UNIT 2

STEREOSCOPY

Stereoscopy (also called stereoscopics or stereo imaging) is a technique for creating or enhancing the illusion of depth in an image by means of stereopsis for binocular vision. Any stereoscopic image is called a stereogram. Originally, stereogram referred to a pair of stereo images which could be viewed using a stereoscope.

Most stereoscopic methods present two offset images separately to the left and right eye of the viewer. These two-dimensional images are then combined in the brain to give the perception of 3D depth. This technique is distinguished from 3D displays that display an image in three full dimensions, allowing the observer to increase information about the 3-dimensional objects being displayed by head and eye movements. Stereoscopy creates the illusion of three-dimensional depth from given two-dimensional images. Human vision, including the perception of depth, is a complex process, which only begins with the acquisition of visual information taken in through the eyes; much processing ensues within the brain, as it strives to make sense of the raw information. One of the functions that occur within the brain as it interprets what the eyes see is assessing the relative distances of objects from the viewer, and the depth dimension of those objects. The cues that the brain uses to gauge relative distances and depth in a perceived scene include.

- Stereopsis
- Accommodation of the eye
- Overlapping of one object by another
- Subtended visual angle of an object of known size
- Linear perspective (convergence of parallel edges)
- Vertical position (objects closer to the horizon in the scene tend to be perceived as farther away)
- Haze or contrast, saturation, and color, greater distance generally being associated with greater haze, desaturation, and a shift toward blue
- Change in size of textured pattern detail

Stereoscopy is used in photogrammetry and also for entertainment through the production of stereograms. Stereoscopy is useful in viewing images rendered from large multi-dimensional data sets such as are produced by experimental data. Modern industrial three-dimensional photography may use 3D scanners to detect and record three-dimensional information. The three-dimensional depth information can be reconstructed from two images using a computer by correlating the pixels in the left and right images. Solving the Correspondence problem in the field of Computer Vision aims to create meaningful depth information from two images.

Monocular vs. stereo cues

To distinguish between monocular and stereo cues -

1- Monocular: single eye

2- Stereo cues: two eyes

Surely, the stereo cues, using both eyes, give you more depth information; but, you can still estimate some depth information from a single photo (monocular even using your both eyes), but you also may be deceived! For instance, please focus on the figure extracted. Trust me; the two yellow lines have the same length; that is exactly true for the two line segments in the right figure.

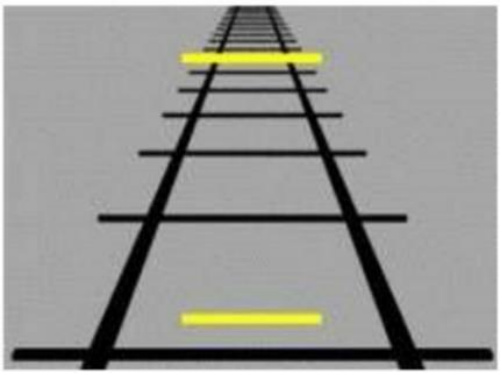

Fig. 3.4 Stereoscopy hardware equipment

` To see the power of the stereoscopy imaging, you should have specific hardware equipment that separate the two received images, one for the left eye and the second one for the right eye. Remember that, your brain must receive different images from each eye to give you the perception of 3D depth. The hardware side consists of two main items, which are the screen or the projector, and the glasses. There are many types of glasses for that purpose, depending on the type of the emitter (i.e. screen or projector)

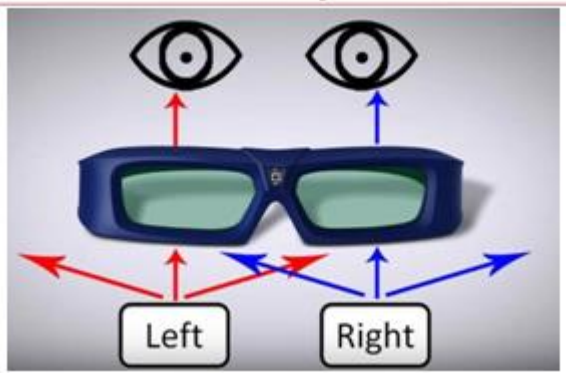

Fig. 3.5 Stereoscopy hardware equipment