Graphics, Digital Media and Multimedia

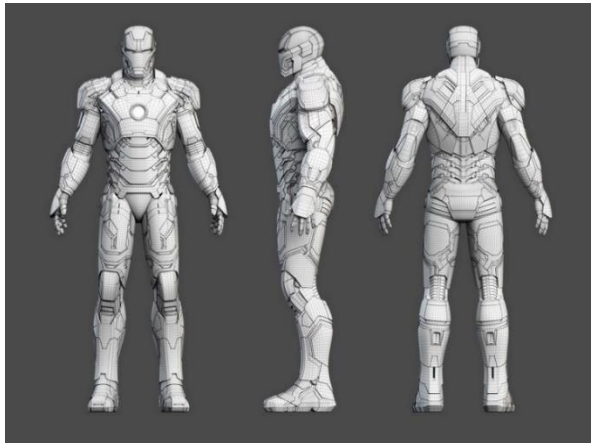
Chapter 6 Multimedia Part 1

Topics

- Computer Graphics
- Image Processing
- Computer vision
- 3D modeling
- Computer Aided Design\Manufacturing
- Presentation Graphics

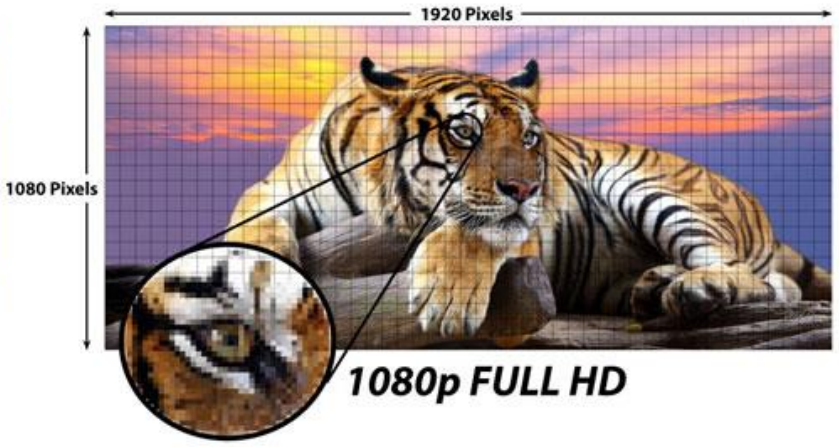
Computer Graphics

- Graphics created using computers and the representation of image data by a computer specifically with help from specialized :
  - Hardware: Graphics Cards, Cameras, Motion sensors, etc...
  - Software: Adobe Photoshop, Unity, Blender, etc…



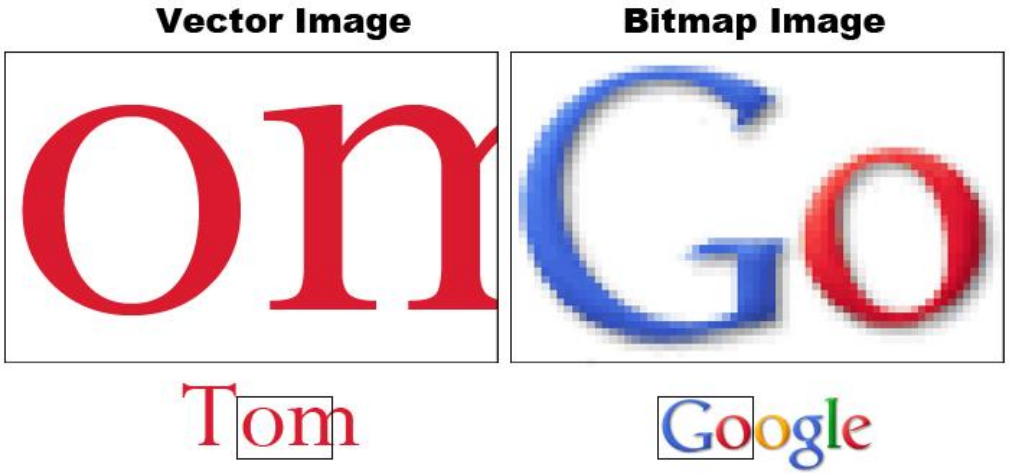
Graphics Terminology

- Pixels:
  - Smallest element in an image.
  - Square shape.
- Image Dimensions:
  - Is measured by the Width x Height of a digital image
  - E.g. 1920 x 1080 (Full High Definition)



