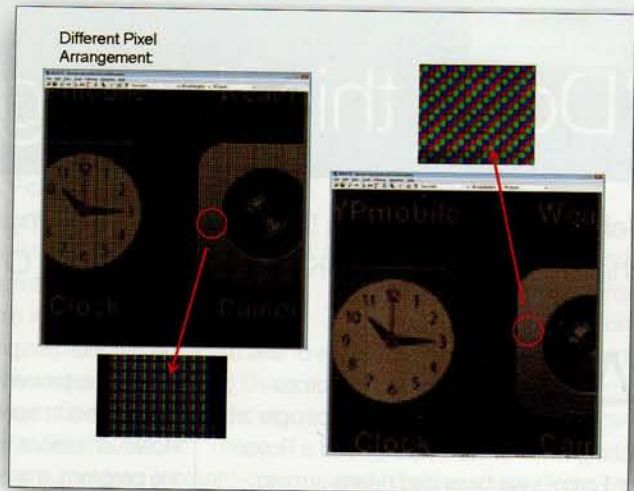
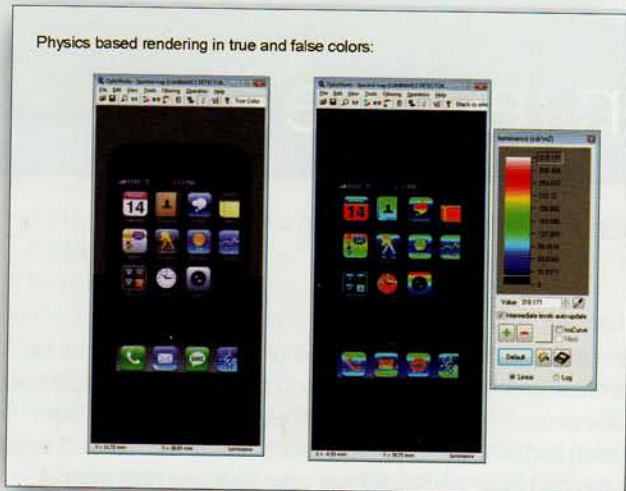


I'm beginning to see the Light!

Optis has released the SPEOS LCD Modeller, which can accurately predict the performance of LCD components in the latest ultra-thin TV screens



LCD Simulation is one of the most interesting simulations that Optis perform. That's saying something, as the whole realm of optical simulation appears to be a world apart from any other type of simulation - replete with terminology and processes that are alien to most of us. It's no wonder there are so few specialist companies in this area, with Optis being the most prominent among them.

The company's portfolio of simulation, analysis and optimisation tools cover all aspects of light modelling, optical design, photo-realism and visual ergonomics - most available in its broad spectrum flagship software, SPEOS. It even has a windshield analysis module (available in Pro/E and CATIA V5 based SPEOS) that is used throughout the automotive industry to test whether the slope and refractive index of a car windshield will enable the driver to see hazards in his path with the sun in his eyes! All of the applications are, of course, based on how we deal with natural and artificial light.

So what exactly is the difference between LEDs (Light Emitting Diodes) and LCDs (Liquid Crystal Displays)? It's a question that many people aren't completely sure about. TV manufacturers

are now providing LCD screens that are ultra-thin, a remarkable feat when you consider that the concept of LED and LCD screens - LED being, essentially, a type of LCD device - is reliant on the use of backlighting technology to generate or propagate light, which is then projected onto the front screen.

The only real difference is in the way they transfer the light. LEDs physically transmit light to the screen, whilst LCDs rely on reflected light from a series of flat film covered with microstructures that are designed to control, or interrupt, the flow of light from the backlighting - or from the side of the screen, where light sources are now being placed, to make ultra-thin displays - and direct it towards the display surface. And, not only ultra-thin TV screens, but the latest mobile handsets shown above.

LCD displays are not exactly a new technology. The film used in early models had dimples to re-direct the light and propagate illumination. The rays of light, however, were fixed and the microstructures indeterminate fixed entities, but they were reasonably efficient.

