Carl Zeiss MicroImaging, LLC.

AxioVision Export and Digital Video

A Carl Zeiss How-To Guide

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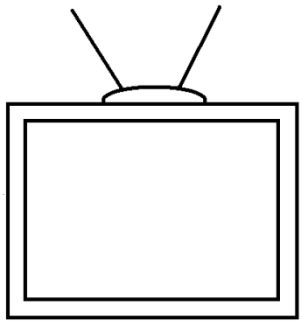
Introduction

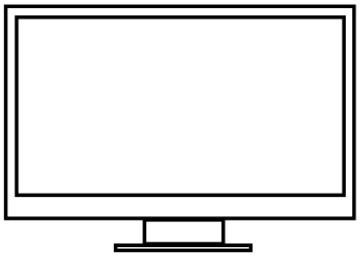
Zeiss equipment and software allows you to do amazing experiments and capture compelling images of what was once invisible. But once you have an amazing experiment, how do you share it with the world? This guide will help you get the best results possible out of AxioVision and help you optimize video for presentation, editing, and sharing.

Digital Video Basics

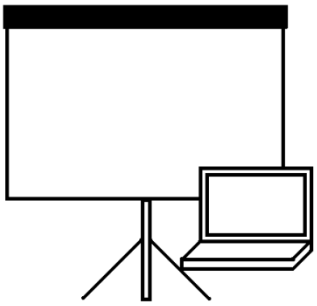
Videos are **a series of frames**. You can think of each frame as an image. Like a digital image, it has dimensions measured in pixels. These define the frame size, which you will see written as [width x height]. When these pictures are played in **rapid succession**, they give the **illusion of motion**. In digital video, we measure the speed of the image playback in frames per second (fps). So the basic description of a video is: [width] x [height] @ [fps]. Here are some common specs to get you going:



Standard TV
720x480 @ 30fps



HDTV
1280x720 @ 30 or 60fps
1920x1080 @ 30 or 60fps



Presentation
1024x768 @ 60Hz (fps)

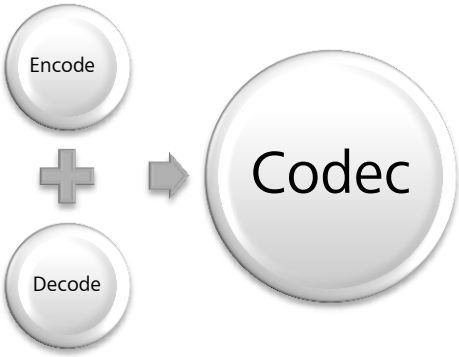
The refresh rate is expressed in Hertz (Hz), meaning cycles per second. In modern computers and displays, Hz=fps. This is important to remember later, as it will help us make videos that playback at optimal quality on our chosen screen.

Compression

If you have ever checked the file size of a time lapse ZVI, you can see that all that raw data becomes a substantial collection in a hurry. Video has a similar issue. The data needed to display each frame of video will add up quickly. So much data in fact that the data stream during playback would easily overwhelm even the fastest computers, let alone something like a DVD player.

The solution for this problem is compression. There are two methods of compression for video that can be used individually or in conjunction; they are temporal compression and spatial compression. Temporal compression is when a group of frames is reduced to a single frame and added data is used to interpolate the now missing frames. Spatial compression is where the information for each frame is converted from counts for each pixel to data that can reconstruct approximate values for each pixel. Delving into more specifics is out of scope for this guide; just remember that more compression means diminished quality and more compression artifacts. Blocks, lines, and color fringes become apparent as compression increases. Compression needs to walk a fine line between video quality and file size.

The piece of software on a computer than accomplishes video compression and decompression is called a **codec**. The important thing to remember is that whatever codec you use to encode must also be present on the playback device to do the decoding.