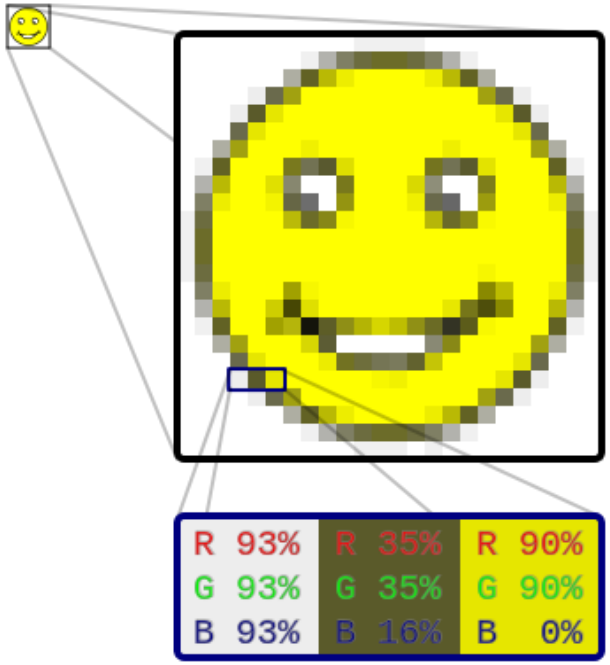
Graphic Types

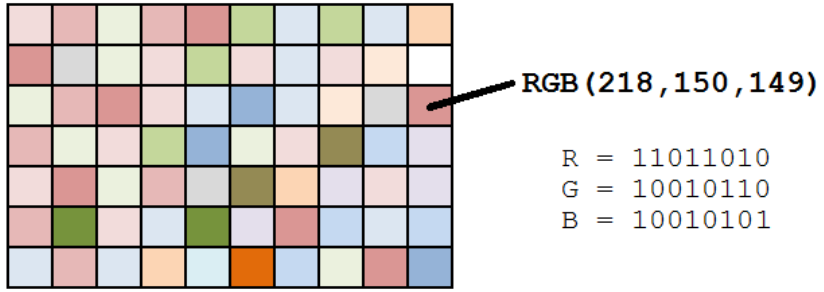
- Bitmap Graphics (Raster graphics)
  - Painting pixels on the screen with a pointing device like mouse, stylus(for artist),etc.
  - Capturing an image with a digital camera.
- Vector Graphics (Object Oriented Graphics)
  - Pointer movements translated into lines and patterns on screen using mathematical formulas



Bitmap/Raster Graphics

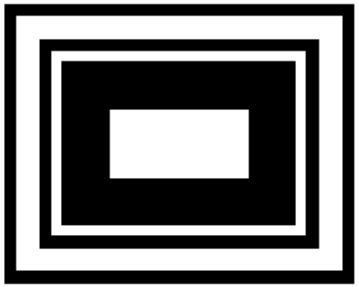
- Is a rectangular grid of pixels, with each pixel's color being specified by a number of bits
  - File Formats: JPG, BMP, PNG, GIF
- Painting Software's:
  - MS Paint, Adobe Photoshop, GIMP, etc…
- Factors determining image quality:
  - Color Depth
  - Resolution

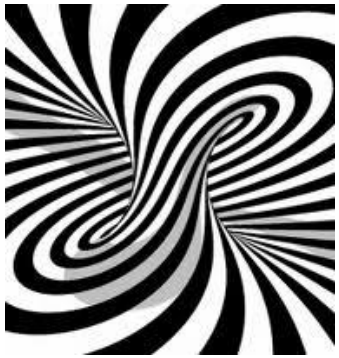




Color Depth

- Color depth: or bit depth:
  - Is the number of bits devoted to each pixel
- Simple bit mapped (monochrome)
  - Each pixel represented by 1 bit.
  - Can be 0 or 1 → e.g. Black and White
- Calculate the file size of a simple bitmap image with dimensions 250 x 200
  - Total Number of pixels in the image = 250 * 200 = 50,000 pixels
  - File size = 50,000 pixels * 1 bit/pixel = 50,000 bits





