


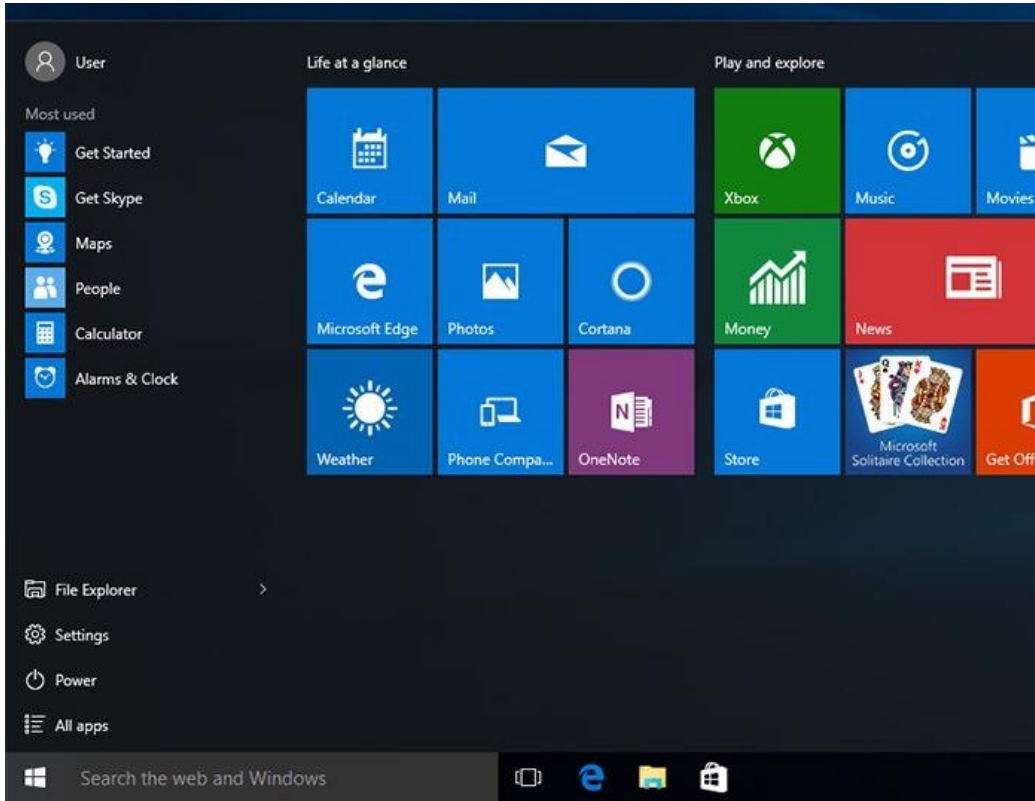
Image Processing

- Image Processing applies techniques to modify or interpret existing pictures.
- There are different examples of image processing in our daily life.
  It is used in
  - Image enhancement.
  - Law Enforcement
  - Medical
  - Moving object tracking...etc.



Graphical User Interface

- Computer graphics is used to design: Menus, icons, cursors, dialog boxes, scrollbars, valuators, grids, 3d interface.
- Lay user can easily use the computer with the help of GUI.
- User don’t have to remember commands.
- More interactive interface.