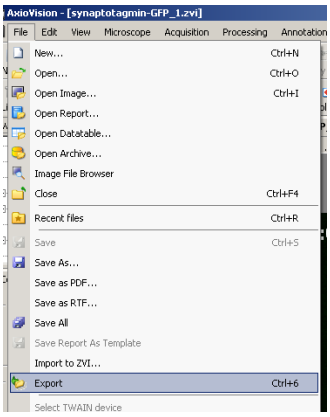
Other than compression, the other place where file size can be reduced is by resizing the frames of the video. This is why internet video has been slow to move up to full screen resolution. By limiting the video frames to a fraction of the size of full screen, file size can be reduced significantly. Along with severe compression, this is a strategy that most internet sites use to get file sizes down to a level that can be streamed.

This gives us our final dimension of digital video. The **Bitrate** of the video is an indicator of how much compression is occurring. This is usually shown in Kilobits (thousands of bits) or Megabits (millions of bits) per second. Here are a few examples for reference:

Media	Resolution @ Frame Rate	Bitrate
DVD (NTSC)	720x480 30fps	8Mbps
Blu-ray	1920x1080 30fps	40Mbps (max)
YouTube	480x360 30fps	140Kbps (average)

AxioVision Export Options

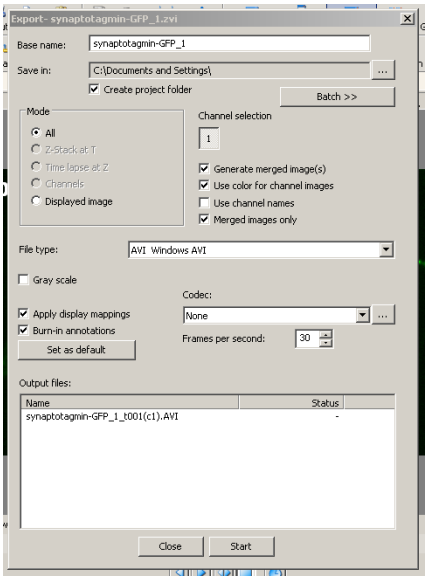
Now that we know about video and have our source sequence, let's look at our export options. Don't take any risks with your experiment. Save it as a ZVI before attempting any exporting.



With the time-lapse sequence open in AxioVision, open the Export Menu (File>Export or Ctrl+6).

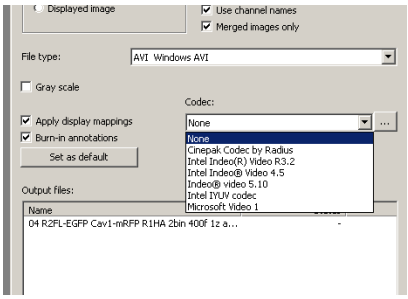
The options available here can be intimidating at first. The Help files that are embedded in AxioVision are very good at explaining this menu. You can press F1 at any time to access the help documentation, or select Help from the AxioVision main window and search for "export."

The most important option for us is the File type selection. As you can see in the figure above, the file type is set to "AVI Windows AVI." AVI stands for Audio Video Interleave, but you can just think of it as the most basic container file for our video.



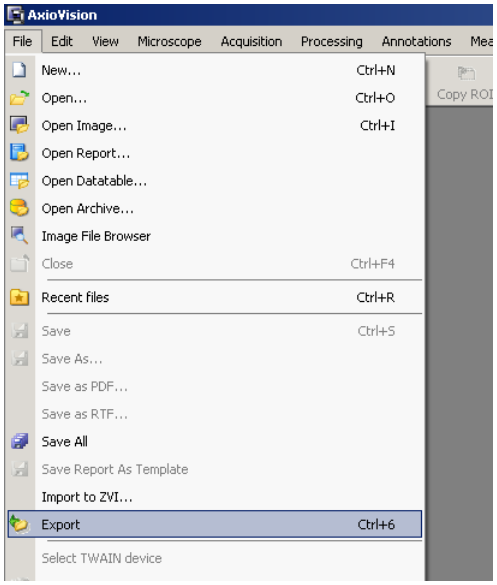
Note: There is a second video file type "MOV Movie." This is the file type to generate Apple QuickTime videos. You must have QuickTime installed to use this option! Due to our use of the Windows operating system and our implementation of QuickTime, we are limited to only creating the most basic QuickTime videos. The file sizes will be large and any compression will be extremely apparent. QuickTime is a good option if you plan to present your videos on a Mac or if you are handing them off to a Mac-based video editor. We have built our software around the Microsoft ecosystem and expect most presentation situations to be Microsoft based, so we will continue in that thread. For more information about Mac compatibility, please contact Carl Zeiss Support.