Color Depth

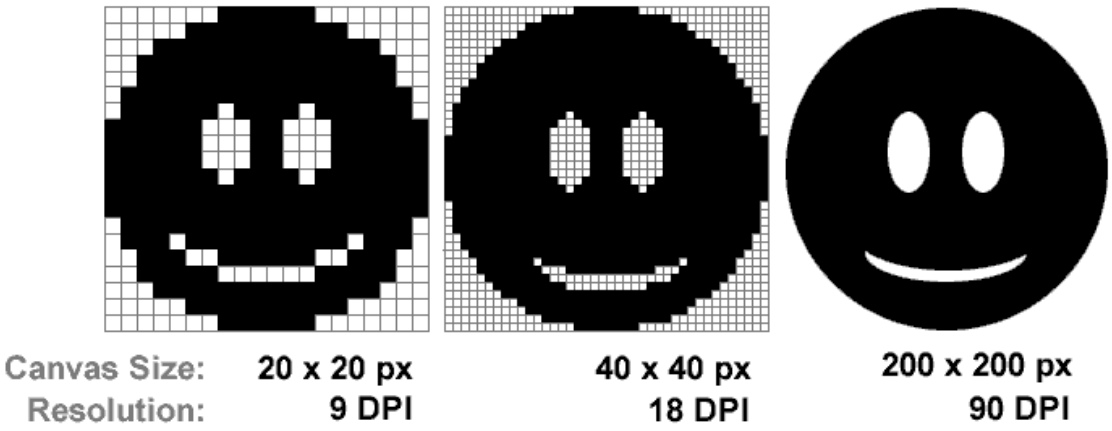
- Gray-scale graphics
  - Uses 8 bits per pixel
  - E.g. Allows up to 256 different shades of gray
- Calculate the file size of a gray-scale image with dimensions 250 x 200
  - Total Number of pixels in the image = 250 * 200 = 50,000 pixels
  - File size = 50,000 pixels * 8 bit/pixel = 400,000 bits ~ 50,000 bytes

Color Depth

- Colored Graphics
  - Modern PCs uses 24-bit (True Color) or 30 to 48 bits (Deep Color) to display millions of colors at a time; photorealistic color.
  - E.g. RGB: (Red, Green, Blue)
- Calculate the file size of a 24-bit colored image with dimensions 250 x 200

Resolution

- Is a measurement of the pixel density of an image.
  - Usually measured in pixels per inch **ppi** or dots per inch **dpi**.
- For Excellent print quality 300 dpi or more
- For Excellent web quality 72 dpi



Resolution

1600 pixels

800 pixels

400 pixels

200 pixels

100 pixels

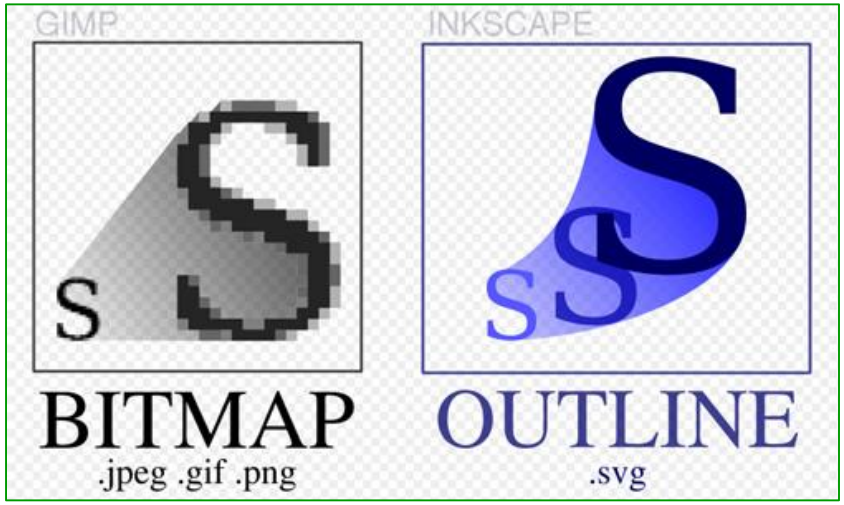
50 pixels

25 pixels

12 pixels

Object Oriented Graphics (Vector graphics)

- Vector-based graphics are scalable graphics that are built using mathematical formulas.
- The advantage of vector-based graphics is that they can be resized without losing image quality.
- Drawing Software's: Adobe Illustrator or Inkscape
  - File Format: SVG



Bitmap Vs Vector

Bitmap

- Stores as dots
- More memory
- Texture, shading and finer details
- Good for Paintings/ Photographs

Vector (Obj Oriented)

- Stores as objects
- Less memory
- Lines cleaner, Shapes smoother
- Good for graphs/ charts, Logos, Drawings , 3-D graphics

