DVDlab
- Home
- Screenshots
- Encoder
- Banners

DVDlab PRO
- Home
- Screenshots
- History

DVD-9 DL
- Home

Resources
- Tips & Tricks
- Help
- Help
- Help
- Help
- Help
- FAQ
- History

DVD Tools
- Timecode calc
- Re-Aspect

Articles
- H. Theater
- DOF Machine
- 3D Video

Photo-Brush
- Start here

Real-Draw
- Start here

CompactDraw
- Start here

PhotoSEAM
- Start here

Multimedia Builder
- Start here

Other tools
- UltraSnap
- Camera Tools

Experimenting with 3D video
Some of my practical experimentations

According to the sci-fi books written in fifties about near future, we should already be watching a holographic 3D video and 3D broadcasting in our homes. Of course we should be also using flying cars and go for honeymoon to the moon. While the later may seems to be more interesting, I will try to rather address the 3D video.

In order to capture stereoscopic images we need some way to record two views at the same time. This is only half of the battle. The other part is how to watch it. Unfortunately even if we are in 21st century this second part is still more difficult than the first one.

Here are few systems for watching 3D video (Source: Wikipedia)

Two color Anaglyph (red-blue/cyan) glasses
Anaglyph images are produced using color filters or computer image processing techniques to combine images from two slightly different viewpoints into a single image. These images may then be viewed with Anaglyph glasses, which use color filters (red on one eye and blue/cyan/red on other eye) to moderate the light reaching each eye to create the illusion of a three dimensional image. Anaglyph images have seen a recent resurgence due to the presentation of images on the internet, coupled with the availabilty of low cost paper frames that hold accurate color filters. (Example: NASA 3D Mars images)

LC Shutter glasses
Glasses containing liquid crystal that will let light through in synchronization with the images on the computer display, using the concept of Alternate-frame sequencing. Need high display frequency to avoid strobing.

Polarized lenses glasses
To present a stereoscopic motion picture, two images are projected superimposed onto the same screen through orthogonal polarizing filters. The viewer wears low-cost eyeglasses which also contain a pair of orthogonal polarizing filters. As each filter only passes light which is similarly polarized and blocks the orthogonally polarized light, each eye only sees one of the images, and the effect is achieved.

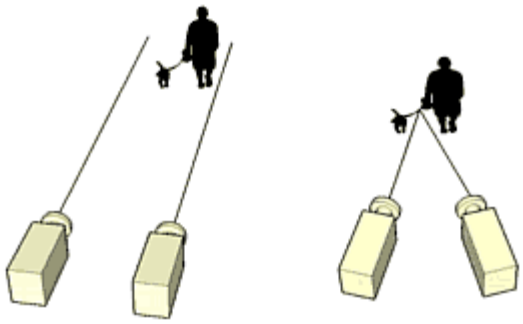
Headmount displays
The user typically wears a helmet or glasses with two small LCD or OLED displays with magnifying lenses, one for each eye. The technology can be used to show stereo films, images or games, but it can also be used to create a virtual display

No glasses solution (Sharp 3D LCD monitor for example)
The LCD is covered with an array of prisms that divert the light from odd and even pixel columns to left and right eyes respectively. As of 2004, several manufacturers, including Sharp Corporation, offer this technology in their notebook and desktop computers. These displays usually cost upwards of 1000 dollars and are mainly targeted at science or medical professionals.
Another technique, for example used by the X3D company [1], is simply to cover the LCD with two layers, the first being closer to the LCD than the second, by some millimeters. The two layers are transparent with black strips, each strip about one millimeter wide. One layer has its strips about ten degrees to the left, the other to the right. That allow seeing different pixels depending on the viewer's position

Summary:
As we can see most of the systems require wearing some sort of glasses and most of them are also wired to the projection device.
A LC shutter glasses are being popular with computers (gaming) because of its low cost and easy synchronization to the monitor. However in order for it to work properly without strobing (eye fatigue) one need a monitor capable of displaying refresh rate of 100Hz or more. Most LCD displays don't fall in this category, so shutter glasses are often used with old CRT monitors. A new DLP projector has been developed called DepthQ that uses high refresh frequency of 120Hz delivering strobe-free images.
Polarized glasses are often seen in a 3D cinemas which require two projectors. While the projection is high cost, the glasses itself are dirt cheap cartboard with polarized film.
Headmount displays are expansive and only one can watch the film, looking like a runaway from startrek covention.
The no-glasses LCD displays are new, expensive and require only specific viewing angle and distance from monitor else the effect is lost.
Only color anaglyph are independent from the projection, the glasses are very cheap but also offer the worst quality (dimmed colors).

