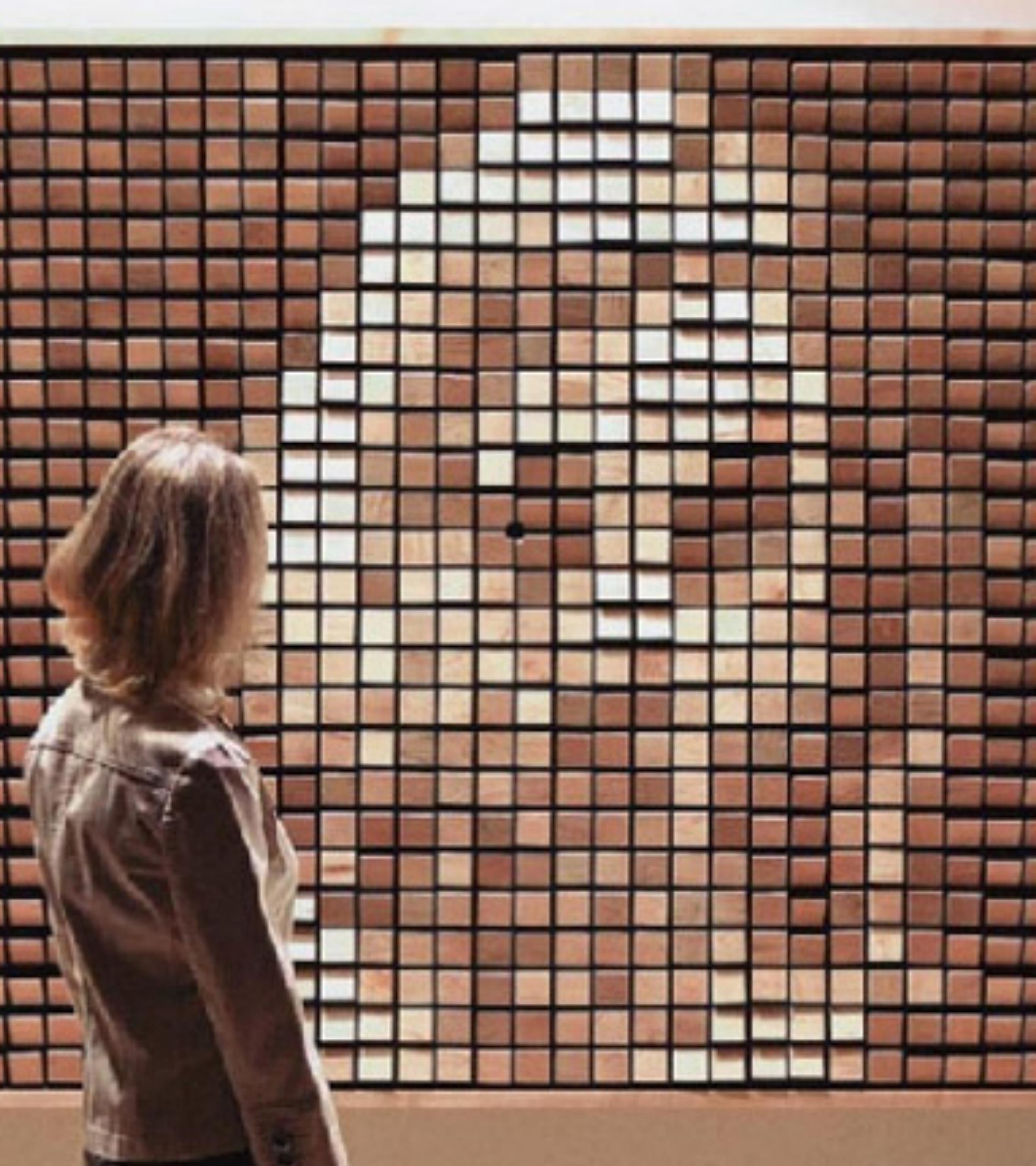




openFrameworks Workshop

Computer Vision 101

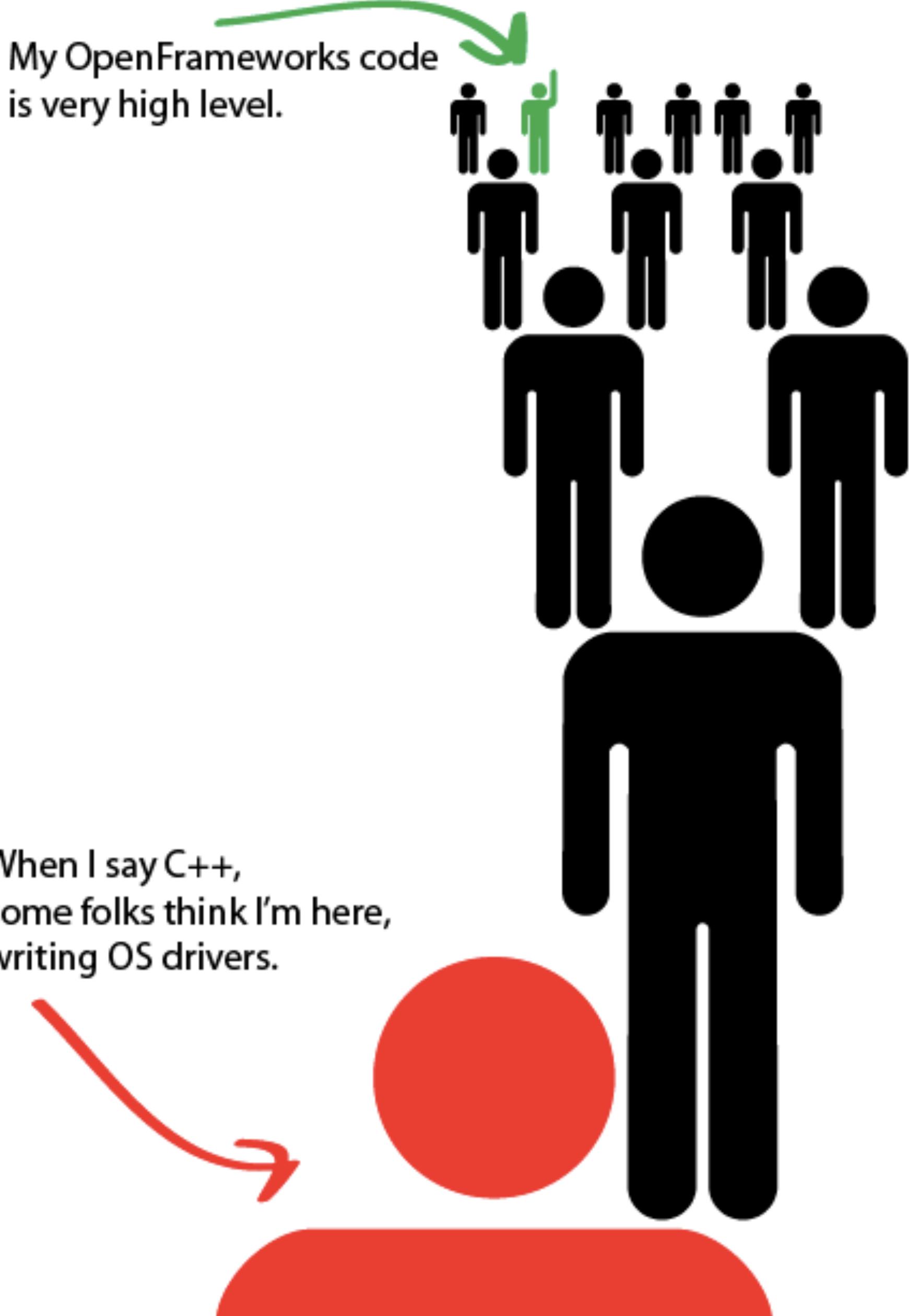
Firm Reed Tothong
@firmread
firmread.com



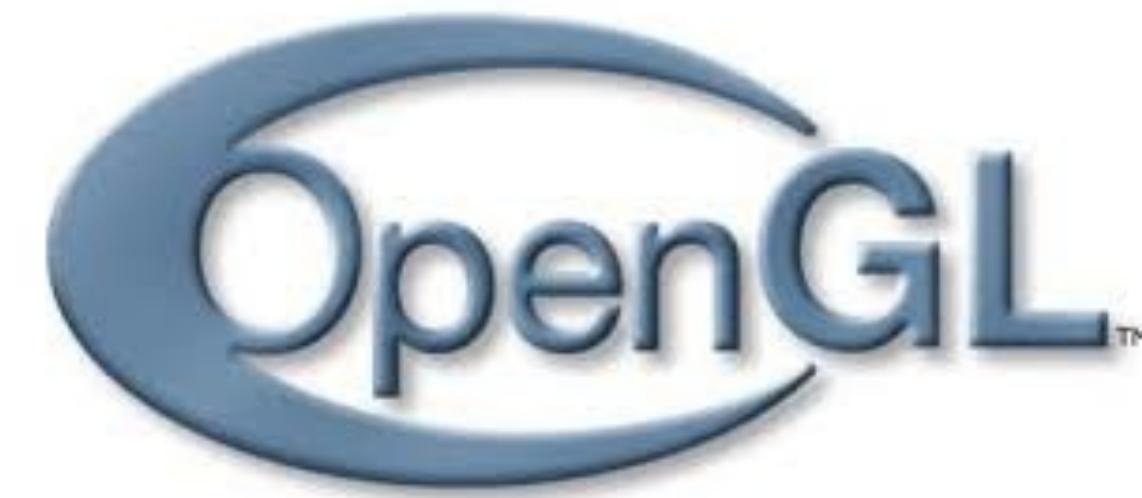
openFrameworks

openFrameworks

My OpenFrameworks code
is very high level.