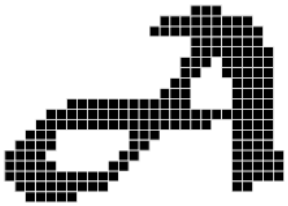
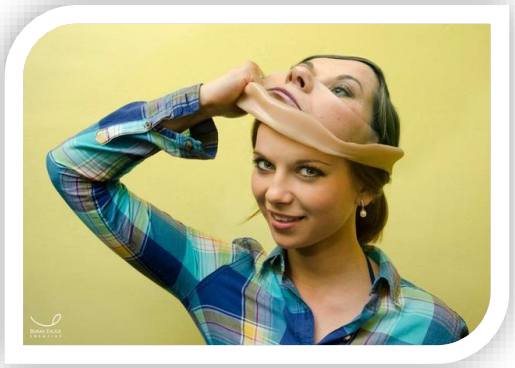


Image Processing

- A field in computer science that studies the use of computer algorithms to perform image processing on digital images.
- Filtering and cleaning
  - Eliminate red eye and facial blemishes
- Far more powerful than photo retouching
  - Can distort and combine photos as in tabloids
  - Can create fabricated images (which look like real)

BEFORE AFTER



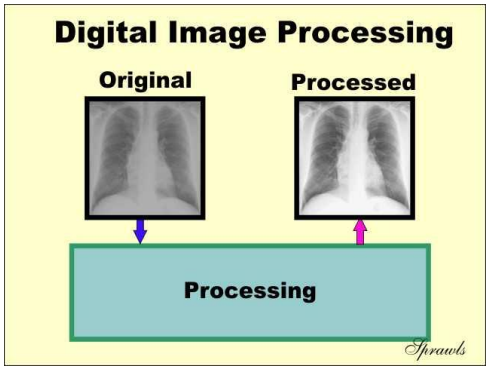
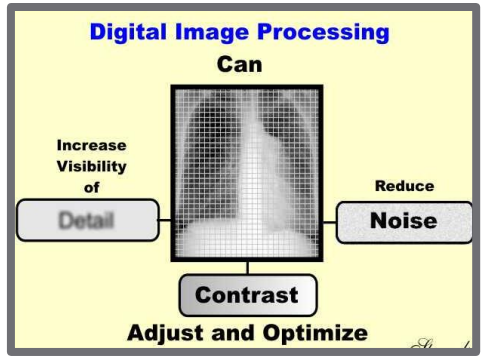
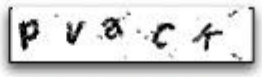


Image Processing

- Medical field help doctors clean x-ray images
- Images from Moon and Mars missions are analyzed for detecting presence of any life-sustaining resources, and other natural resources.
- Natural Language Processing
  - Cleaning Captcha Phrases

