Technical Intro to Video Capture

(Documentation at: http://www.virtualdub.org/virtualdub_docs.html,

Downloadable from: http://virtualdub.sourceforge.net/)

* Finding the Software on your (Lab) Computer:

The software should be clearly available on the desktop. If it is not, go to the start menu and type 'virtual' into the *Search Programs and Files* box. The software you want is called 'VirtualDub' and has an icon that looks like a gray gear-and-screw. Open this.

* Capturing Video with the Webcam:

Select 'File,' 'Capture AVI' to get the webcam activated. If both a webcam and a microscope are connected to your computer, you may need to select the device. Select 'Device,' and 'Logitech Webcam 600' for the webcam or the 'UCMOS03100KPA' option for the microscope.

To adjust the color space compression, output size (resolution), or frame rate, select 'Video,' 'Capture Pin.' To adjust brightness, contrast in the image, and other exposure settings, select 'Video,' 'Capture Filter'. These two methods are very important and significantly different for the microscope, and you will learn more about this later.

To adjust the length of your video, select 'Capture,' 'Stop Conditions.' Be aware that ImageJ can process only about 400 frames (due to the limited working memory of the computer, more frames possible with the virtual stack option), so you will need to adjust the play rate and total time of your video to take the minimum length to capture your event and not much else.

To begin capturing a video, you first need to set a name for the resulting file. To do this, select 'File,' 'Set Capture File,' and input a file name. You should be saving your files to different folders for different experiments, so as not to confuse them. Create a folder for your group to use in My Documents (you cannot create a folder on the 'Desktop' of the Lab computer due to IT permissions). Then click 'SAVE.'

When you are ready to capture video of motion/your subject, select 'Capture,' 'Capture video.' Keep in mind, you may need to collect several trial videos before you manage to get good video for analysis in ImageJ.

* Capturing Video with the Microscope CCD Camera:

Unfortunately, the user interface for the microscope camera is not quite as friendly as the webcam. In fact the frame rate, which is very important for the measurements you will be doing, is difficult to set exactly.

The capture process for the microscope camera is very similar to the webcam. The main difference are in how to set the video settings, such as resolution, frame rate, and brightness. To adjust the output size (resolution, select 'Video,' 'Capture Pin.' There should be three options available, but keep in mind that higher resolutions lead to drastically larger files. To adjust brightness

and frame rate, select 'Video,' 'Capture Filter'. Because of the nature of the camera, the best way to control the frame rate is to change the exposure time. The exposure time value is around the spacing between frames, so 0.5 s exposure time will translate to around 2fps. Changing the exposure time will also change the brightness of the image, as more light will be collected for each frame. **After you set the exposure time and take a video, it is important to record the resulting frame rate. You can find the frame rate in the information panel on the right of the video capture screen, under the video tab and next to the label "average rate".**

The remainder of the video capture process for the microscope is identical to the webcam process. Be sure to change the name for each video to something that helps you identify the video, and don't forget to record the frame rate!

* Video Construction & Planning (Being a 'Good Cinematographer'):

Creating a good video for analysis in ImageJ is tougher than you might think. You will need to consider elements of video construction and planning. You need to be a 'Good Cinematographer.' Here are some questions to consider:

- What is the best angle? How should the camera be aligned to view the motion of the object in which you are interested?
- What is the best time between frames? How many frames-per-second should you be collecting, given the time for the phenomena to occur and the memory limitations of ImageJ (about 400 frames)?
- Is there a known length visible in the video?
- Are all objects of interest clearly visible in the video?
- Is the entire portion of motion in which we are interested visible in the video?
- Is the camera (perspective) stationary?

* Determining Distance-to-Pixel Ratio in ImageJ:

Once you have imported the .AVI file into ImageJ, you will need to determine the distance-to-pixel ratio for your video (this should be done separately for **each** video analyzed).

You will need to use the 'line' tool (*Straight* tool, 5th from left end of icons in toolbar) in ImageJ. Click on the 'line tool' icon of the ImageJ menu toolbar (it looks like a sloped line or a slanted fraction bar (/), and the bottom right corner has a downward-pointing black triangle). Using this tool, click on one end of a 'known length' object hold down the mouse button, and drag the line across the 'known length' object to the other side. Without releasing the mouse button, look to see the length (in pixels) of your line segment--this information should be at the top of the video window or at the bottom edge of the ImageJ menu toolbar. It will say "length=....."This length, in pixels, is equal to the 'known length' of the object. Now you have a distance-to-pixel ratio to help you turn pixel locations into physical positions. Once the mouse button is released, this pixel length will no longer be displayed by ImageJ. It can be recovered by selecting 'Analyze,' 'Measure' and looking at the measurement on the data table that appears.