When I say C++,
some folks think I'm here,
writing OS drivers.

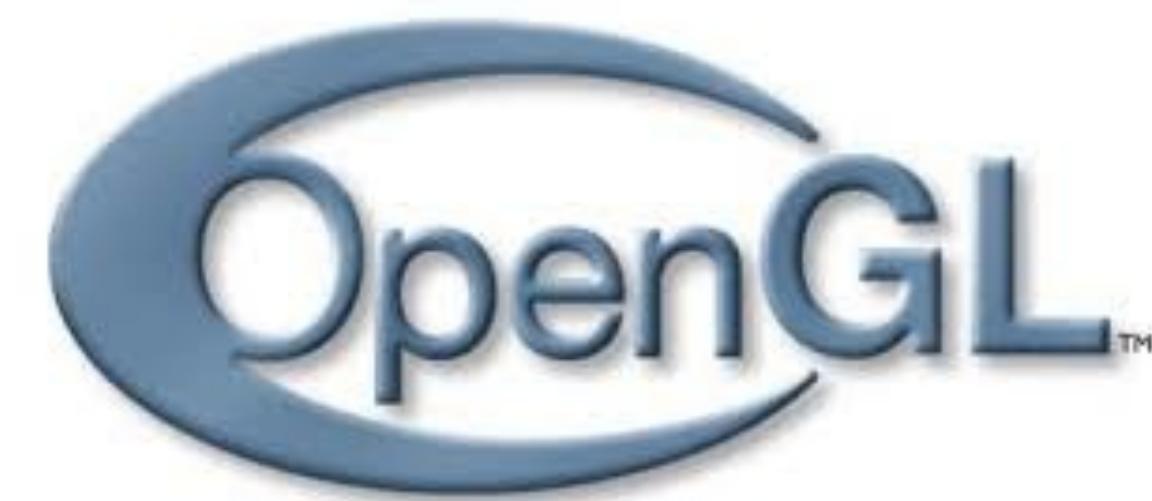


openFrameworks

openFrameworks is an [open source C++ toolkit](#) designed to assist the creative process by providing a simple and intuitive framework for experimentation. The toolkit is designed to work as a general purpose glue, and wraps together several commonly used libraries, including:

- > [OpenGL](#), [GLEW](#), [GLUT](#), [GLFW](#), [libtess2](#) and [cairo](#) for graphics
- > [rtAudio](#), [PortAudio](#) or [FMOD](#) and [Kiss FFT](#) for audio input, output and analysis
- > [FreeType](#) for fonts
- > [FreeImage](#) for image saving and loading
- > [Quicktime](#) and [videoInput](#) for video playback and grabbing
- > [Poco](#) for a variety of utilities











How does computer think about what it see ?

Computer Vision examples



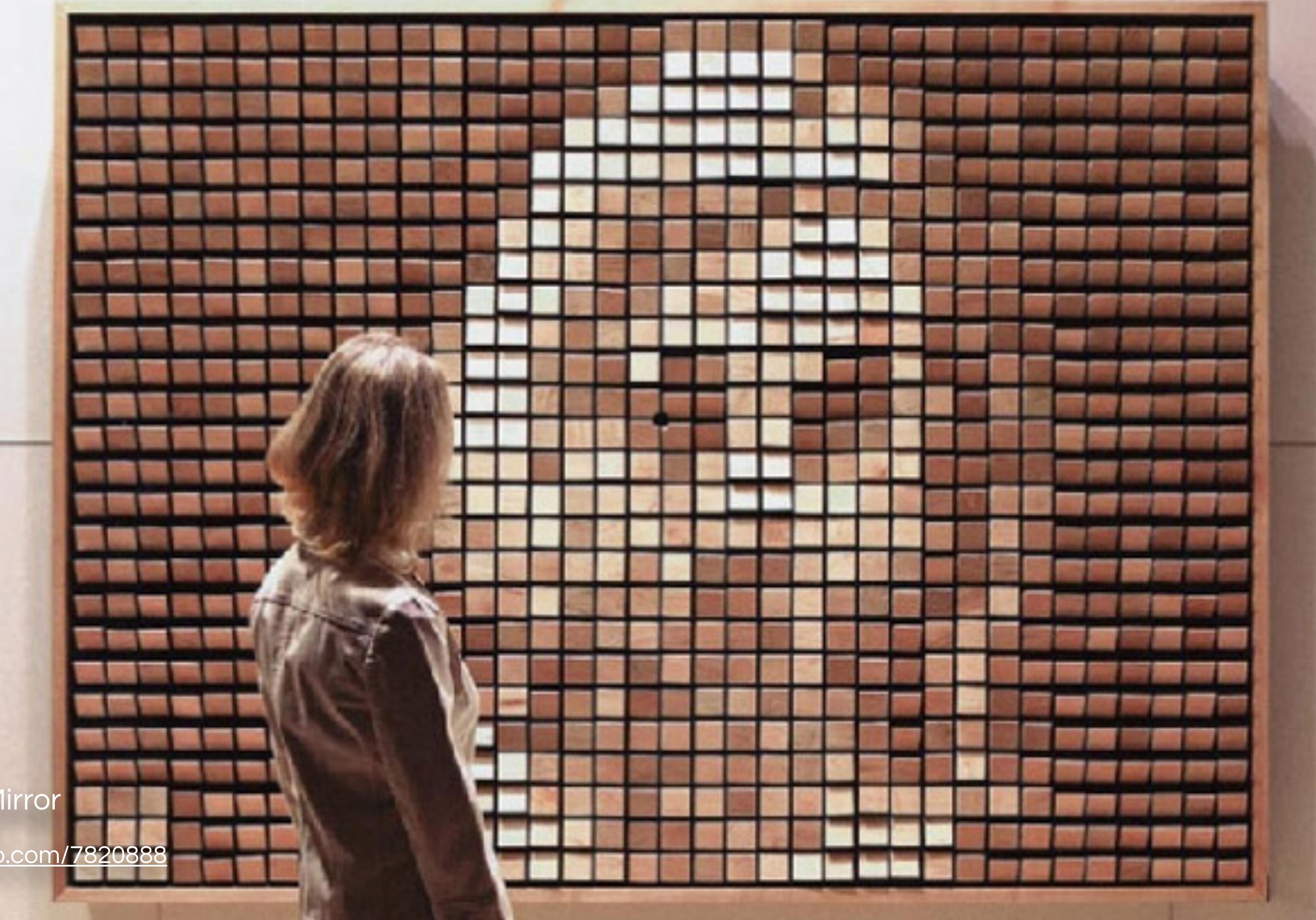
<https://vimeo.com/36239715>



Robot Readable World

C106
M46

CARGO
11/01/03 08:46:21



Wooden Mirror

Daniel Rozin

<https://vimeo.com/7820888>



The background of the image is a dark, abstract geometric pattern composed of numerous small, sharp triangles in shades of purple, pink, and orange. These triangles are arranged in a way that suggests a three-dimensional, crystalline or fractal structure, with some points being more prominent than others.

The Wombats 'Techno Fan'
Memo Akten & The Found Collective
<http://www.msavisuals.com/wombats-techno-fan/>