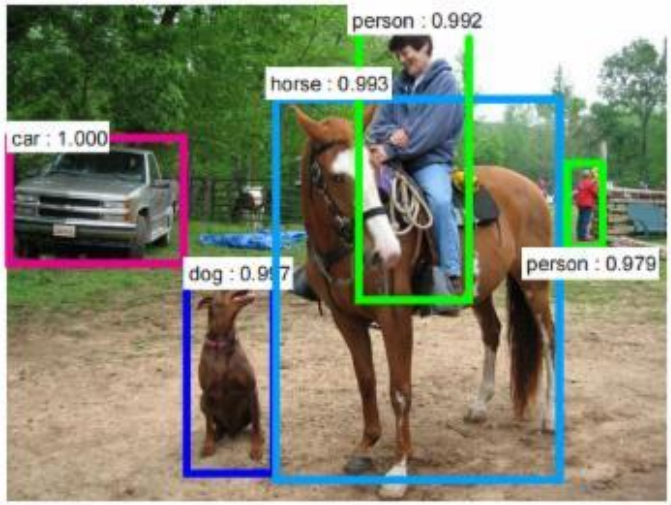


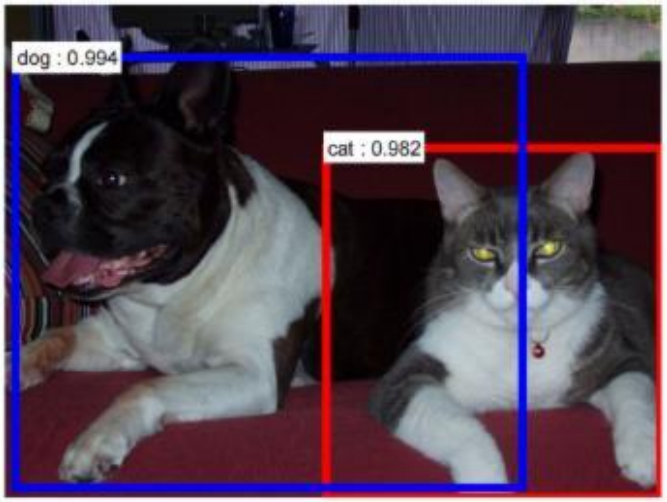


Computer vision

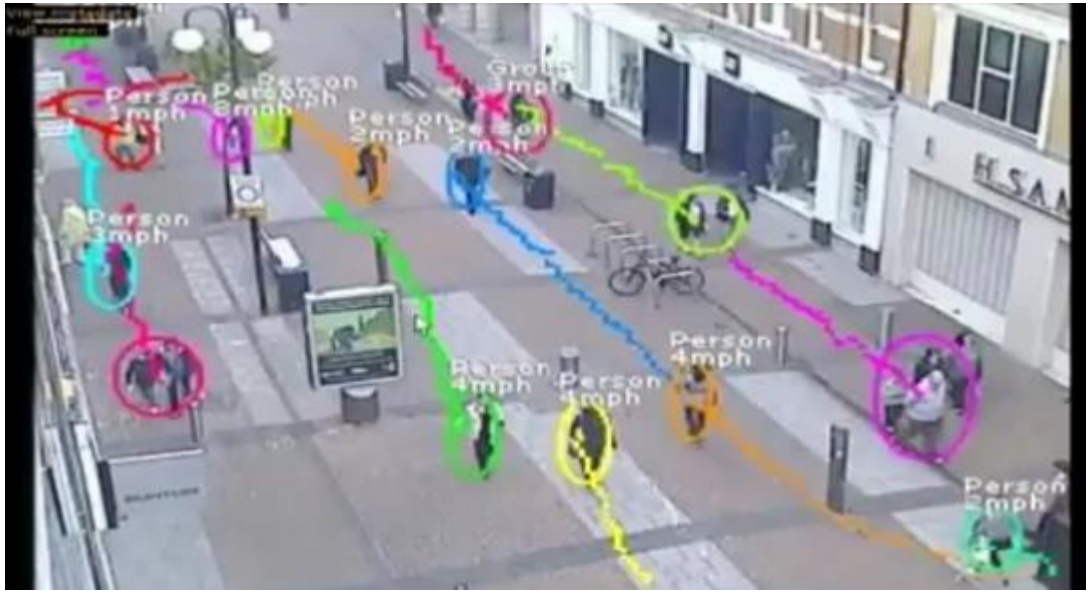
- A field that includes methods for acquiring, processing, analyzing, and understanding images
- Some of the research areas in computer vision :
  - Object detection
  - Tracking
  - Action recognition
  - Facial Recognition

