

Angles of View: Watching Technology - A Moving Target

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Now that we have completed the first year which has as its first digit 2, we can easily satisfy ourselves that our industry has before it a future that will be as informed by change as it will be underpinned by technology. Although we at Da-Lite Screen Company have a particular bias regarding the endpoint of the "V" part of AV, we are not unmindful of some of the other, major components which will contribute to its still emerging appearance. Vol. VII of this series, then, will seek to depict attributes of visual displays which, in the light of our new century, need to be regarded in both novel and differing ways. To see what some of them are we'll start by

Watching Technology - A Moving Target

In the past, this series has proffered the following answer to the following question:

Q: What is the primary goal of a visual display system?

A: To deliver as many as possible of the light rays emanating from the projector into the eyes of the audience.

Historically, that has been a perfectly defensible answer, though, from today's vantage point, there are some tacit assumptions underlying it which may no longer be necessary. One thing that answer assumes, for instance, is that light rays are at a premium. Since, historically, there never were enough of them, it was essential that (as far as it was technically possible) none be wasted.

Does that paucity of light rays still persist? Of course not. Even "little" projectors now put out more light than is needed by the typical screen size they are designed to fill. And "big" projectors? Their illuminance specs are no longer to be measured in hundreds of ANSI lumens but thousands.

So; if we don't have to worry any more about having enough "brightness", what might we be concerned with instead?

That depends, we will here suggest, on how the display is going to be used. For reasons to be outlined below, it really can be said regarding display dynamics that "Form Follows Function."

Contemporary displays have become more than vehicles for presentation. That's a second and less obvious assumption which is buried in the original answer. The purpose (not quite the same thing as goal) of a display system (then) was to enable presentation of visual materials which could be assimilated by the visual systems of their audience under ambient conditions which were typically imperfect. If that information was kinetic, it was called video but was expected, in its quality, only to resemble television. Alternatively, if the content of the presentation was static, it was presumed to contain data.

In a negative sense, static imagery meant that audiences had a much easier time detecting imperfections and artifacts than if a series of continually varying images were to be flashing by at the rate of 30 frames/second. Still, another way of distinguishing between those two would be to notice the disparity of their sources — a VHS tape vs. a PC. A deeper dissimilarity is that one source was digital and the other analog

What connected all of them, nevertheless, is the commonality of their function. They made up, independently or otherwise, presentations. People were supposed to look at them and be persuaded, sold, trained, inspired, informed, convinced, converted, or (once in a great while) impressed. Conspicuous by its absence from that list of participles is the word entertained.

Presentation as Entertainment has been the province of the Home Theater industry and has a history that, while not different from AV in the initial technologies available to it, has nevertheless evolved in parallel and, consequentially, evaluates its displays with significantly different criteria.

Joel Silver, President of Imaging Science Foundation, Inc. (joelsilver@att.net), and an expert on designing and setting up home theaters, firmly believes that the essential purpose of his kind of display system has very little to do with light rays. Instead, he declares, the truer goal is "The most accurate possible reproduction of the electronic signal."

If there is an underlying assumption to that definition, it would be that the signal in question is good enough to justify being faithfully duplicated. Now that most of our home entertainment systems include DVD players, there is a ready source that is capable of extremely high quality imagery. From an audio/visual perspective, that imagery's evaluation criteria would include

- 1) Brightness
 - 2) Uniformity
 - 3) Resolution
 - 4) Contrast
- and (Mr. Silver insists) 5) Color Fidelity.

Fair enough. As the preferred projection technology in pro AV and Home Theater is migrating away from CRTs, the criteria of Brightness and Uniformity are, effectively, vanishing. Because more than sufficient lumen output may now be counted on from any of the chip-driven projectors, adequate Brightness may now be safely taken for granted. Since that is true, there is absolutely no routine need to utilize screen surfaces whose purpose is to manipulate perceived "brightness" (gain) at the inevitable expense of Uniformity. Readers of this series should surely have seen by now that high gain screens have outlived their usefulness and, thus, really are passé.

That leaves, then, just three remaining metrics: Resolution, Color Fidelity, and Contrast. We are all used to expressing the first as a pair of numbers which enumerate the dimensions of the matrix of square pixels which make up "the picture." In the forthcoming world of 16:9 aspect ratio, High Definition displays, those two numbers have become quite large: 1920x1080. The product of those two yields more than two million pixels in a single image.

Although higher resolutions are certainly possible, they aren't, for most applications, necessary because 1920x1080 is a resolution limit for most displays that is beyond the visual acuity threshold of the people who are watching them. If the absolute size of an image's pixels is too small to be detected by viewers looking for them, then, ipso facto, Resolution need no longer be thought of as a limiting attribute.

Color Fidelity is a trickier matter. What makes it complicated is that the core library of software accessed by Home Theater enthusiasts is film; and film is not, historically, an inherently electronic medium. Using any number of photographic techniques and exposing them onto any number of emulsions, filmmakers have had available to them a color palette limited only by their imaginations. The colors available to electronically projected imagery, on the other hand, are confined to a very much smaller spectrum.

A quick way to see the significance of this is to look at a "map" of color space that has been laid out on a two dimensional graph. The larger, dorsal-shaped triangle plots all the colors that may be seen (no matter what) by the human eye. The inner, regularly shaped triangle has as its vertices three "points" which define what exact color R, G, and B will each be in the world of electronically projected color space. As no real-world color can be seen which has coordinates outside the larger triangle, no color can be projected which isn't inside the smaller one.

The reasons why the smaller triangle couldn't originally be bigger had to do with certain performance limitations of the phosphors used to coat the surfaces of CRT tubes. That, however, was only true then. In the forthcoming era of Digital Cinema, it is not at all unlikely that cameras to make it will have a color space greatly larger than the triangle shown above. And, if (when) that does happen, Color Fidelity as a standard of importance will surely shift accordingly.

Now we are left looking at Contrast — an issue which has been with us since, well, the Dark Ages. Unlike resolution or even color space, there is no amount of contrast that is superfluous. Our eyes like contrast even more than brightness and, although they can't get enough of it, we can say how much they can be given.

Movies have always had the edge here. A "high contrast" film could exhibit a ratio of 250:1. Video projector manufacturers have pretended to similar ratios for years but that posturing was always recognized as adventurous. Not any more. Now there really are electronic projectors that can display contrast ratios of 500:1 and that, considering the intrinsic difficulties involved, is an extraordinary and extraordinarily welcome achievement

Summing up, then, it is genuinely remarkable that all (all!) the attributes of visual are changing, driven as each of them is, by underlying technologies that are themselves by no means yet mature. The time may soon be approaching, it may even, in fact, be here when looking at an image displayed up on a Da-Lite screen will be indistinguishable from looking through a similarly sized window at the real world. Now, wouldn't that be something to see?

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