Homographies

Rafael Lozano-Hemmer

<http://www.lozano-hemmer.com/homographies.php>



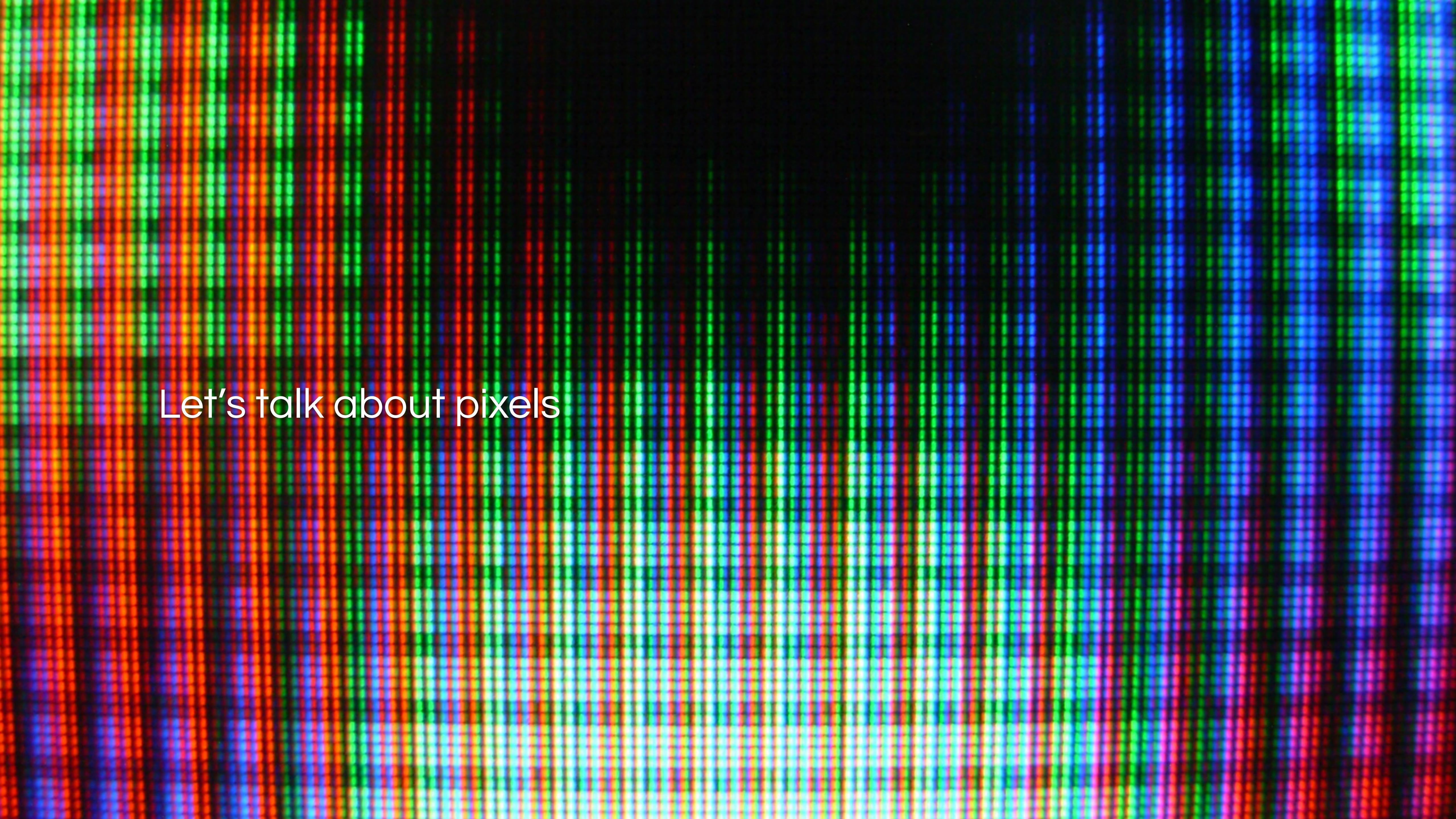
Wind
Damian Stewart
<http://damianstewart.com/>

The background of the image is a close-up view of tall, green grasses with long, thin blades, swaying slightly. In the upper right corner, there is a dark green, leafy hedge or bush. The lighting suggests a bright, possibly sunny day.

wind
sound from motion

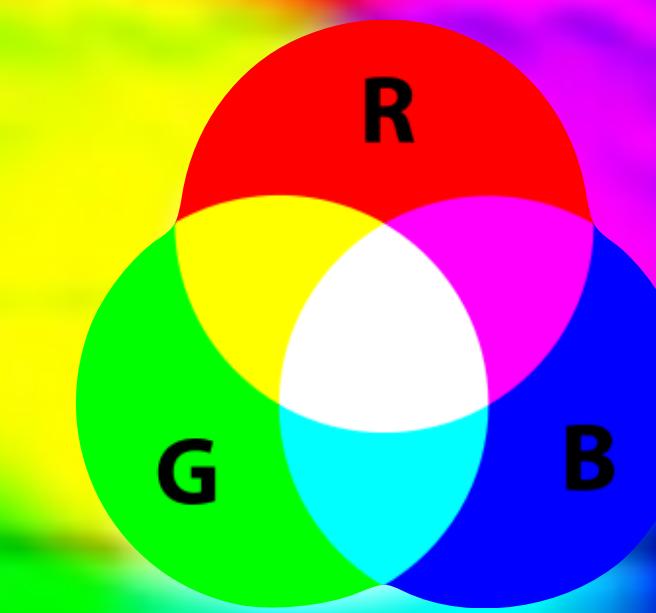
damian stewart 2008-2011

How does computer think about what it see ?



