Unit 1 - Interactive Video Basics

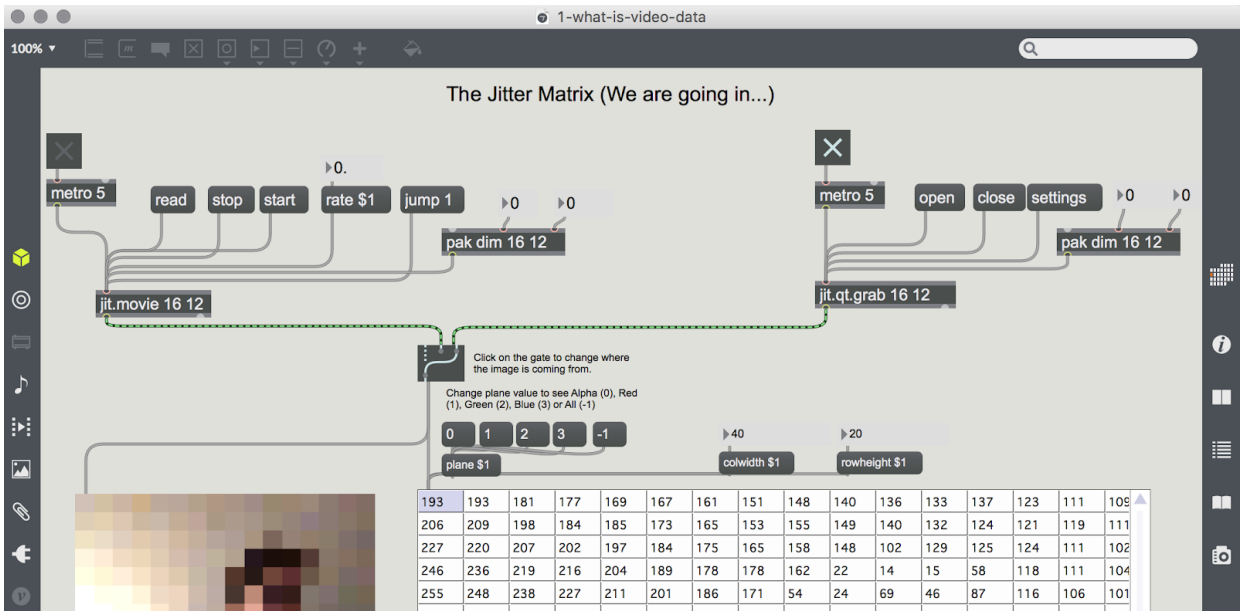
What is Video Data?

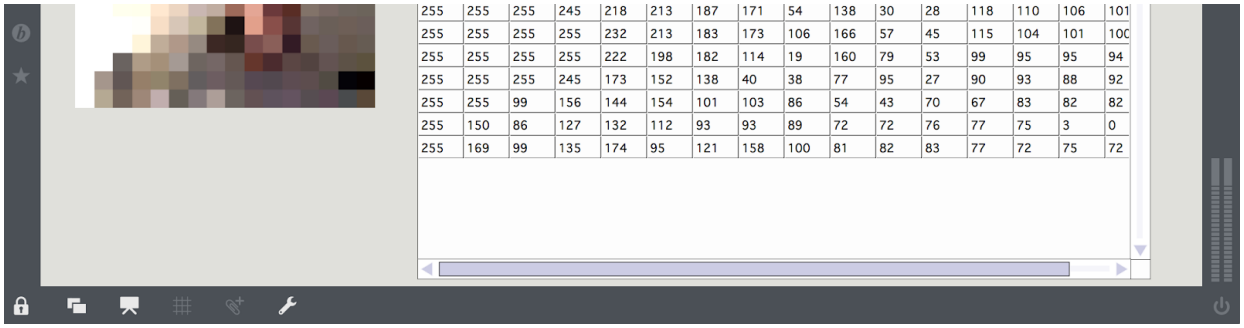
First we are going to look at video as a data stream using a patch that I made. I think it is crucial to understanding what can be done with video - once you see what it is made of you will start to think about it differently. It is a medium, and it is malleable - like clay, but digital. You can almost touch it in Max, and you can certainly mold it into other forms.

Open the patch titled **1-what-is-video-data.maxpat**. You can find this (and all future course patches) in the Class Patch Archive section of the course content.

If the file does not open inside of Max 7, then your computer might not know what program to use to open these types of files. In this case, open Max 7 first and choose File/Open... If this does still not work then visit the Troubleshooting area of the course content.

