Multimedia Technology (IT-204-F)

Section B
Image compression & standards

LECTURE 1
IMAGES - I

INTRODUCTION

◎ An image (from Latin: imago) is an artifact, for example a two-dimensional picture, that has a similar appearance to some subject—usually a physical object or a person.

IMAGES

- Images may be two-dimensional, such as a **photograph, screen display, and as well as a three-dimensional, such as a statue or hologram**. They may be captured by optical devices—such as **cameras, mirrors, lenses, telescopes, microscopes,** etc. and natural objects and phenomena, such as the human eye or water surfaces.

IMAGES

- The word image is also used in the broader sense of any two-dimensional figure such as **a map, a graph, a pie chart, or an abstract painting**. In this wider sense, images can also be rendered manually, such as by drawing, painting, carving, rendered automatically by printing or computer graphics technology, or developed by a combination of methods, especially in a pseudo-photograph.

VOLATILE/ FIXED IMAGE

◎ A **volatile image** is one that exists only for a short period of time. This may be a reflection of an object by a mirror, a projection of a camera obscura, or a scene displayed on a cathode ray tube.

◎ A **fixed image**, also called a hard copy, is one that has been recorded on a material object, such as paper or textile by photography or digital processes.

STILL IMAGE

◎ A still image is a single static image, as distinguished from a kinetic image.

◎ This phrase is used in photography, visual media and the computer industry to emphasize that one is not talking about movies, or in very precise or pedantic technical writing such as a standard.

◎ A film still is a photograph taken on the set of a movie or television program during production, used for promotional purposes.

MOVING IMAGE

◎ A moving image is typically a movie (film), or video, including digital video. It could also be an animated display / ANIMATION.

DIGITAL IMAGE

- A digital image is a numeric representation (normally binary) of a two-dimensional image.

- Depending on whether the image resolution is fixed, it may be of vector or raster type.

- Without qualifications, the term "digital image" usually refers to raster images also called bitmap images.

Pixels

- Pixels are the smallest individual element in an image, holding quantized values that represent the brightness of a given color at any specific point.

- Picture Element
  - smallest area of digital color
    - displays : light emitting
    - cameras : light sensing
  - uses Red-Green-Blue color components
    - analogue of cones in the retina

RASTER IMAGE/ BITMAP

◎ Raster images have a finite set of digital values, called picture elements or pixels.

◎ The digital image contains a fixed number of rows and columns of pixels.

◎ Typically, the pixels are stored in computer memory as a raster image or raster map, a two-dimensional array of small integers. These values are often transmitted or stored in a compressed form.

CREATION OF RASTER IMAGES

◎ Raster images can be created by a variety of input devices and techniques, such as digital cameras, scanners, coordinate-measuring machines, seismographic profiling, airborne radar, and more.

◎ They can also be synthesized from arbitrary non-image data, such as mathematical functions or three-dimensional geometric models; the latter being a major sub-area of

FRAME BUFFERS

◉ **Display Image**

  ◉ used to drive display

  ◉ holds a single digital image,
i.e. a frame

  ◉ used to map logical to physical
pixels

◉ **Display Refresh**

  ◉ physical pixel output decays
Rapidly

  ◉ needed to see sequence of
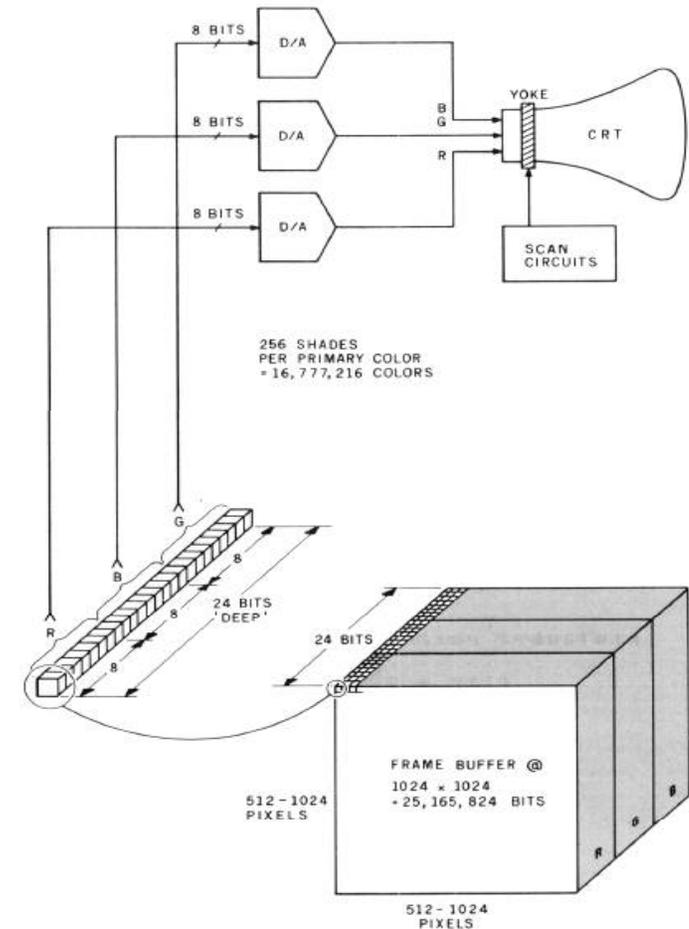   Frames Refresh rates 30
        120 fps

Figure 2.14: A hi-tech 24 bit per pixel frame buffer.

DOUBLE BUFFERING

◎ Separate Rendering from Display

- ⊙ use two buffers, one "on-screen" and one "off-screen"

- ⊙ sequence

  - ○ display from on-screen buffer while rendering into off-screen buffer

  - ○ swap buffers quickly when rendering is complete

VECTOR GRAPHICS

◎ Vector graphics is the use of geometrical primitives such as points, lines, curves, and shapes or polygon(s), which are all based on mathematical expressions, to represent images in computer graphics.

◎ "Vector", in this context, implies more than a straight line.

◎ Vector graphics is based on images made up of vectors (also called paths, or strokes) which lead through locations called control points.

VECTOR GRAPHICS

◎ Each of these points has a definite position on the x and y axes of the work plan.

◎ Each point, as well, is a variety of database, including

- ⊙ the location of the point in the work space and

- ⊙ the direction of the vector (track)

- ⊙ Each track can be assigned a color, a shape, a thickness and also a fill.

- ⊙ This does not affect the size of the files in a substantial way because all information resides in the structure; it describes how to draw the vector.

APPLICATIONS

◎ Digital Photography

◎ Medical Imaging

◎ Digital Image Processing

◎ Remote Sensing & GIS

◎ Wireless Imaging

SCOPE OF RESEARCH

◎ Built-in Mechanisms in Imaging Devices for file compression and image enhancement

◎ Digital Photography