Let's talk about pixels

Additive color



TV CRT

PC CRT

XO-1 LCD

LCD

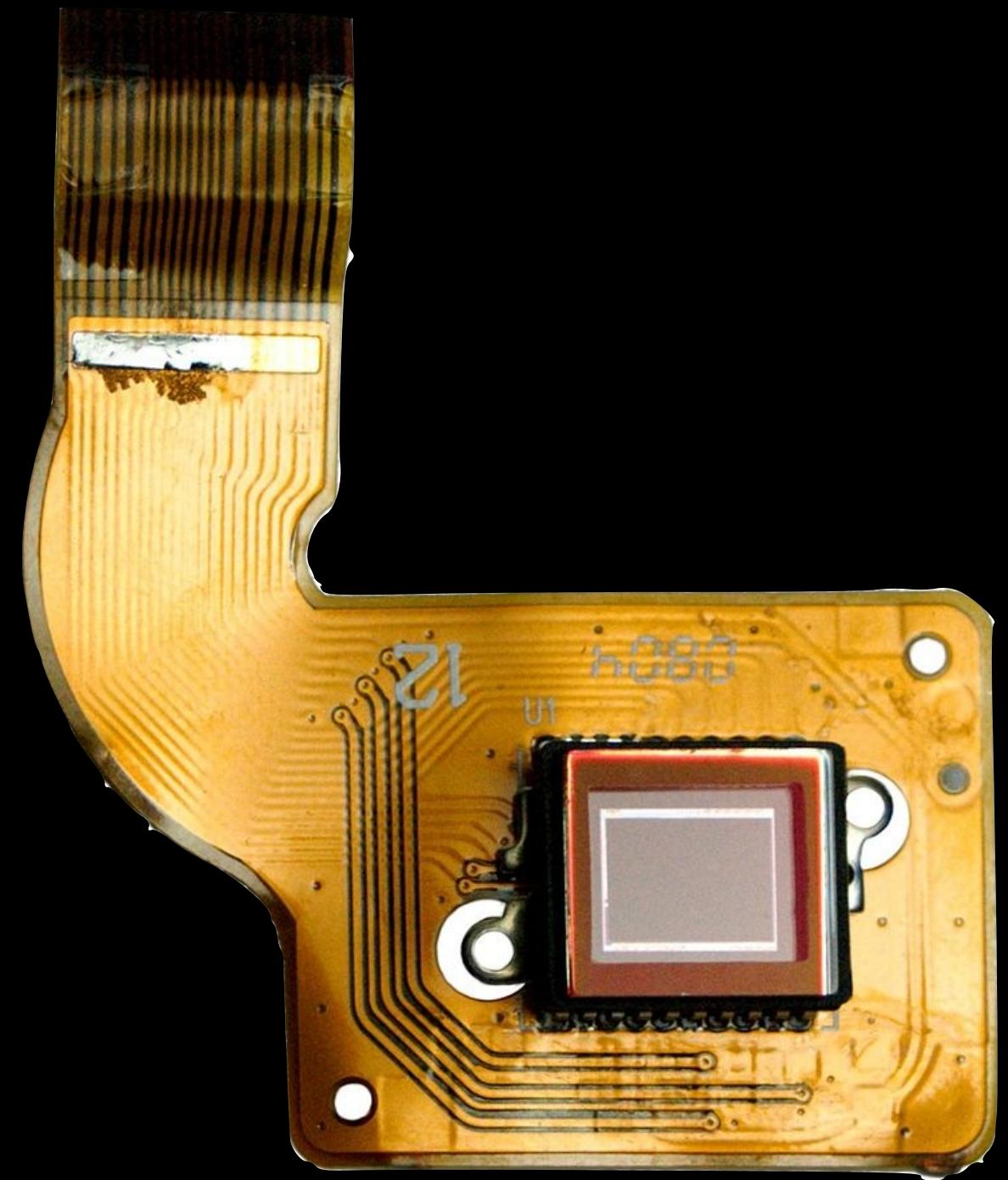
iPad

iPhone 1G

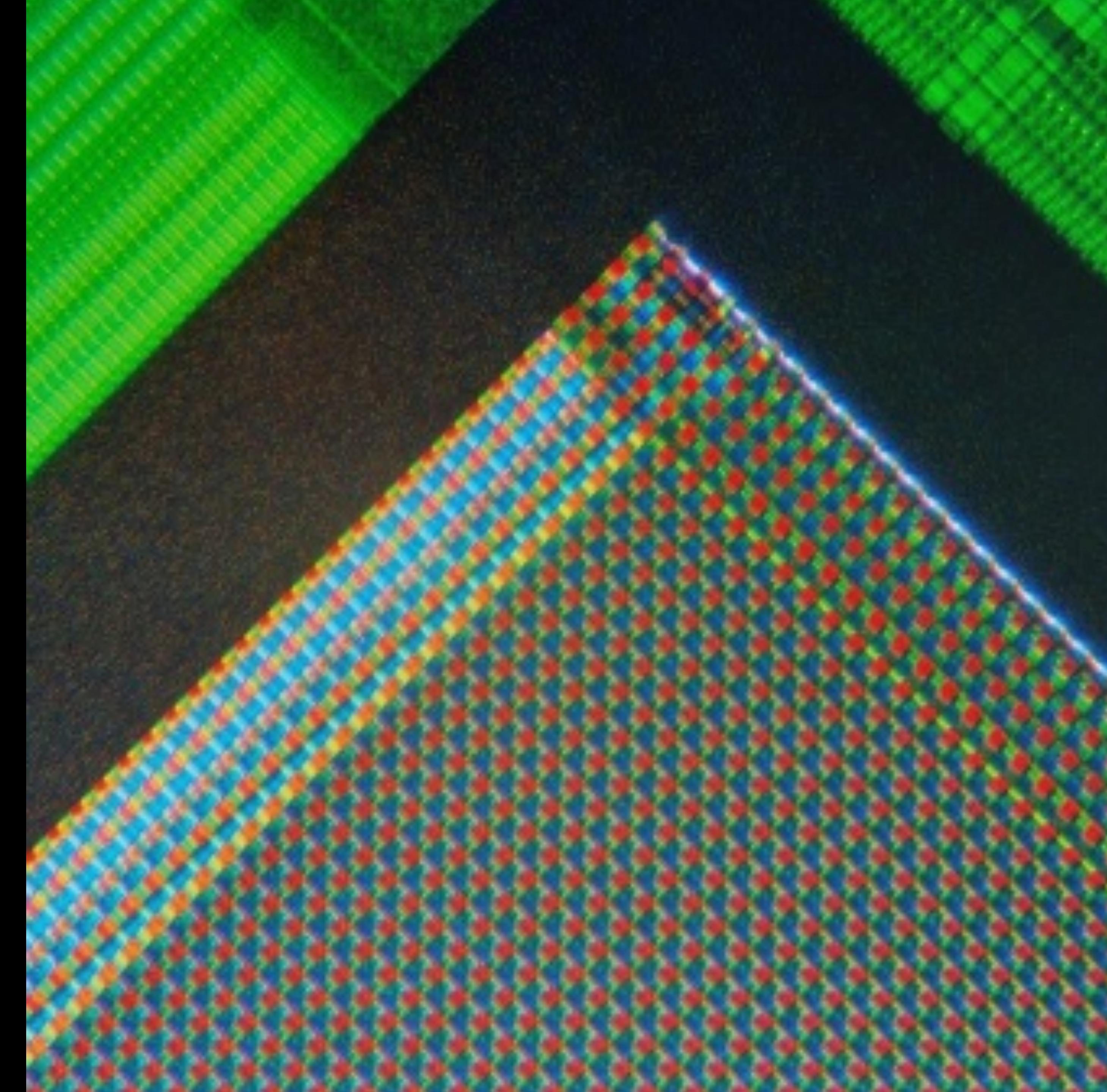
iPhone 3G

iPhone 4G

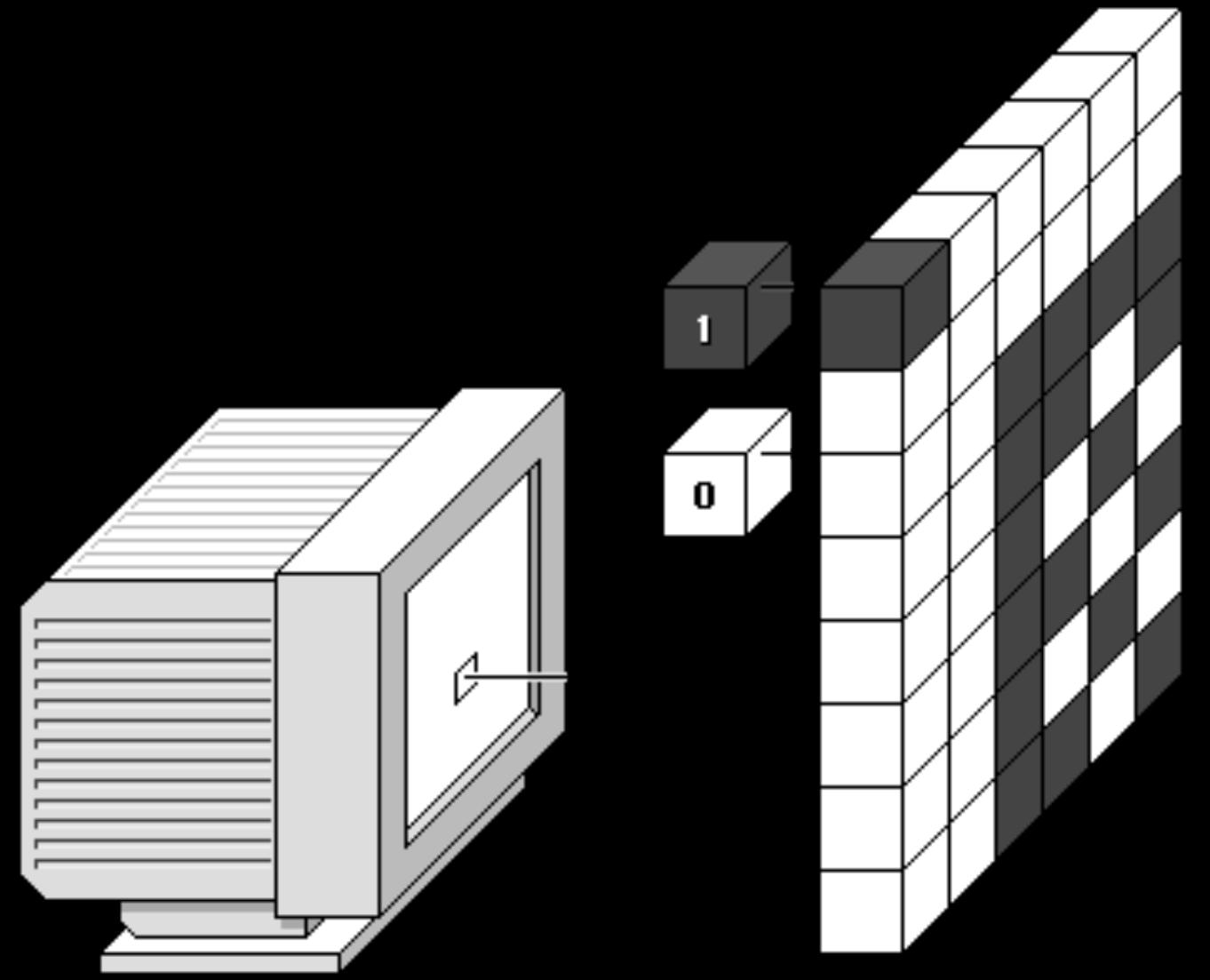