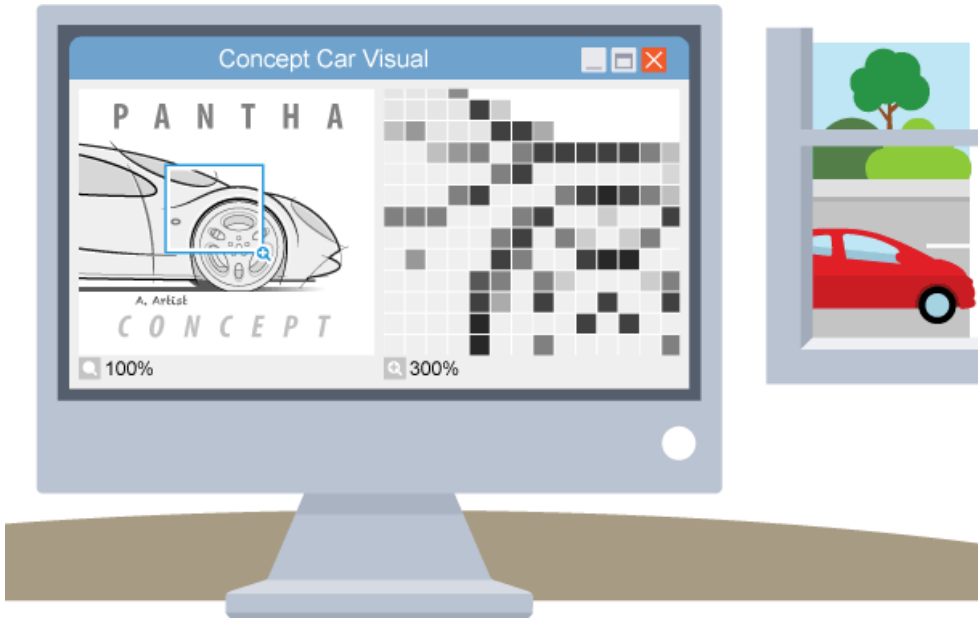
Components of CG

- Modeling: Defining objects in terms of primitives, coordinates and characteristics.
- Storing: storing scenes and images in memory and on disk.
- Manipulating: changing the shape, position and characteristics of objects.
- Rendering: applying physically based procedures to generate (photorealistic) images from scenes (using lighting and shading).
- Viewing: displaying images from various viewpoints on various device.


PAINTING
WITH
PIXELS
DRAWING
WITH
VECTORS

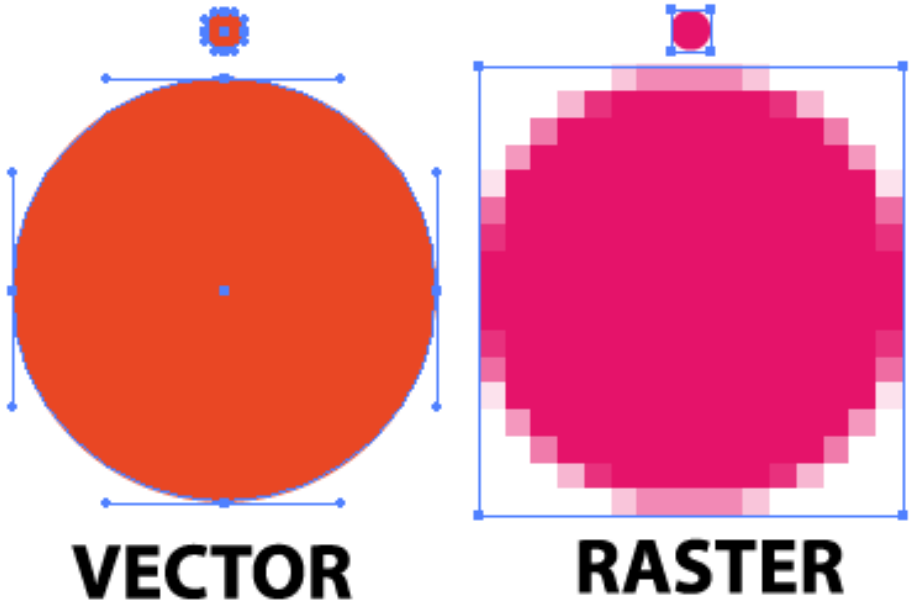
Bitmap vs Vector Graphics

- Bitmap :
  - Often they are called raster graphics
  - When you create a bitmapped graphic you are basically creating a bunch of colored dots Pixels
  - Each pixel gets assigned a specific color
  - The more pixels you have, the more detailed the image can be