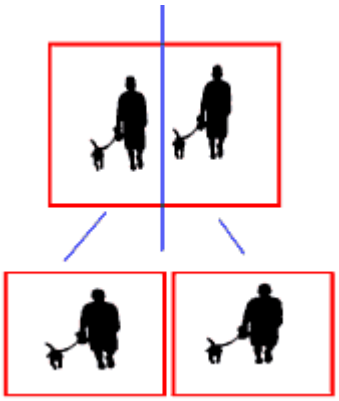
Capturing 3D video
One idea would be to take two identical cameras and duct-tape them together, eventually wire them with a sync cable. Here is a small problem: When we are looking at a scene with our eyes, they don't just look in parallel but focus on the main object.

Our duct-taped cameras would not do that but always see parallel or at our duct-tape-made angle. So we need to have some way to change the paralax angle of the two cameras. You can see right away that this is not a good solution especially with a big cameras.

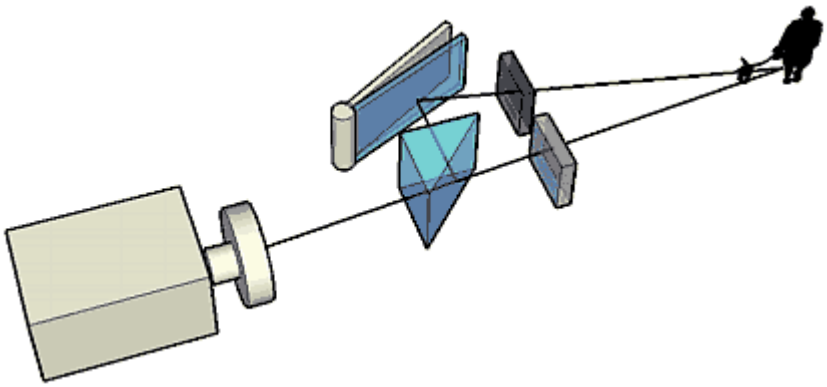


A better way would be to have only the optics shift, using mirrors or prisms.

One Camera solution.
A mechanically easier way is to somehow record the two views with just one camera. We would need an optical device that merges the two views and allows for angle change. One example is below where each "eye" image is optically side-squeezed then merged to one frame. During projection we can stretch and split the two images (digitally)



This method above creates much more mobile solution eliminating the second camera, but such optical merger is still quite complex. A simpler solution is to use frame alternating where one camera frame captures full view of one eye and other frame captures full view of the second eye. A diagram of such device is below:



There is a prismatic beam splitter, movable mirror that can change paralax and two Liquid crystal displays that darken the left and right view synced to the camera frame-rate so the camera capture left eye in one frame, then right eye in second frame. Because our DV cameras are interlaced, that means the clock frequency for one half-frame is 60Hz (NTSC). Such device would capture one half-frame (top-field) of left eye and second (bottom filed) of the right eye in 60Hz refresh rate. Such result frame (top and bottom filed combined) will look like this:

It is then equally easy to split back these two fields to a two video frames (each with half vertical resolution).

Why I am focusing more on this later way of capturing 3D is simple: such commercial device already exists. It has been developed by 3Dvideo Inc that went soon out of business. Their camera adapter is now distributed by i-O Display Systems and another similar device exist U-Bin Stereocam. These devices are in a range of $200-$300 and often much lower on ebay. NuView is shown below:

Once you capture the video with the NuView Camcorder adapter you can play it on a CRT TV with NuView Virtual FX controller and using shutter glasses.

Important Warning: Before you jump and run to get this, you have to understand that the Virtual FX controller (the "decoder" that is often bundled with it) works ONLY on a CRT TV that has 60Hz (or 50Hz for PAL) refresh ratio. It will

NOT work on ANY LCD, Plasma, Projection, DLP or even better double-rate CRT. Given the fact that there are less CRT TV's around us every day this way of viewing is obviously set to die. Also the effect of 60Hz shutter glasses switching is not very easy on eye and create rather disturbing strobe effect.

Because of the above I will in the further discussion focus only on the NuView Camcorder adapter as an easy an non-expensive way to capture 3D signal in frame interleaved mode and ignore the Virtual FX controller (that is sometimes being bundled with the adapter) as a device on the edge of being obsolete. Let's be this clear, the NuView Camera adapter does not depend on the soon-to-be obsolete NuView FX controller. The controller and shutter glasses are just a means to watch 3D on your CRT TV.

We will have to explore a way of splitting the frames back to two video streams and converting it to any format so it will work in the future depending on the type of projection. A good thing is, that with NLE we have easy means how to convert the once captured 3D video to the target format if it is a Subfiled, Sidefield, dual stream or keep it in the interleaved format.

This is the whole focus of the second part of this article.

Part 2 - Using NuView adapter and converting the video