Screen



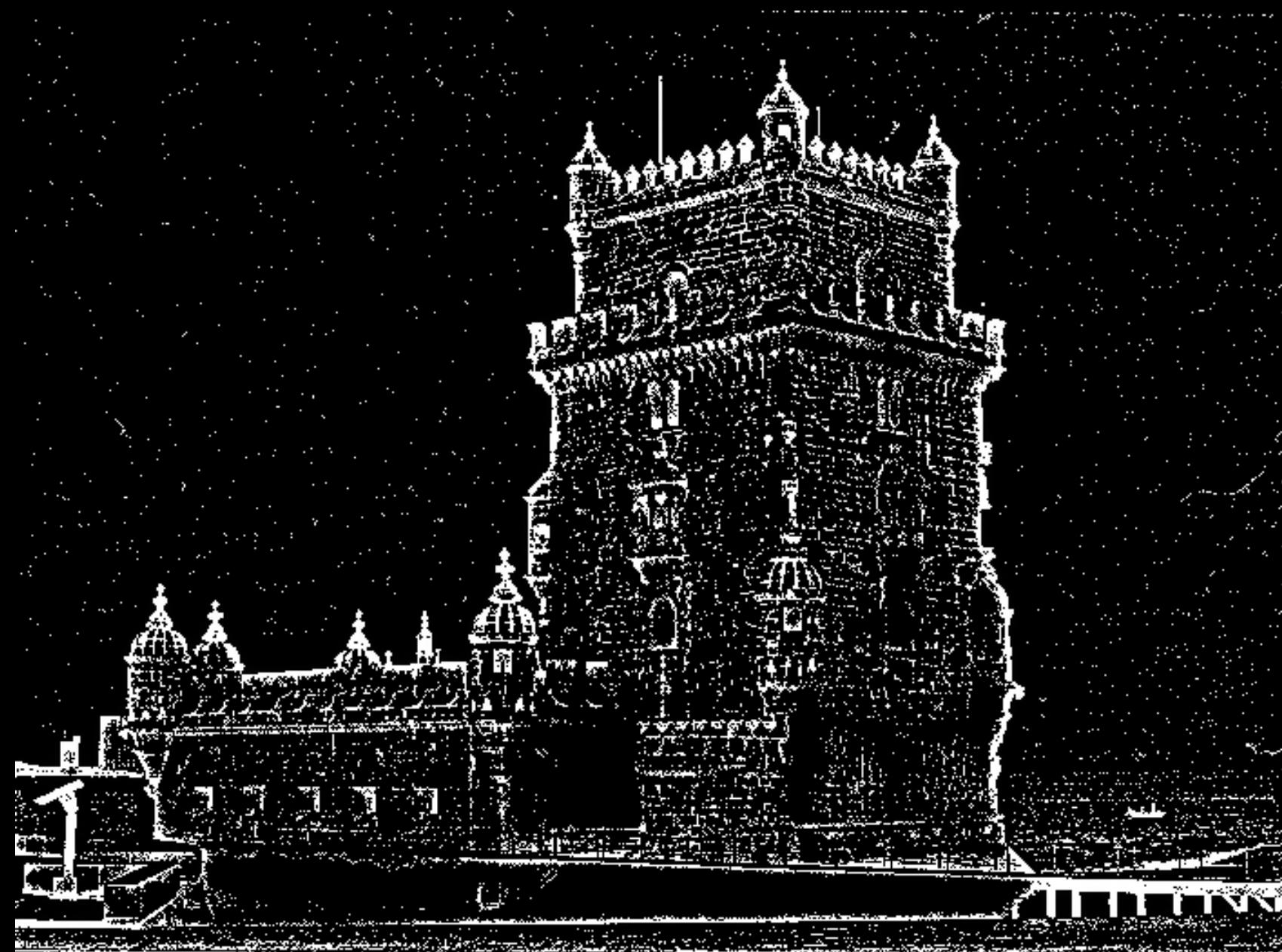
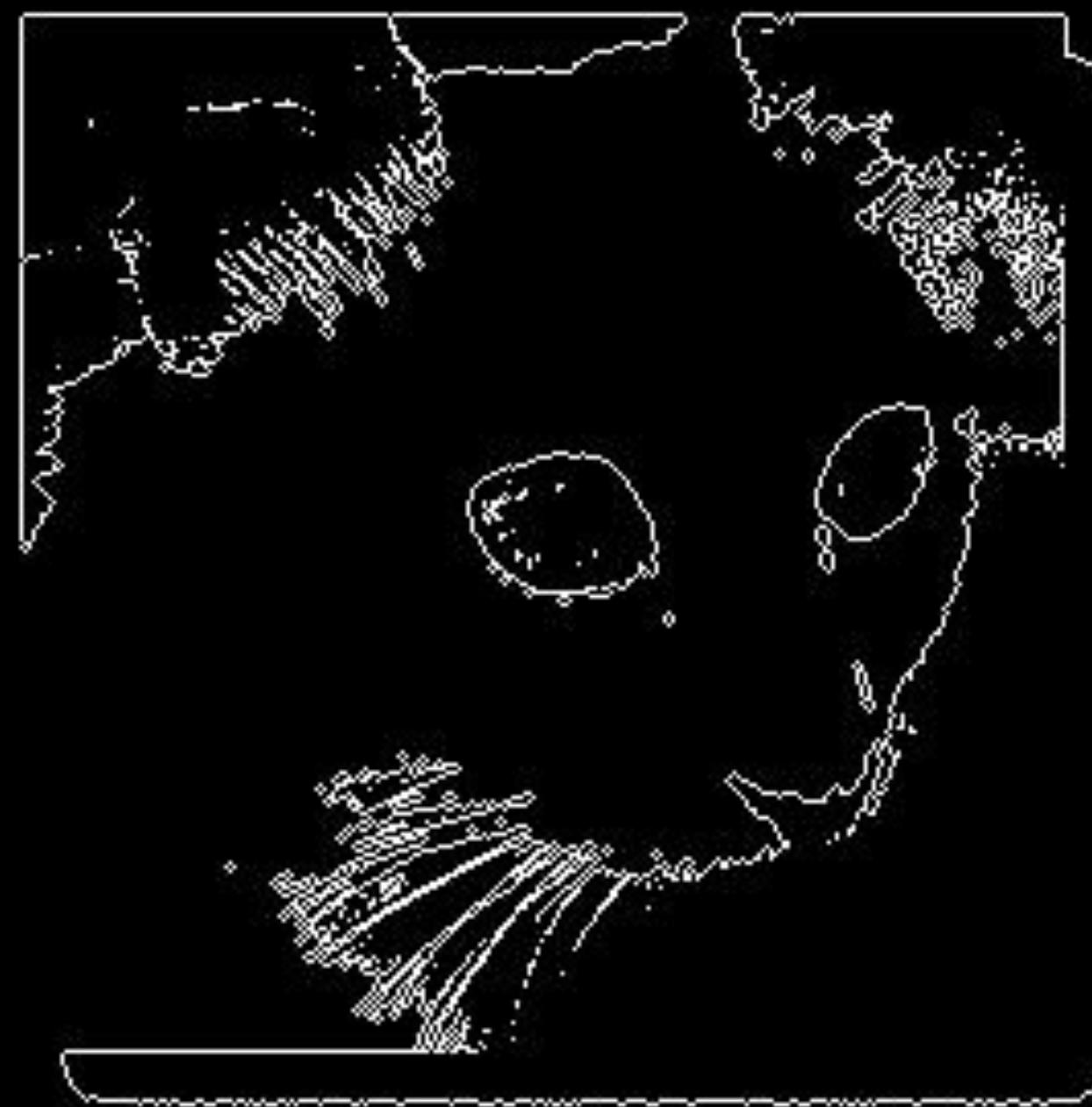
Camera Sensor



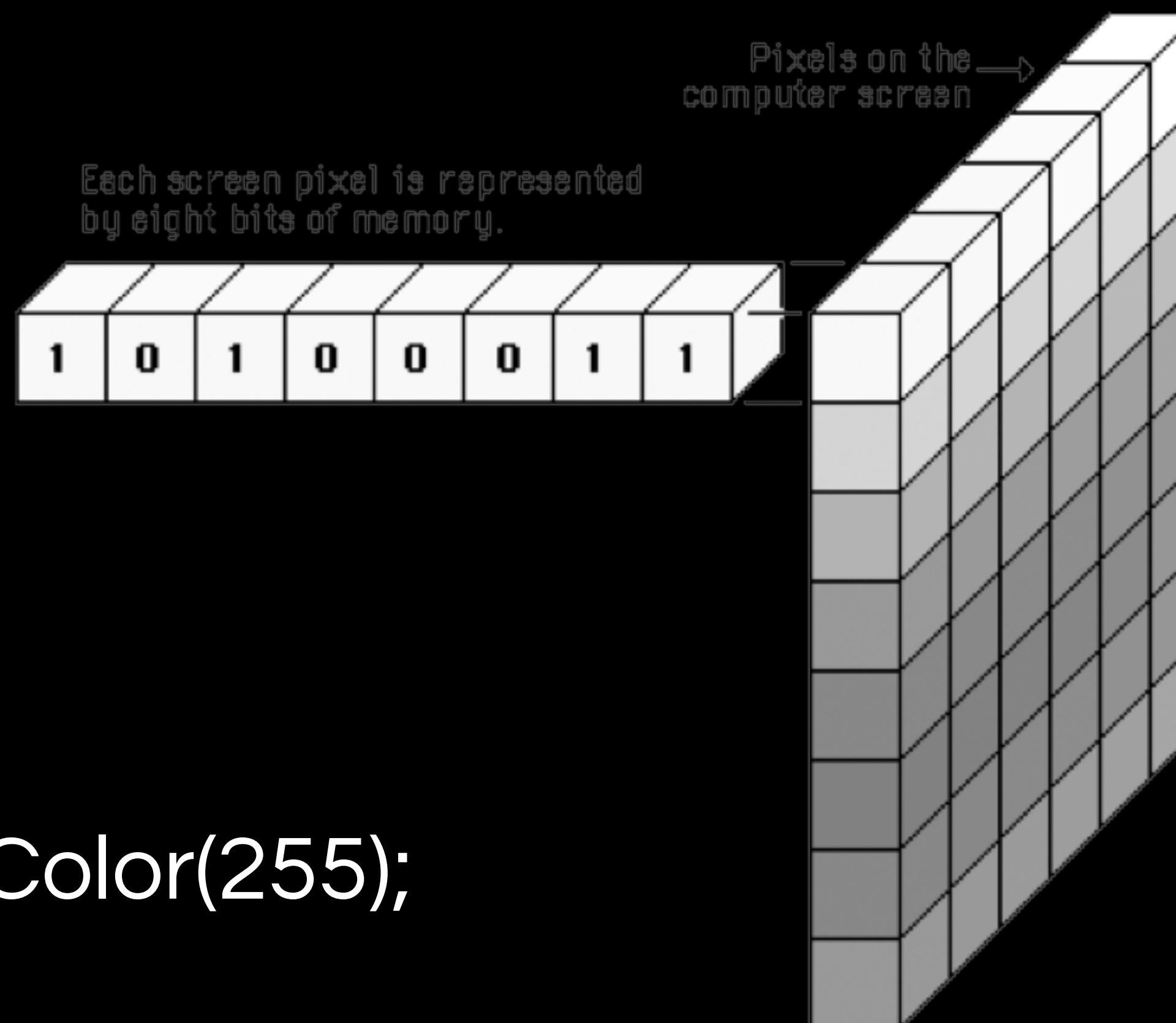
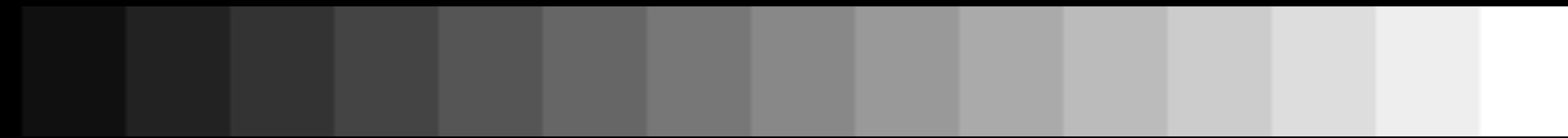
darkness (black) is absence of light