When you open the patch it will look something like this, but without any video playing.





In order for video to play you will need to turn the program on and give it a few messages (commands). You can think of a Max patch as a computer program that is ready to do things, but needs to know when you want the things done, and further instructions on how to do them. Each object in the software is a graphical representation of code, and is awaiting information and messages from you, the user, and/or the other objects in the patch.

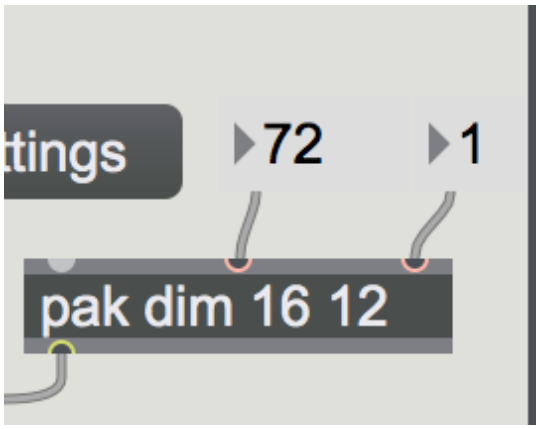
In this instance you need to turn on the metro object using the toggle above it - I chose the one on the right which turns on jit.qt.grab - the object that “grabs” video from the built-in camera, or most external cameras. You must also send it the message “open” by clicking in the box with rounded corners that says “open” in it - this is a message box. Once you have done both of these things your patch will look like this screenshot, but the numbers will be constantly moving. If you do not have a camera attached to your computer, use the metro on the left, and send the “read” message to the jit.qt.movie object, which will make a dialog box appear asking you which movie you want to read. Pick anything that Quicktime can read, which is most movies - or use one of the movies distributed in the Class Movies area of the course content.

Max processes video as a matrix of data, and you will run into the word “matrix” as you use this software, so it’s best to get comfortable with it now. You may have taken linear algebra and remember matrices, or you may have never thought about them before. It is not important that you know anything at all about linear algebra, but I find this to be the most interesting use of it. A matrix is just a grid of data. In my college math classes the data was always totally abstract, and if you look in the patch it is hard to imagine all of those numbers having any meaning - but the software knows to turn them into pixels with a specified color value and that gives us video. The colorspace is RGB, which you may know from web or graphic design. It means that each pixel gets 3 color values - red, green and blue - in the range of 0 to 255 (that gives us 256 shades of each). With this information the computer generates the image. This is known as “true color” and produces over 16 million unique color values. (You can read more about it here:

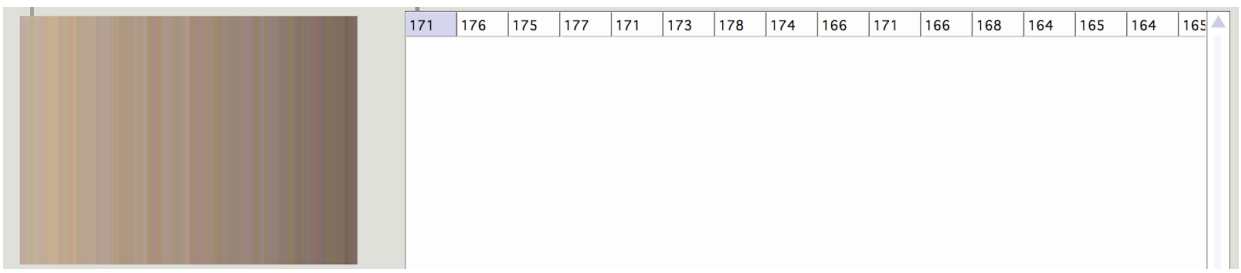
https://en.wikipedia.org/wiki/Color_depth#True_color_.2824-bit.29 and here: https://en.wikipedia.org/wiki/RGB_color_model)

We will likely never look at video as a grid of numbers again. Even though the computer will be processing video as a grid of numbers, we will be focusing on video as a grid of pixels, which is just a regular digital video image. So, why am I showing you video this way? There are a few things I want you to take note of and appreciate:

