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12/14/07

Comparing Technological Processes For Displaying Video Images.

CRT

The first technology developed for displaying video images is called a Cathode Ray Tube. Images in CRT's are generated inside an evacuated glass vacuum tube where light generated by electron guns are deflected by a series of metal plates and then transmitted through a screen coated with phosphorescent material to produce an image. In color CRT monitors, three guns (red, blue and green) located in the back of the tube, produce a rapidly generated stream of electrons. Though methods of arranging electrons vary from model to model, metal plates inside the tube create an electronic current as the lights from the guns are emitted. The gas in the vacuum tube will ionize into plasma when the electrons are charged by the electric current of the metal plates, (a positively charged plate is known as an anode, a negatively charged plate is a cathode.) Before the light hits the screen it is filtered through a shadow mask, which separates the electronic beams into appropriate colors, blocking unwanted light form being illuminated. The phosphor material on the screen is arranged in a pattern of small dots or pixels and glow with the appropriate color and brightness from the focused electron beams, which produces a tangible image.

CRTs were the dominant display technology of the twentieth century. By 1931, CRT televisions were available on the consumer market, and for nearly sixty years there was virtually no competition to the technology. The technology would continue to develop well into the nineties and CRT monitors are still widely considered to provide a best image quality of all display technologies. Despite the fact that CRTs still have a greater dynamic range of color and better resolution then alternative technologies, corporations are investing in research for improving the newer display technologies and the gap seems to be closing. The practical drawbacks of the CRTs, including its cumbersome size, the excessive heat generated and the high voltage necessary to operate CRT monitors have made alternatives appealing to mass market consumers. On some well used models of CRTs a phenomenon known as phosphor burn-in occurs where the screen can be permanently discolored by a continuous transmission of a particular image. Recently (and rapidly) CRT monitors have been pushed to the margins of the marketplace as the alternative monitors have become affordable. By 1995, all major manufactures had discontinued producing CRT monitors, but they remain the standard by which all other technologies are compared.

LCD

Liquid Crystal Display technology depends on multiple layers of reflective and refractive material surrounding a chamber of a liquid crystal solution. The crystals in the liquid are rod shaped molecules located in the center of the devise. The rods become electrically charged through their reaction to electrodes that line the transparent surface of the liquid container and correspond to specific pixels on the display screen. The crystal's function is similar to the shutter of a camera; they block light or allow it to pass according to the specifications of the signal. Layers of polarizing glass and color filters are installed on either side of chamber where electrodes and crystals interact. These filters help to manipulate the temperature of light, and create the desired image.

LCD technology has advanced rapidly in the last ten years and seems to be the favorite to supplant CRT as the dominant method of video display in the consumer market. Most of the advantages of LCD panels are physically obvious: the flat monitor weighs less, takes up less space and require less voltage for operation than a traditional CRT. However there are also technical disadvantages when comparing LCD monitors, to a CRT display. Many of these drawbacks stem from an inability to make manual adjustments to essential aspects of the image. The resolution and aspect ratio of an LCD screen are fixed during the manufacturing process and cannot be easily adjusted. While colors are exceptionally bright and the image display is comparatively sharp, LCD panels have difficulties reproducing the extreme color values on the grey scale compared to a CRT. The limits of representing sharp contrast make LCD monitors less efficient in dimly lit environments and there is also a limited range angles in which the image can be properly viewed, an LCD panel requires a viewer to be directly in front of the screen to see an accurate representation of an image. There is also a problem with some LCD monitors known as “the screen door effect” where an image can appear excessively pixilated. However, LCD screens are a fundamental component of rapidly developing technologies such as laptop computers and remain extremely popular with consumers. It seems reasonable to expect that limitations of the LCD technology will be addressed and possibly overcome in the near future.

DLP

The name Digital Light Processing refers to a specific process of projection developed and trademarked by Texas Instruments in the eighties. Millions of microscopic mirrors are arranged on the surface of a semiconductor chip called a Digital Micromirror Devise. A white light, generated by a high-powered mercury vapor arc lamp within the DLP system is filtered though a color wheel and then focused by a series of lens before it reaches the DMD chip. Each microscopic mirror on the DMD is equipped with hinges that are adjusted through electronic signals. Every mirror corresponds directly to a specific pixel on the display screen and the angle of tilt in the mirror produces a precise light value and a coordinated image.

DLP technology shares some of the practical benefits of LCD monitors; it is lighter and more space efficient then the CRT. However there are other areas where DLP suffers the same noted drawbacks as LCD in comparison to CRTs including poor viewing angles and limitations in representing sharp contrasts. Considering DLP monitors in relation to LCD’s there are strengths a weaknesses for each technology. For example the complex circuitry makes a DLP monitor less likely to be susceptible to “the screen door effect,” the design of DLPs, specifically the individual mirrors make the monitor more conducive to maintenance and that comparably size LCD screens are still slightly more expensive then DLP monitors. Although DLP is thought to be superior to LCD in representing the grey scale, champions of LCD technologies site a specific problem in the capacity of DLP to display color as the technologies major drawback. More expensive

DLP monitors have three separate DMD chips for each primary color but the majority of consumer models consist of one chip and a color wheel for distributing all three colors. A complaint has repeatedly been levied against DLP displays that can perceive the motion of the wheel, blurring various colors and affecting the sharpness of the image. There have been allegations that this problem, which has been coined "the rainbow effect," can give a viewer sensitive to this phenomenon a terrible headache.

PDP

A Plasma display panel is similar to LCD technology in that two polarizing glass panels are installed to bookend a chamber of a special material capable of conducting electricity. However instead of conducting electricity through the stimulation of liquid crystals, plasma display units use a mixture of two types of inert gases: xenon and neon. Thousands of sealed compartments containing the noble gasses are lined with a phosphorous materials oriented to generate an ultraviolet light corresponding to one of each of the three primary colors. Theses color specific chambers are known as sub pixels because three distinctly colored compartments are assigned to each specific pixel of the generated image. The emission of light is stimulated by electrodes that function as a catalysis for the interaction of phosphorus material and the gas inside each compartment.

Of all the twentieth century display technologies, the strengths and weaknesses of the PDP process are most similar to traditional CRT. On the positive side, plasma monitors are thought to have wider viewing angle, better color fidelity and dynamic range than LCD or DLP because of their incorporation of phosphorous material into their matrix. Although the phosphorous material in the PDP system allows the picture quality to come closest to CRTs, PDP are also susceptible to phosphor burn in which could shorten the life span of the system. Plasma display is therefore not recommended for computer display, graphic design or other types of work where specific pixels are illuminated for long increments of time without being refreshed. The PDP system is generally more expensive and requires a significantly higher voltage than LCD or DLP, which causes some to regard it as a less efficient display system.

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