Binary Image
1-bit monochrome
0 / 1

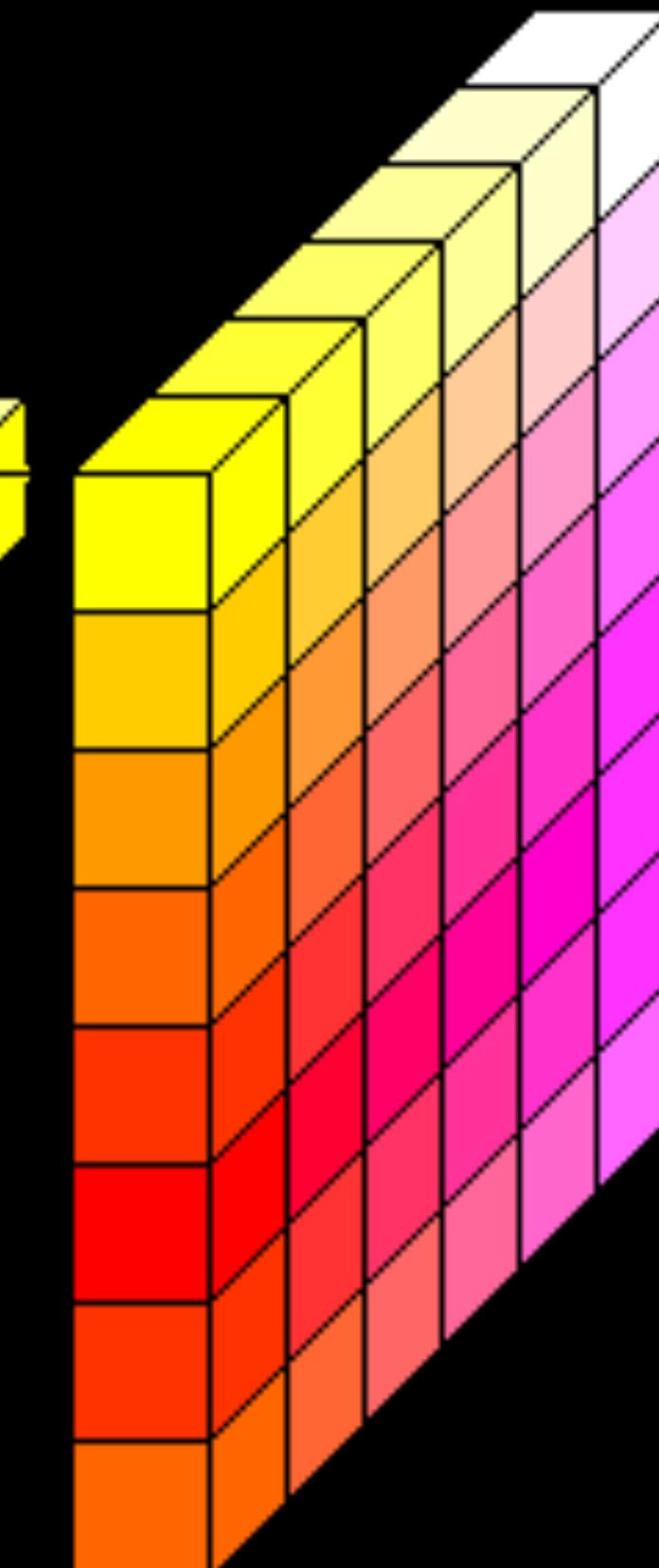
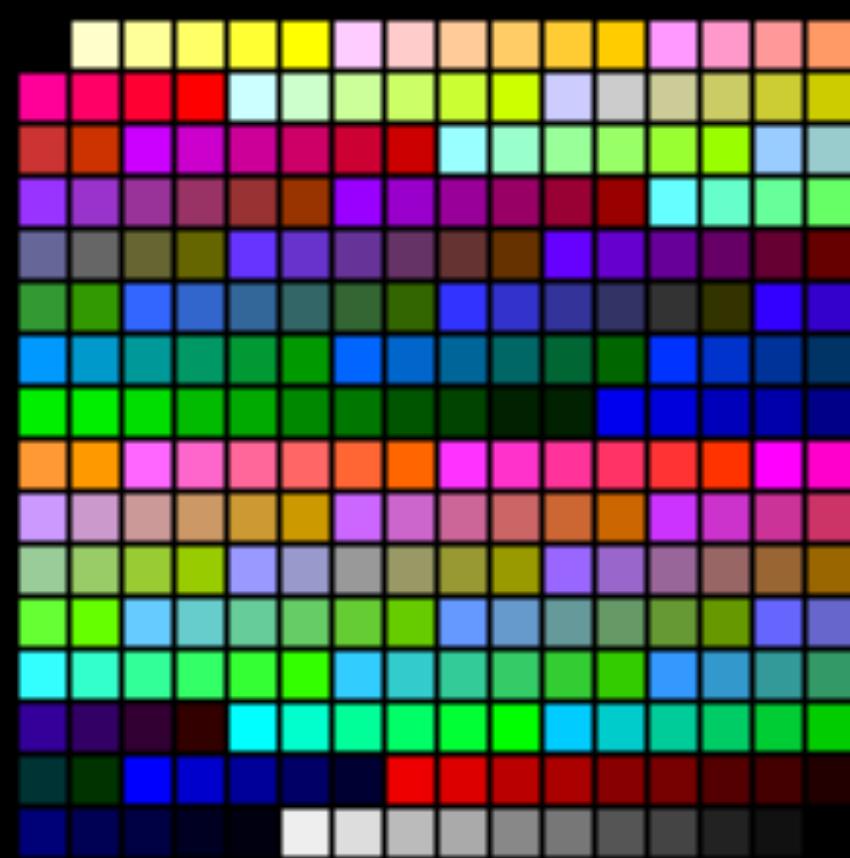
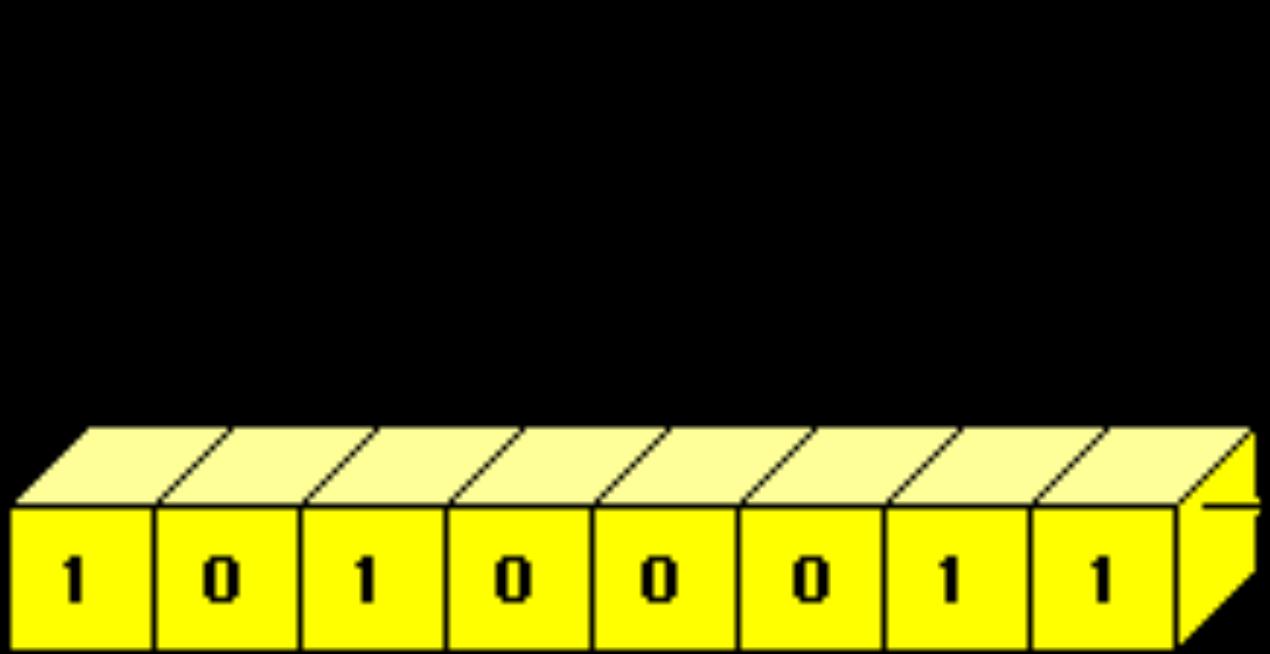


grayscale image
0-255 (8 bits)