Object Detection



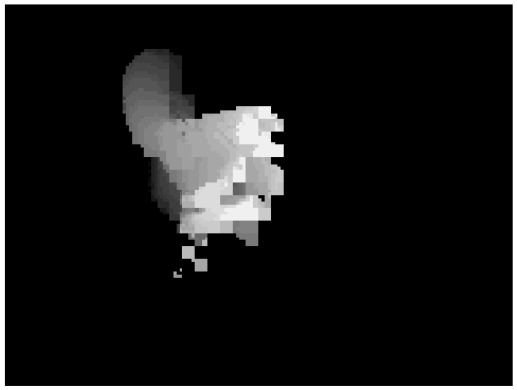


Tracking



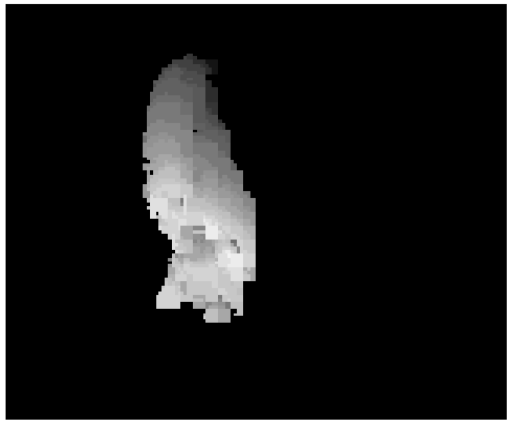
Action Recognition YouTube Link

sit-down



sit-down MHI

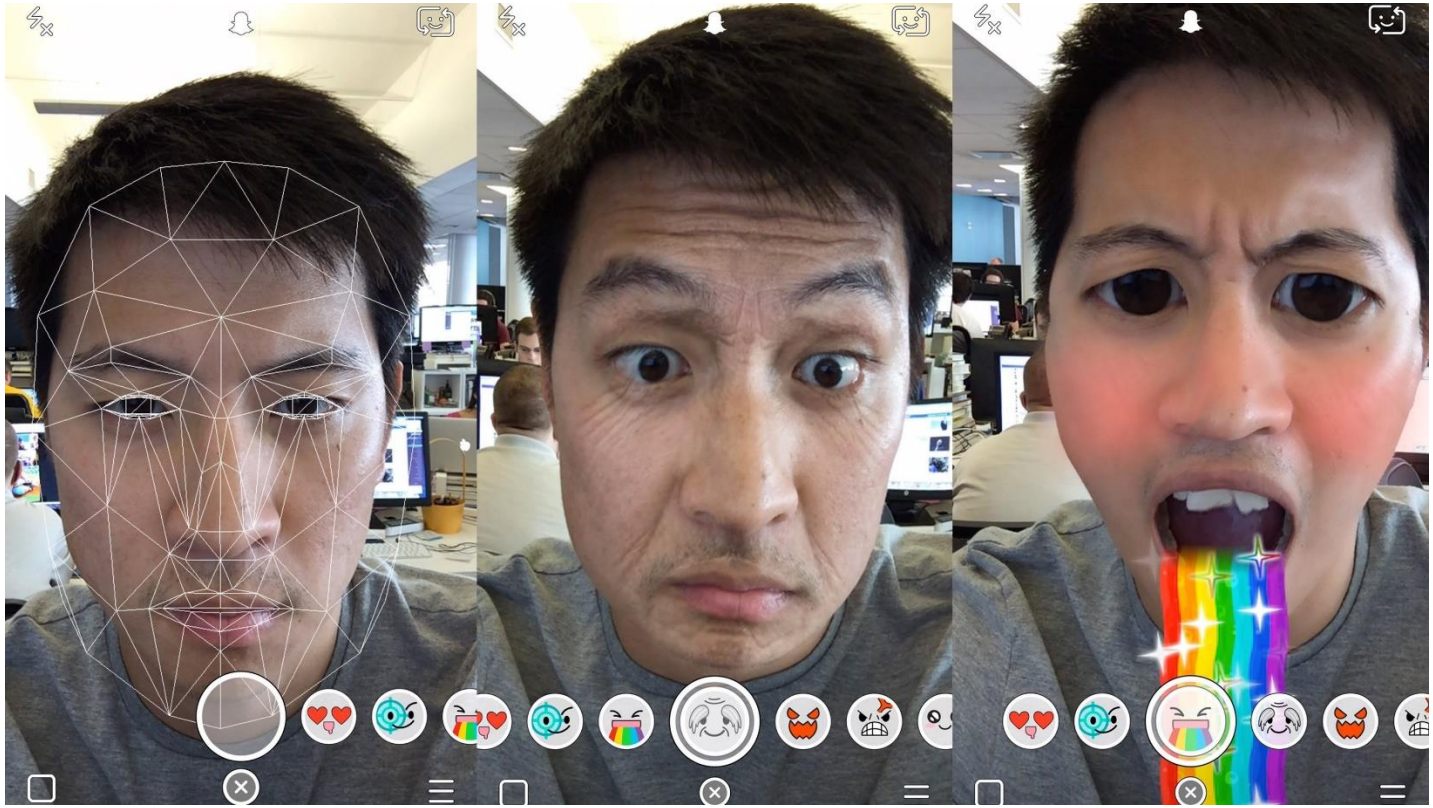
crouch-down



crouch-down MHI

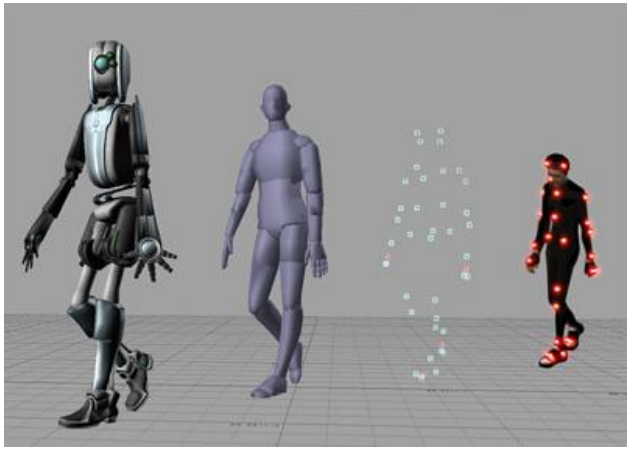
Facial Recognition

- Snapchat Filters



3D modeling Software

- Is the process of developing a mathematical representation of any surface of an object in three dimensions via specialized software.
- Ability to rotate it and view from different angles
- Can create walk through 3D environment that exists only in memory
- Software Tools:
  - Blender, 3D Max, AutoCad, Sweet Home 3D