Bitmap vs Vector Graphics

- Vector Graphics : Vector graphics are created and manipulated using *drawing programs* (as opposed to paint programs for bitmapped graphics)
- Instead of using pixels to describe the image, it describes the image using shapes
  - Circles
  - Lines
  - Curves
- Also has to store the color of these shapes



File Formats

- Once we've chosen which graphics format we're going to use now we have to select which file format
- Each way of storing an image is called a *file format*
- Each file format converts the image to a corresponding string of bits differently in order to store them on disk or transmit them over the Internet

Common File Formats

Bitmap Formats

- GIF: graphics interchange format
- JPEG: joint photographic experts group
- PNG: portable network graphic
- BMP: Windows bitmap
- TIFF: tagged image file format

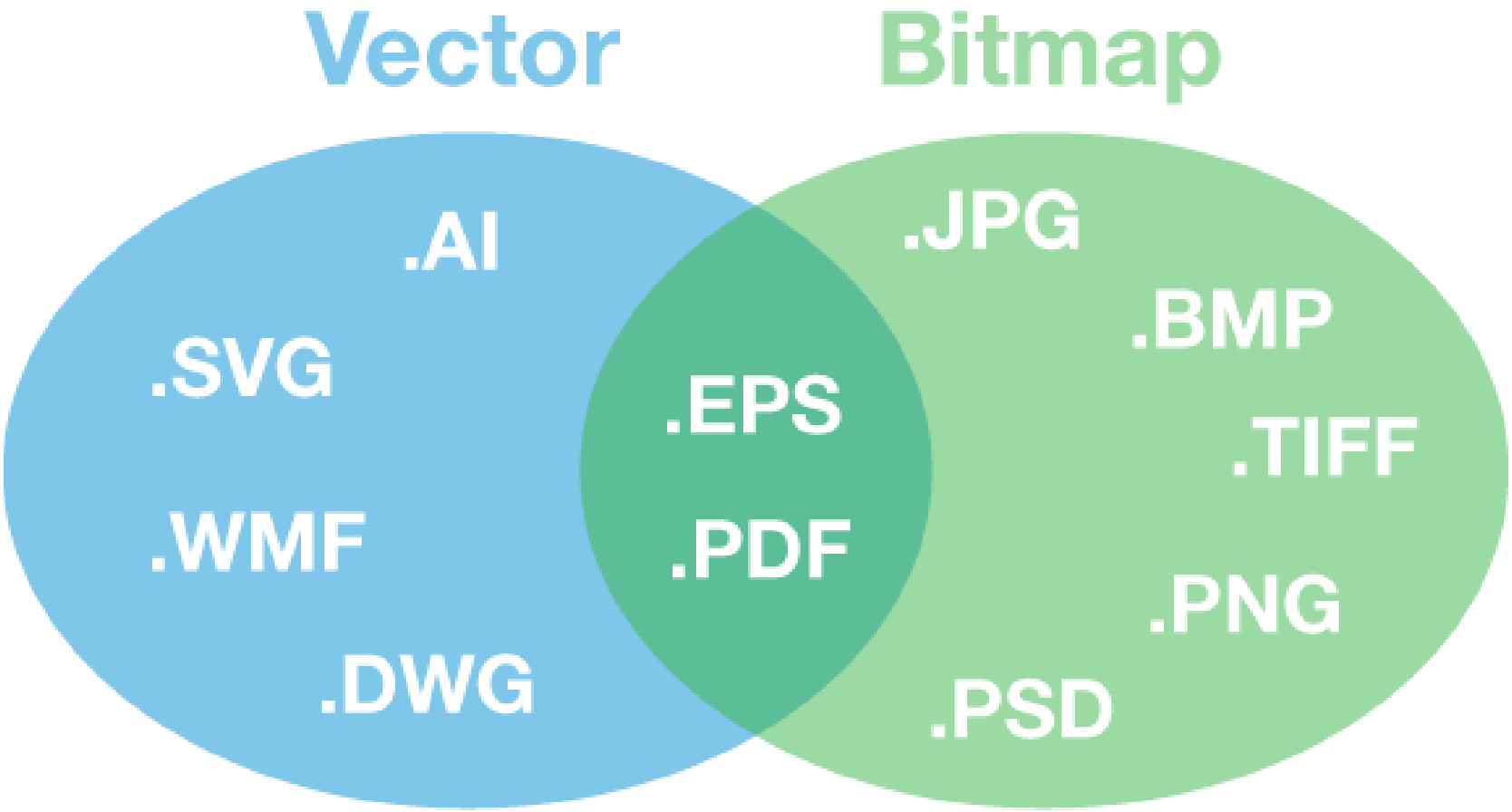
Vector Formats