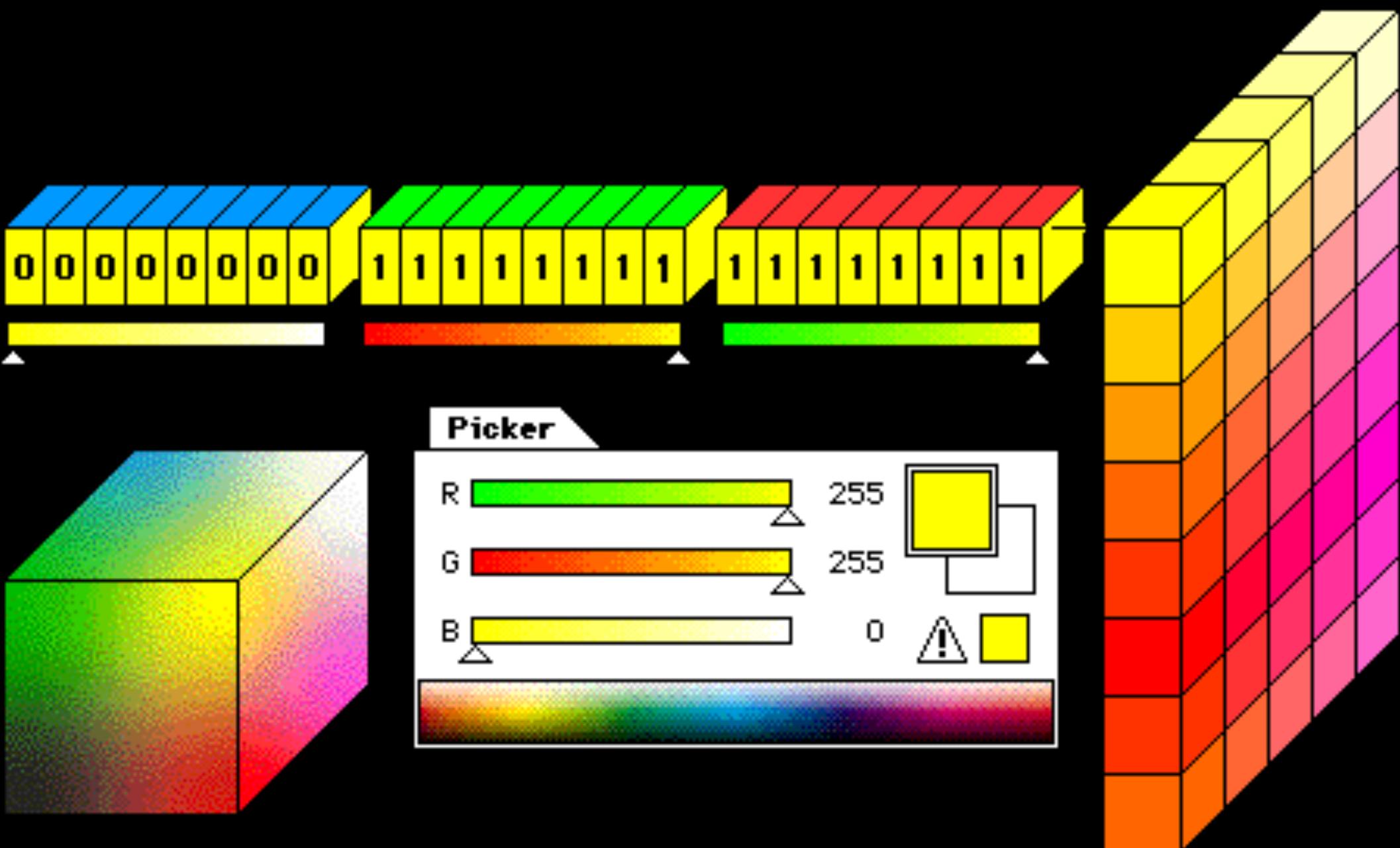


ofSetColor(255);