3D modeling

- Animation Movies

3D modeling

- The Hobbit movie motion capture (YouTube)

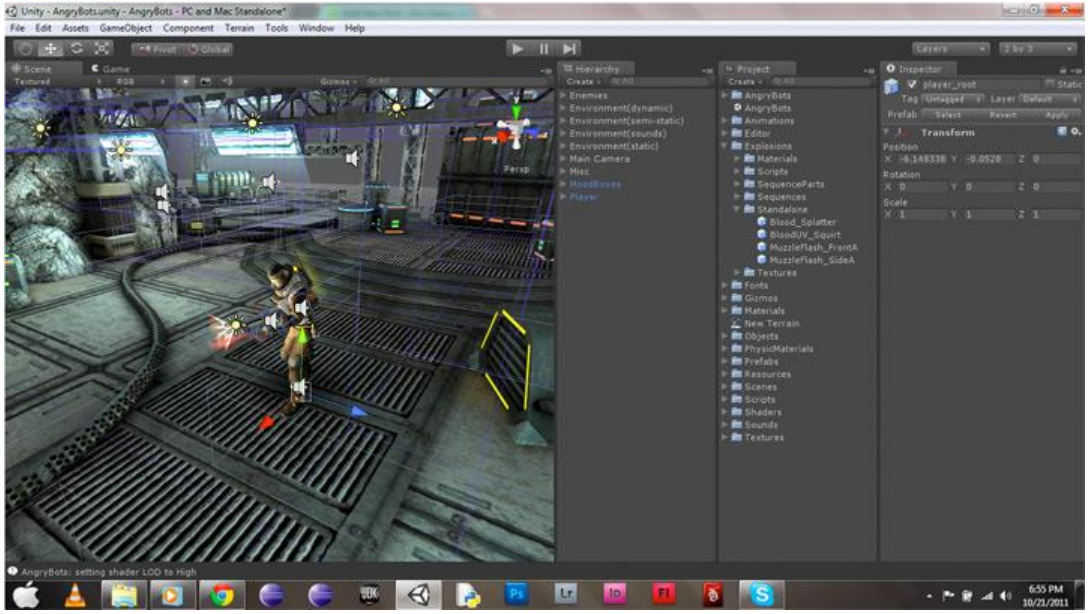


3D modeling

- 3D home design

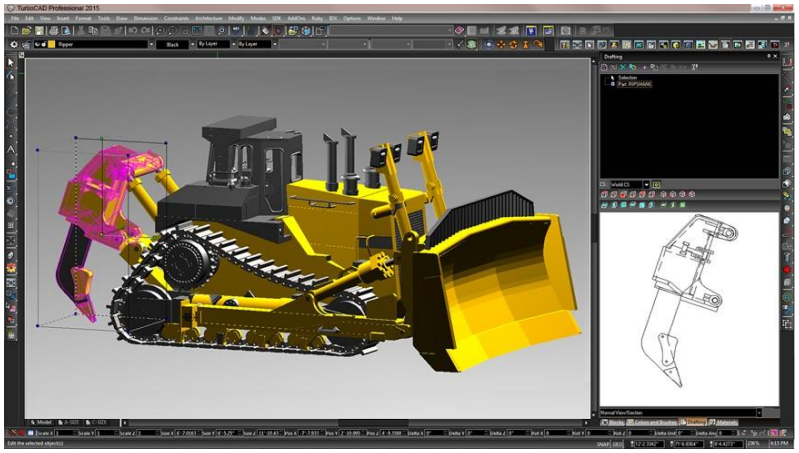
3D modeling

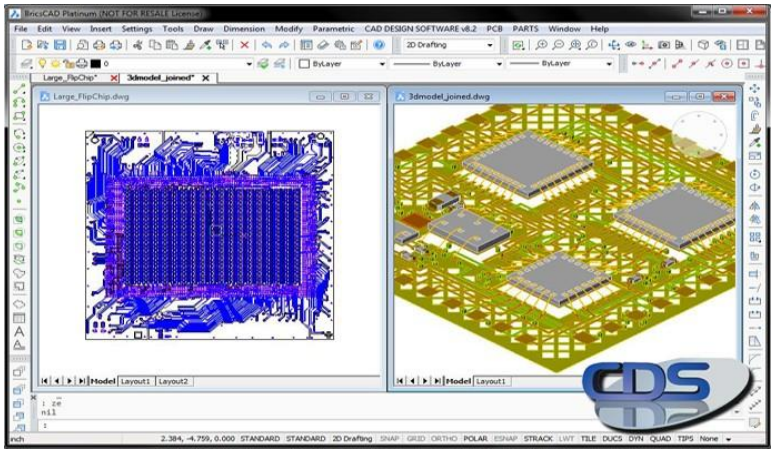
- Dorms Nightmare GamePlay; Game Created By Walid Abu Ali& Hamad Mubarak
- 3D Animation Showreel, By Walid Abu Ali - BS IT Multimedia
- Game Engines: Unity 3D or Unreal 4



CAD- Computer Aided Design

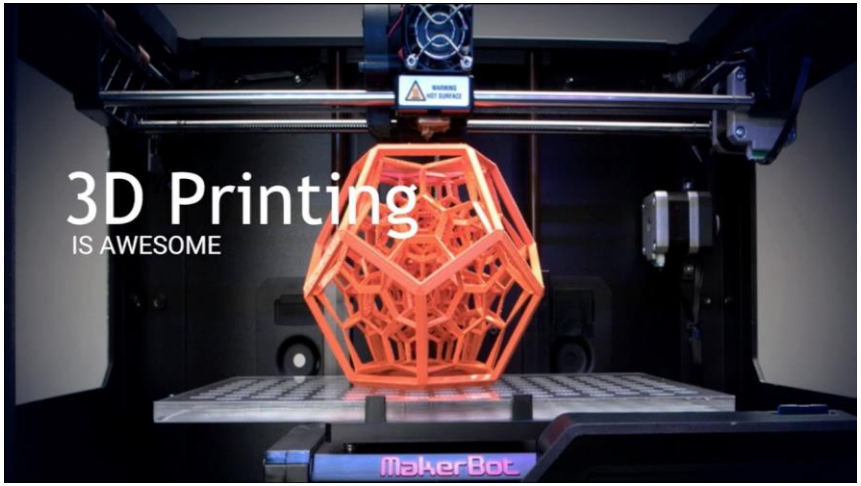
- CAD is the use of computer systems to assist in the creation, modification, analysis, or optimization of a design.
  - Creates designs on screen
  - Design computer chips PCB (Printed Circuit Boards) or building electric schematics
  - Can test product prototypes
  - Cheaper and faster than design-by-hand





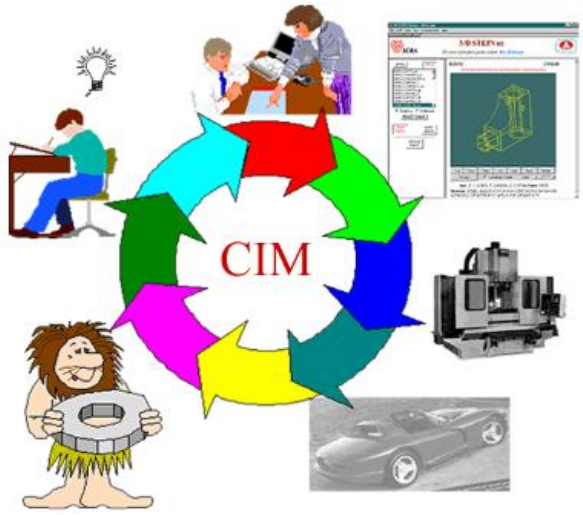
CAM- Computer Aided Manufacturing

- CAM is the use of software to control machine tools to help manufacture products.
- Translates the design of a product created on computer with CAD tools, into manufacturing instructions for numerical controlled machine tools.



CIM- Computer Integrated Manufacturing

- Combination of CAD/ CAM
  - Is the manufacturing approach of using computers to control the entire production process.
- Major step towards fully automated factory
  - Increased productivity
  - Enhanced flexibility
  - Improved quality



Presentation Graphics

- Used for Lectures, Sales demos, seminars etc.
- Slide shows on comp screen + LCD projectors
- Includes images, animation and video clips
- Example:
  - MS PowerPoint
  - Prezi
  - Emaze

Presentation Tips

- Eye Contact
- Don’t read from the slides
- Don’t condenses your slide with too much text
- Slow down
- Clear voice
- Understand your audience
- Have fun and be entertaining
- Choose correct design theme colors