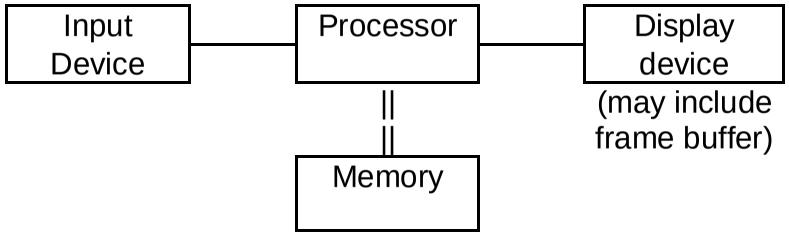
Graphics Hardware; the RGB model

References:
"Interactive Computer Graphics", pp. 5-9, 53-60, 79-83, 87-89.

Assigned Readings:
"Graphics Programming with OpenGL", sect 2–2.3, 2.6; Ch 4-5

Graphics Hardware



A complete graphics system would include the five (5) items illustrated above. In particular, the graphics I/O hardware can be split into two categories: input devices and output devices. (or at least this was possible until a few years ago when they invented touch-screens, scanning-cartridges for inkjet printers, etc).

Input Devices
Most input devices provide only 2 dimensional input; eg.

- mouse, trackball: based on movement or rolling
- joystick; accu-point (mini-joystick): based on bending
- light pen (Timex DataLink watches): based on light sensor
- touch screen, touch pad: based on sensors in an array
- optical scanners: based on moving a line-array of sensors

Input Devices (cont'd)

The 3-dimensional input devices are much fewer; eg.

- space ball: no movement but force sensors for input
- VR glove: used in 3-D VR "arcade" games.

Some input devices only provide "1-D"; eg. a keyboard.

Output Devices
Existing output devices are generally all 2-D, although you can get some 3-D effects using special glasses. Output devices can also be divided into two categories; eg.

- raster scan
- vector scan

Almost all current output devices fit into the raster category.

The only common examples of vector scan output devices are:

- plotters (eg. like those used in the school of Architecture?)
- oscilloscopes

Examples of raster scan output devices are:

- computer monitors (nearly every one in existence)
- tv screens
- laser printers (black&white, colour) Don't forget these!

Non-hardcopy raster scan devices typically need to be refreshed many times per second. Therefore they need a *frame buffer* to store the image to be displayed. ... Therefore they need a method of storing "colour" in a finite amount of memory.

RGB Colour Model

Artists (and computer scientists) know that any colour can be represented by *adding* together some combination of the three primary colours: red, green, and blue. This is known as the RGB or an *additive* colour system since equal parts of all three add up to pure white.

There is a complementary system commonly used by the printing industry called the CMY (Cyan, Magenta, Yellow) system. Any colour can be generated by combining cyan, magenta, and yellow. These three colours are said to form a *subtractive* colour system since equal parts of all three generate pure black.

Q. Why would there be two systems in use today, and not just one? Hint: what is the result of equal combinations?

The graphics card in computers commonly store colours using one of two methods: indexed (or palletized) and true colour. The largest difference between the two is in the amount of memory required to store a given image.

The storage requirements of any method can be defined by the formula:

rows x columns x bits/pixel = total bits
total bits / 8 = total bytes.

Indexed colour modes are often described as “16 colour”, “256 colour”, or “32/64K colour”. True colour are often described as “24 bit” or “32 bit” colour.

We will further develop these concepts, including advantages and disavantages, during the lecture portion of the class.