

## How Does Ultra-D Technology Work?

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The Ultra-D technology of Stream TV Networks for 3D displays has been developed to result in a natural 3D perception, where glasses are no longer needed. The Ultra-D technology generates a light field addressing human depth perception in a way close to seeing the real three-dimensional world. The Ultra-D optical solution addresses two important depth cues; stereopsis and (partial) motion parallax, resulting in a more natural 3D experience.

### 1. Introduction of Stream TV Networks

Stream TV Networks, Inc. is a Philadelphia-based new media company. With the unique 3D glasses-free display technology, the company provides creative and attractive entertainment and communication experience to its customers, and opens up the most valuable market for the latest consumer electronics industry.

For a long time, Stream TV Networks, Inc. has been continuously researching and developing in the pioneering and innovative products. The company makes breakthroughs in the field of 3D glasses-free, and makes every effort to develop displays and tablets with multi-sizes. At the same time, Stream TV Networks, Inc. also provides kinds of tools for software development to its content and software partners, which includes 3D video conversion, 3D glasses-free game development, and 3D glasses-free broadcast system. By constant updates and R&D, Stream TV Networks, Inc. contributes to establish a better foundation for the ecosystem of the 3D industry in the future. And then, a totally new industry will be also produced.

Stream TV Networks, Inc. wants to redefine “new media” so that it reaches its true dynamic potential and real-time interactive relationship with the media consumer.

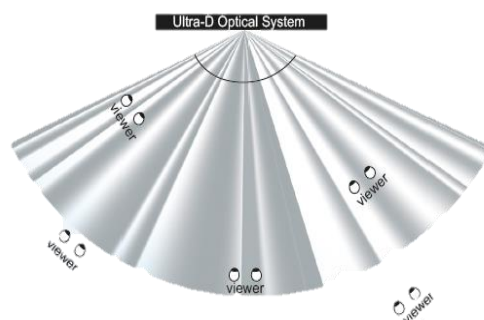
### 2. Introduction of Ultra-D Technology

Ultra-D™ is the result of years of research and development in the field of 3D optical delivery. Ultra-D™ is a proprietary combination of hardware, middleware and software in perfect sync. It introduces a proprietary optical stack matched to the sub pixel level of the panel and adhered to the panel during the bonding process. The result is a state of the art display that allows the unassisted human eye to view live and recorded content in true 3D. No Glasses Required! The optical technology directs light from the sub-pixel level at an optimal angle to create a 3D image for the human eye.

It's like opening a window to a world that is just beyond reach. Behind the scenes, there is a vigorous play by a matrix of sophisticated software algorithms that scan incoming feeds to decipher the different layers that may be used to extrude and generate depth. Once identified, they are given depth that may be either user-defined or computer-generated and packaged into the Ultra-D™ format. All this happens in microseconds, keeping the video latency to levels that cannot be discerned by the human eye. This is what auto stereoscopic 3D or glasses free 3D should be.

### 3. How Does Ultra-d Work?

**The Basis of the 3D Perception:** Human beings have three dimensional perception of the world around them. People perceive some objects to be nearer than other objects by means of depth cues. These cues are classified as binocular (when sense of depth is achieved by cooperation of both eyes and the brain) and monocular cues (when vision from one eye provides stimuli to perceive depth). Stereopsis is commonly referred to as the only means for depth perception. This is inaccurate, as depth perception relies on many more cues than stereopsis. Please see below “Pic. 1”.



**Pic. 1. Ultra-D Optical System**

**How does Ultra-D generate stereopsis?** It does so by using a stack of layers of refractive and diffractive optical elements, optically transparent, bonded to a liquid-crystal display. The light of individual sub-pixels is projected into space in such manner that it generates something similar to a light-field. Virtual and partial sub-pixels merge in the space and form complete and separate views for each eye of the viewer (then the viewer's brain takes over; processing them in the same natural way, as it is used to in the real world, creating a natural 3D experience. It is very different to 3D display technologies with glasses, which only project two discrete views of a scene. With the Ultra-D technology the viewing areas (light-fields) are repeated in a horizontal way and the transitions between these areas are smooth. So, a viewing area is not divided in discrete viewing zones (cones) as is done in most other technologies, but the optical system creates an almost continuous light-field in front of the screen. (see image)

The technology does not need special equipment as sensors for eye or head tracking. This means there is no limitation to the number of viewers and there is no fixed viewing position with respect to the screen. It allows a viewer to move freely in the range of recommended viewing angle of approximately 120 degrees and feel as if looking at the world through a window.

**Monocular** cues are also important for perceiving three dimensions. Monocular cues allow people with partial or complete stereo-blindness (when a brain does not perceive the differences between two eyes as depth) to still see three-dimensionally. Motion parallax is a monocular cue, which is independent from stereopsis. Motion parallax is a strong trigger for perceiving depth. It can be experienced when an observer moves, the background moves in respect to the object(s) in the foreground or vice versa.

**How does ULTRA-D generate motion parallax?** The Ultra-D system does not generate discrete views but generates something similar to a light-field. As the result, it allows the viewer to perceive the scene from different directions within this field. This enables the background of a scene to appear to move with respect to an object in front of it and vice versa. This allows experience of more complete 3D. Also in this respect Ultra-D is very different to 3D display technologies with glasses, which can project only two views of a scene.

#### **Acknowledgment**

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#### **References**

1. Stream TV Networks, Inc. Official Websites (<http://www.streamtvnetworks.com>)
2. Ultra-D Technology Official Websites (<http://www.ultra-d.com>)