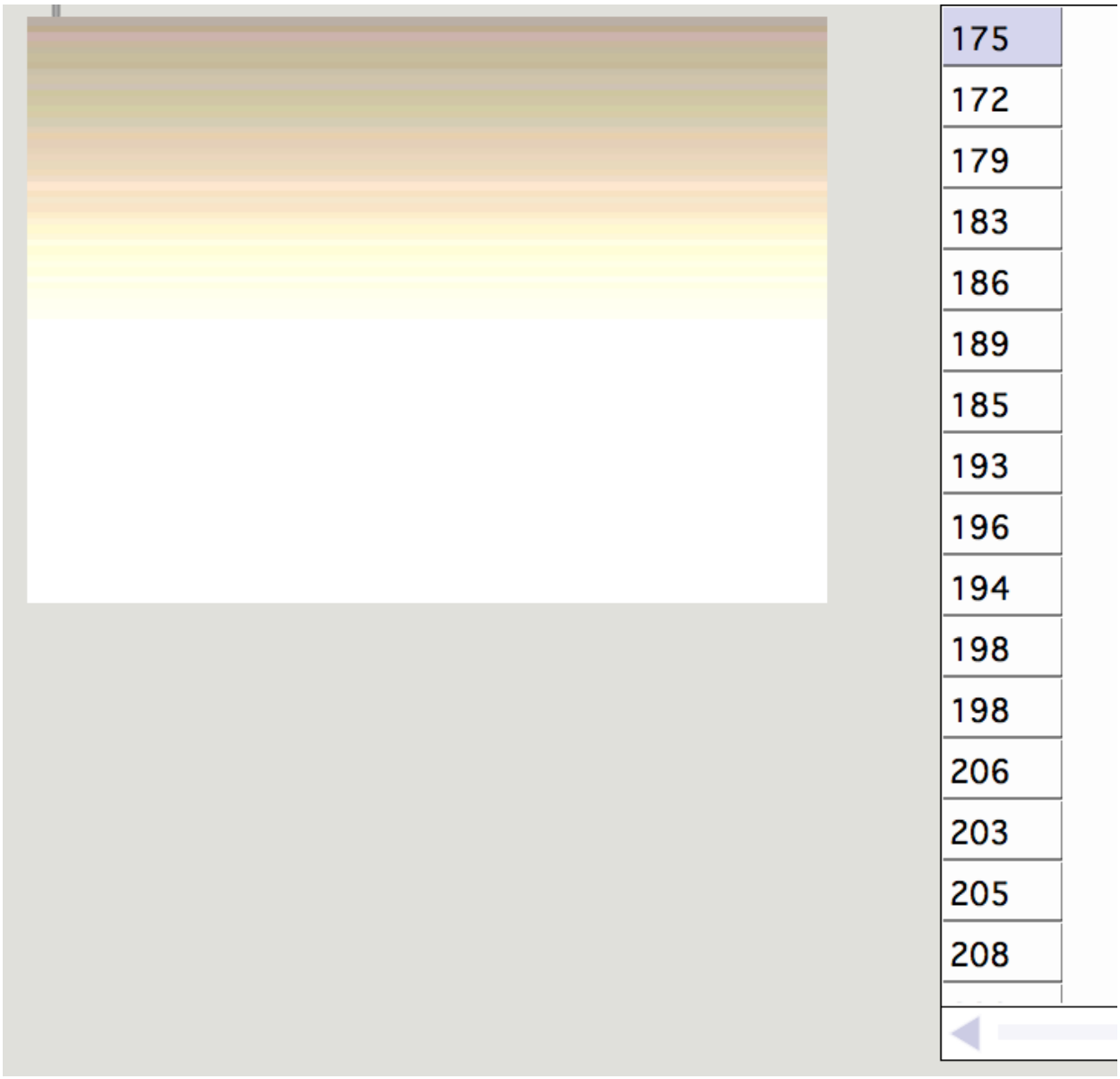
1. Video data is just numbers, and that is good for us because we can do all kinds of interesting things to numbers. We will work with colors in the range 0-255 and in the range 0. - 1. Sometimes it is easier to divide the color values by 255 and keep them in that range.
2. In order to produce a high quality image, you need A LOT of numbers. This is why video processing can eat up all of your computer's brain power.
3. The video matrix can be any rectangular shape, try going to this area of the patch and changing the numbers in the number boxes (you can click on the box and type a new number, or click without releasing and scroll). Try making your numbers like the ones here, 72 and 1:



The result is 72 columns of video and 1 row. Since the screen that I am asking Max to display the video in is not 72 x 1, it is repeating the pixel value down each column, making a streak of video.



Now try making a lot of rows and 1 column, see what I mean about malleable? I think this “behind the scenes” world is fascinating. I hope you do too.



Ok, you can close this patch now, or play with it more.