- SVG : scalable vector graphics
- EPS: encapsulated postscript
- CMX: Corel meta exchange
- PICT: Macintosh Picture
- WMF: Windows metafile

How to Pick a File Format?

- **Type**: does the file format store the type of image you want to use (bitmap or vector)?
- **Portability**: can other people use images in this format?
- **Color Depth**: does the format support the number of colors you need?
- **Compression**: can make the file smaller, but it takes time to compress and decompress a file
- **Transparency**: do parts of your image need to be transparent?

How to Pick a File Format?



Animation

Animation

- An animation is just a sequence of individual images, Basically, the subject of computer animation focuses on how things change over time. Usually, this refers to motion, but can also refer to other properties changing over time.

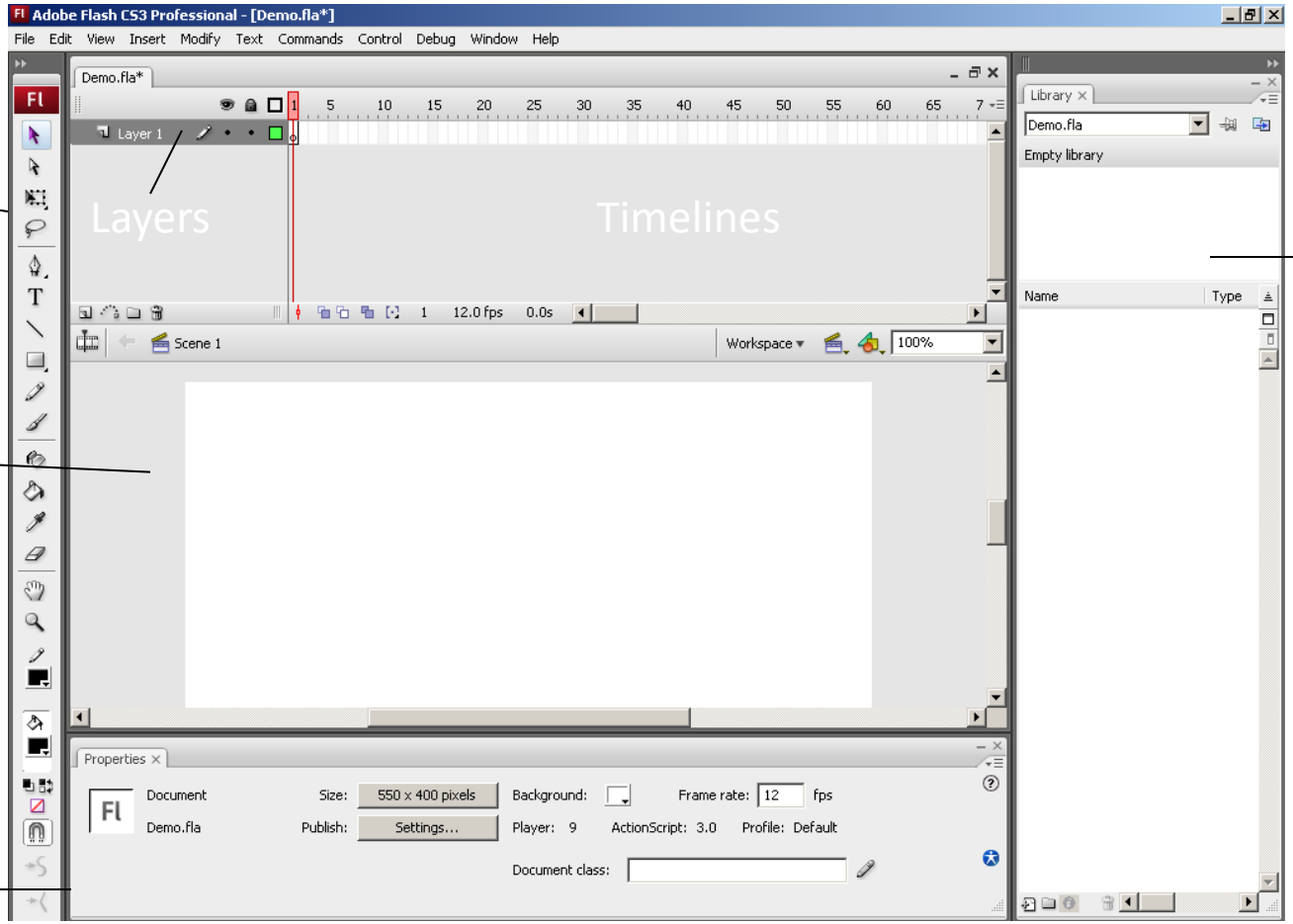
What Can a Flash Animation Include?