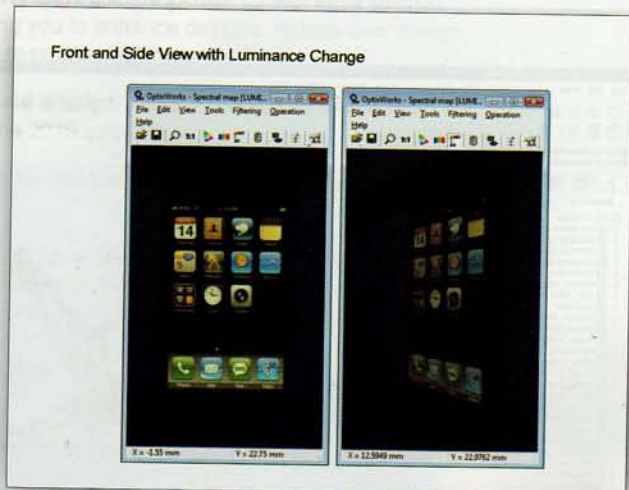
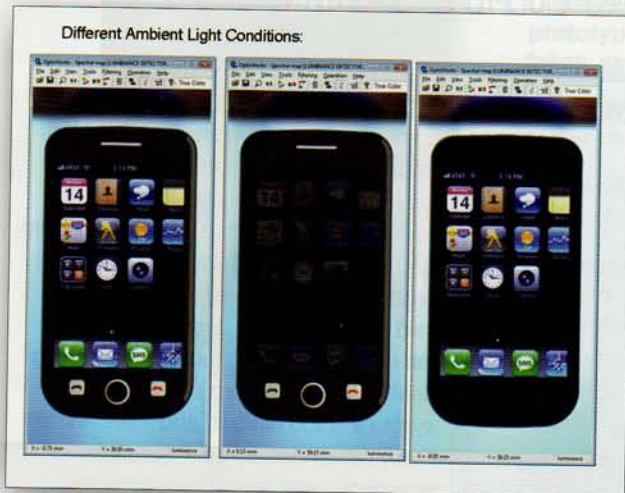
However, with no way of modelling the way that light was propagated to the screen, the design of LCDs was pretty

much guesswork, with low diffusion rates, scattering of light properties and polarisation absorbing some of the light. The crystals used were grown naturally, and there was no way of defining their output. LCD was never a true representation of the actual image, and any attempt at modelling the process in CAD was time consuming, heavy in data, and took a long time to simulate.

SPEOS LCD COLOUR MODELLER

Not any more! Optis has given new prominence to the technology, and is working with several unnamed TV and mobile phone manufacturers to develop ultra-thin screens using more advanced LCD technology. Their unique SPEOS LCD Colour Modeller is a vital part of the project. The aim, naturally, is to guarantee that customers will see, on the screen, exactly what they would expect to see in any day or night environment. This is achieved using the software's physics-based visual ergonomics and Optis' unique human eye model.

The software analyses the components of the LCD display and simulates its global performance, taking into consideration its illumination system and the LCD screen itself, looking at the interaction, or optical coupling, between



the BLU (backlighting unit) and the LCD. The LCD model also takes into account all of the LCD's optical properties including polarization effects, which are actually necessary, in order to measure contrast levels on the display. The BLU polarises the light beam, with its' polarisation status being dependant on its' location inside the BLU itself, which affects the black and white level.

In addition, the LCD model takes into account the absorption spectrum of filters, which with the BLU, allow a combination of colour within the LED spectrums to combine and generate better colour reproduction.

In effect, this means that designers can create a geometric model and define filters to produce any colour they want, and provide screens with the most consistently accurate and readable displays possible!

The simulations that can be performed by the LCD Colour Modeller are flexible enough, as well, to include other light sources that affect the display, such as front lighting units, or, indirectly, external light illuminating the display itself.

3D TEXTURES

The SPEOS LCD Modeller enables display manufacturers to model the flat

film surfaces and populate them with microstructures - more accurately described now as 3D textures - and simulate their function far more accurately. This is where another Optis tool comes in - SPEOS 3D Textures, which was developed specifically to create and optimise the hundreds of millions of micro-optics that cover the surfaces of the back lighting films.

3D Textures can be created as dimples, pyramids or any other geometric shape, using diverse materials, including tinted and diffusing materials, depending upon applications they are being made for. They can be coated to improve their performance, and applied to even the most complex micro-optic shape.

They can also be produced in a light model format, keeping overall data sizes low, so that simulation performance requirements are kept to a minimum - with rapid loading times of around 2 seconds for 1 million patterns, low memory usage (150Mb for the same size of model) and fast simulation times of around 16 minutes for 4 million patterns.

Reducing the simulation burden allows different configurations to be experimented with, and, consequently, the layout of the crystals can be played around with, using different shapes of

layout patterns for different effects.

All of the film stack can be integrated within one model, with little extra burden for the simulation process - whole stacks of textured film being simulated together to calculate the combined effect and produce optimum levels of brightness on the screen. The LCD layer is optimised, the brightness is enhanced, and colour shifting - the strange effects you see when looking at the LCDs at different angles - is reduced. Other bugbears can also be addressed, such as the ability to see the screen clearly in natural day or sunlight, and the width of the viewing angles.

Once you are able to simulate and predict the performance of the different elements in an LCD display, you are also in a position to optimise its performance whilst reducing the number of LCDs used to produce the same effect - thereby reducing manufacturing and component costs dramatically.

The absolute benefit for the manufacturer, though, is that what was once a hit or miss affair, with the best results only found after physical testing, now becomes a 'one-hit' process, where the best solution can be found before a single screen is put into production!

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