With AVI selected, the second option is Codec. As we discussed before, a codec is a piece of software that allows the video to be compressed when made and then decompressed during playback. The codecs available on a stock Windows system are limited and behind current technologies. Additional third-party codecs can be installed, but can require significant configuration and experimentation. AxioVision can utilize any **Microsoft Windows DirectShow Compatible** video codec. Just remember that any machine you play the video back on must have the same codec as the computer used to make that video.



The Microsoft Video 1 codec is the best default option for video. In testing, acceptable quality with file sizes that weren't overwhelming were achieved with Compression levels of 10-20%. The help files recommend installing **Windows Media Video 9 VCM.** The installation package that includes this codec is now known as the **Codecs Installation Package for Windows Media Player 6.4**. This codec package gives nearly equivalent quality to Microsoft Video 1 at about ¼ the file size.

AxioVision Video Export Quick Reference



With your time-lapse experiment open, Select Export from the File Menu.
Note: Stream files (ziAR) must be converted to ZVI using the cutter

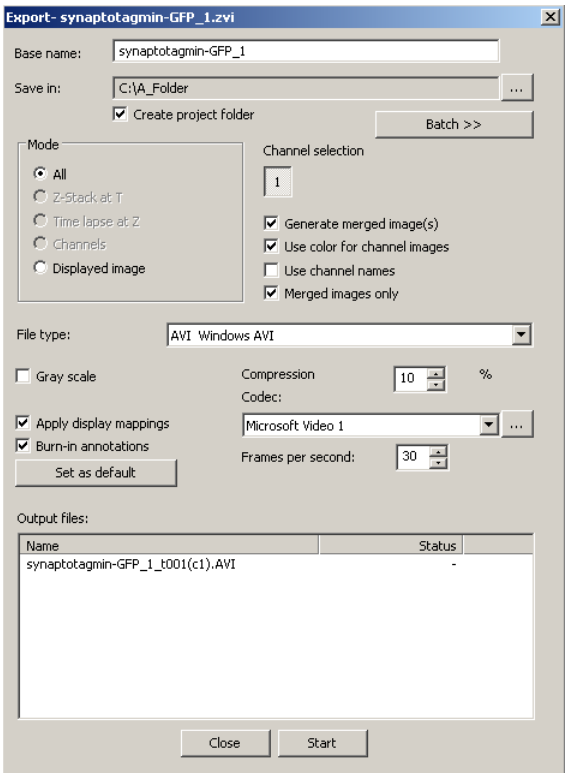
Export Window Step-by-step:

Base name:
If you would like to change your experiment's output file name, type your preferred name here

Save in:
Select your save location

Mode:
For video output, set this to 'All'

Channel Selection:
Select all the channels you would like to see in the finished video. To adjust these, make changes to the display of your time-lapse experiment.



File Type:
AVI for video on Windows computers
(Use MOV (QuickTime) for Mac playback)

Codec:
Microsoft Video 1 (reduces video file size)
3rd Party codecs can also be used if preferred

Compression:
<15% to prevent artifacts and keep file size low.

Frames per second:
30, 20, 15, 10, or 6

smoother motion
shorter video

less CPU needed
longer video

Press Start and your movie file will be generated