- Vector-based graphics
  - Has the ability to "tween"
    - Automatically generates fill-in frames between a beginning and an ending image
- Bitmap-based graphics
  - Can be moved & rotated
- Embedded fonts
  - Can be moved, resized, skewed, rotated, recolored
- Sound
  - Can synchronize sounds with animation frames

Flash Environments

- Flash authoring environment
  - Design environment (graphics tools)
  - Scripting environment (create program code)
- Flash player
  - Users must have this installed on their workstations
  - If not present, automatically prompted to install when they start your animation

Flash Development Environment



Toolbox

"Stage"

Properties panel

Other panels

Important Components

- Stage: where the action takes place
  - Be sure to set the stage dimensions before you do any development
  - This determines the animation's size on your Web page
- Layers
  - Allow you to separate and stack objects
  - All layers cover entire the stage surface
    - Like transparent pieces of paper stacked on each other
  - Animation objects move within a layer
- Timelines
  - Every layer has a separate timeline
  - Timeline is broken into **frames** that correspond to different times in the animation
  - When you select a frame, the stage shows what will appear in that layer at that time
  - The **playhead** shows the current frame that is playing

Types of Animations

- Shape: uses shapes you create in Flash
  - Can change shape position and/or properties
  - Creates straight-line animation between a start position and an end position
  - Can only be used with vector images
- Motion: uses symbols you create or import into Flash (bitmaps)
  - Can create straight-line animation between a start position and an end position
  - Can change the position or rotation of a symbol
  - Can "kind of" make a symbol morph into a different symbol

Symbols

- Symbol: reusable object
  - Save an animation image as a symbols
  - This saves file space because the symbol is only saved once
- Types of symbols:
  - Graphics (can't be shape tweened)
  - Movie clips (self-contained animation within a movie)
  - Buttons (Up, Down, Over, OverWhileDown states)

Flash Files

- Authoring file
  - .fla extension
  - This file creates the design version of your animation
- Published file
  - .swf extension
  - Can't be edited
  - Can play on most operating systems
  - Fairly small files

Activity

- Make a simple motion tween of a ball moving left to right.
- Make 2 buttons
  - Play
  - Stop

  Write appropriate script to make movie play or stop when corresponding button is clicked.

Thank you