8 bits color

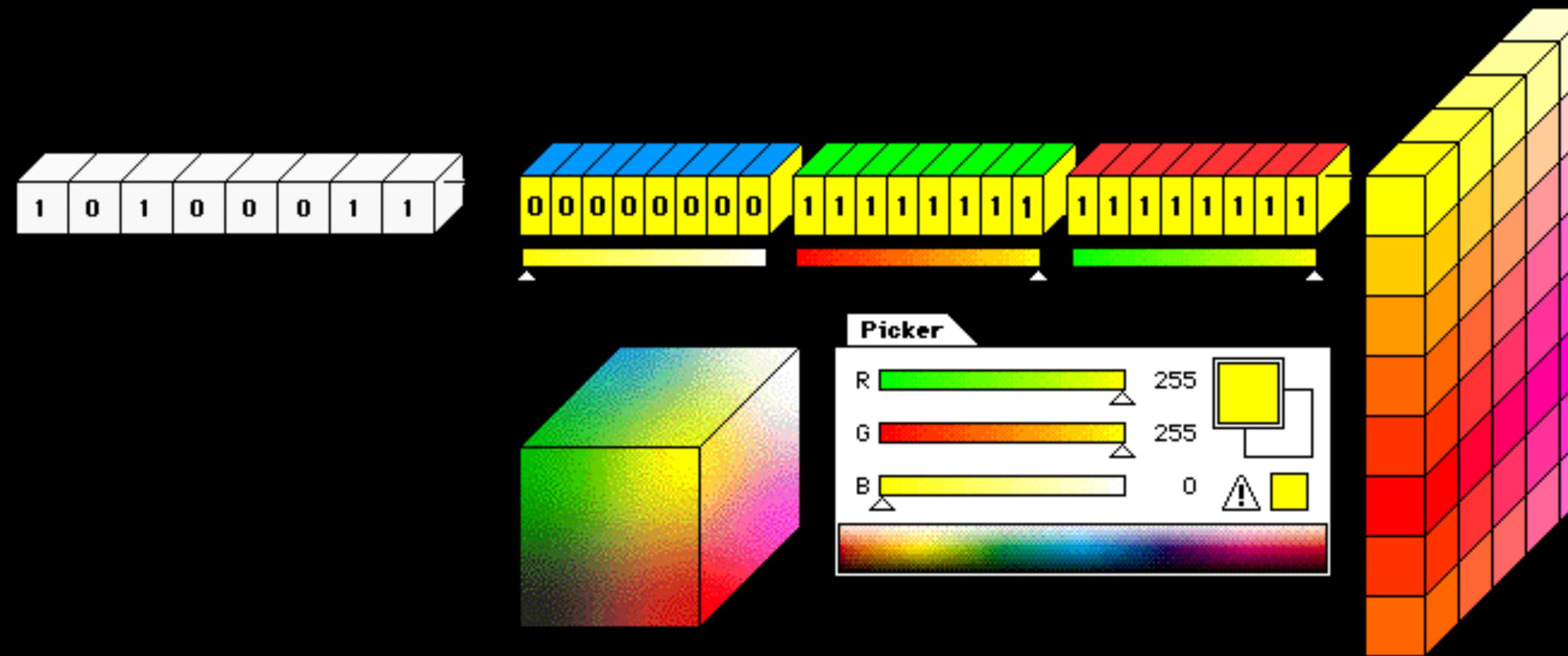


True Color (24-bit)
millions of colors
0-255 (8 bits) for 'each' color



`ofSetColor(255, 255, 255);`

True Color (32-bit)
0-255 (8 bits) for 'each' color
and alpha channel

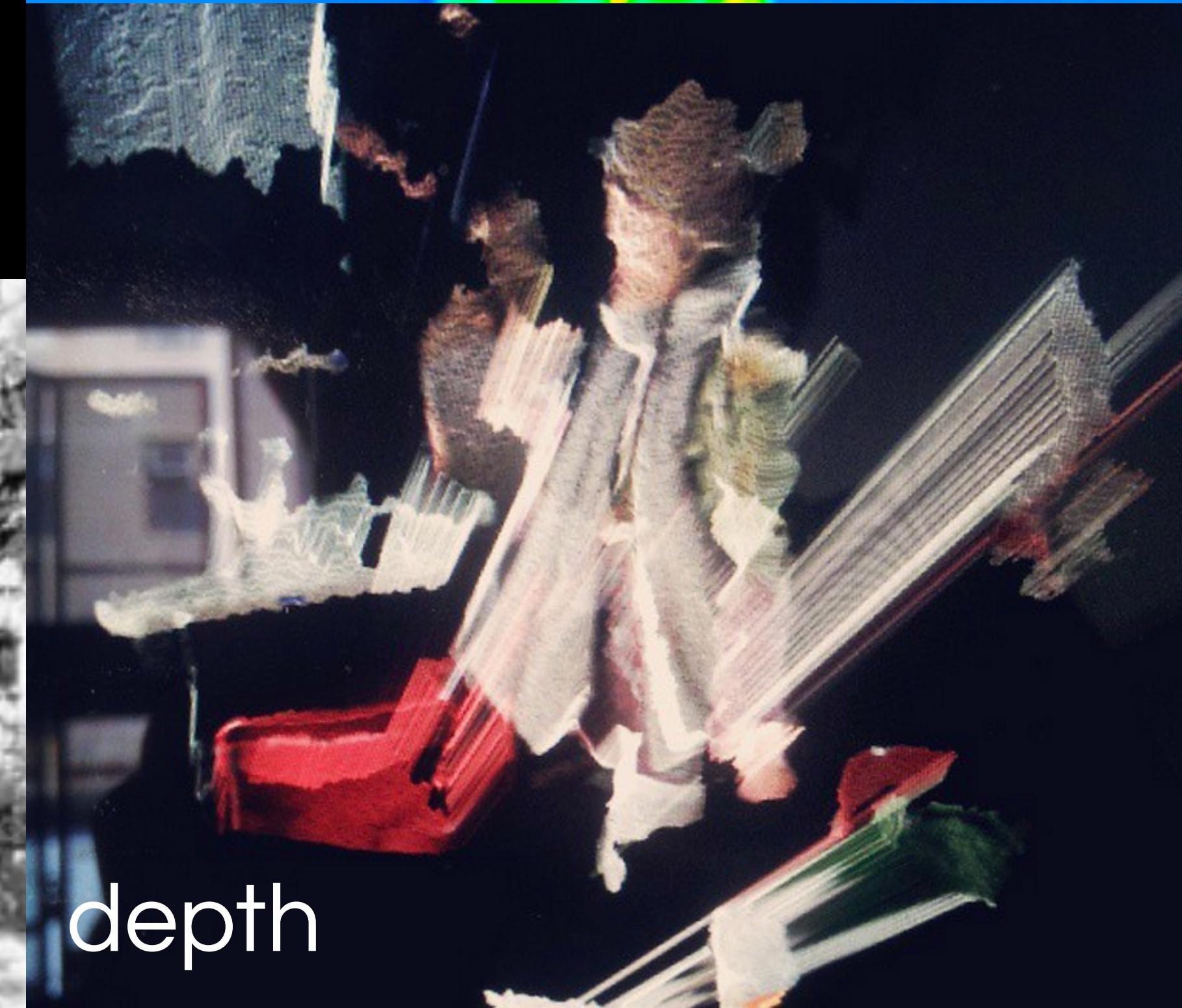
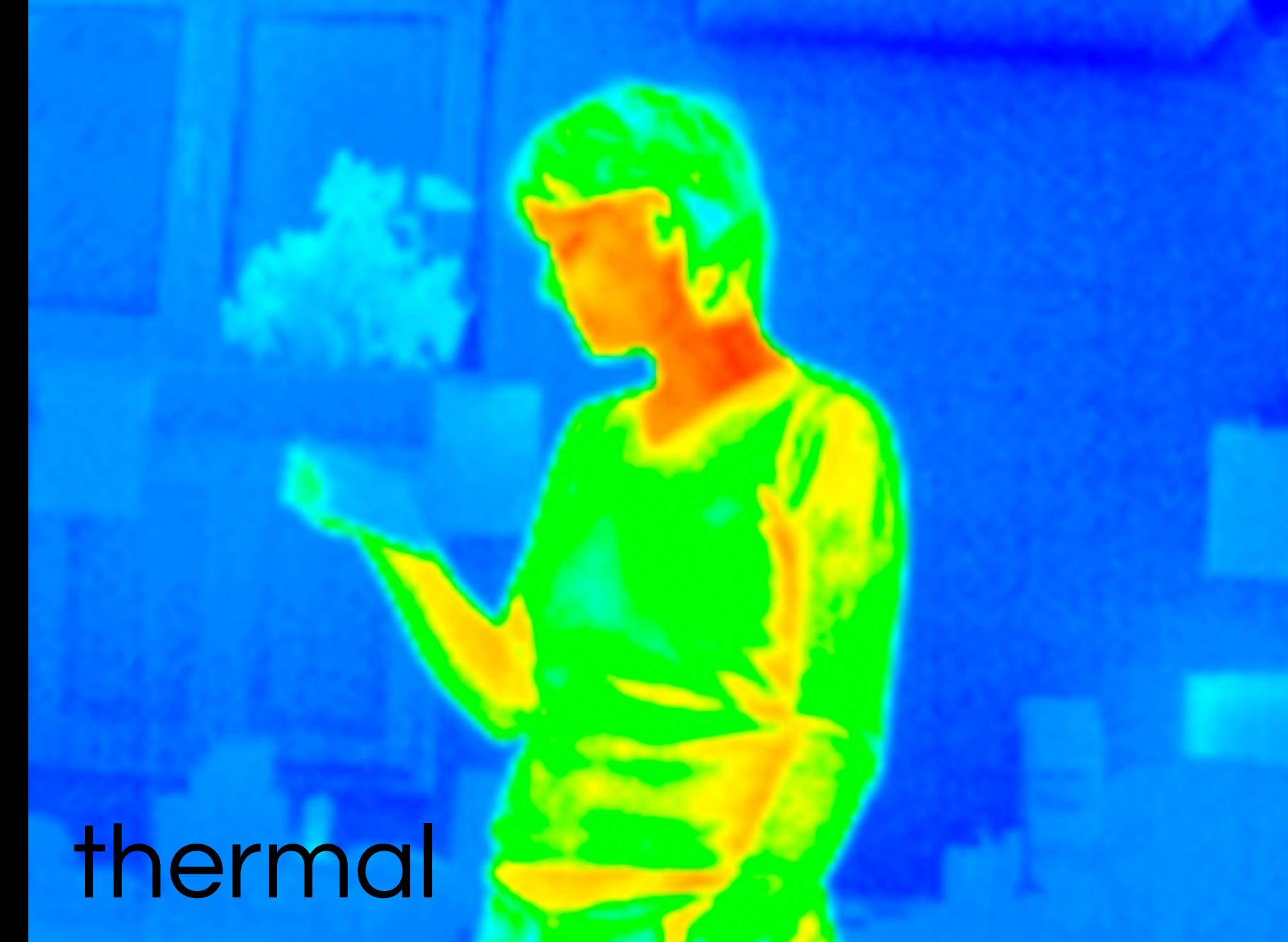


`ofSetColor(255, 255, 255, 255);`

other kind of cameras



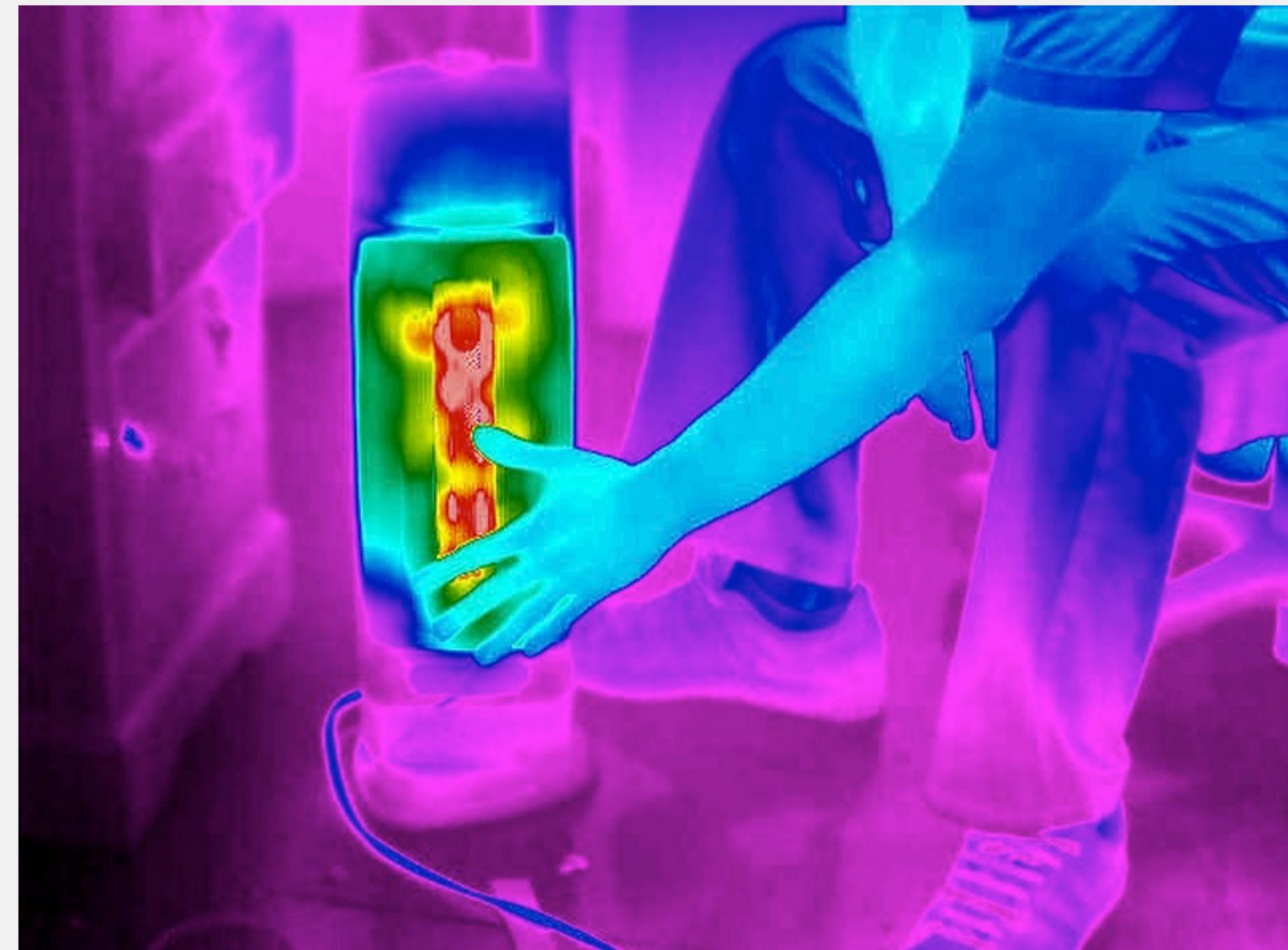
infrared





CREATIVE
APPLICATIONS
NETWORK

Guide to Camera Types for Interactive Installations



(image source)

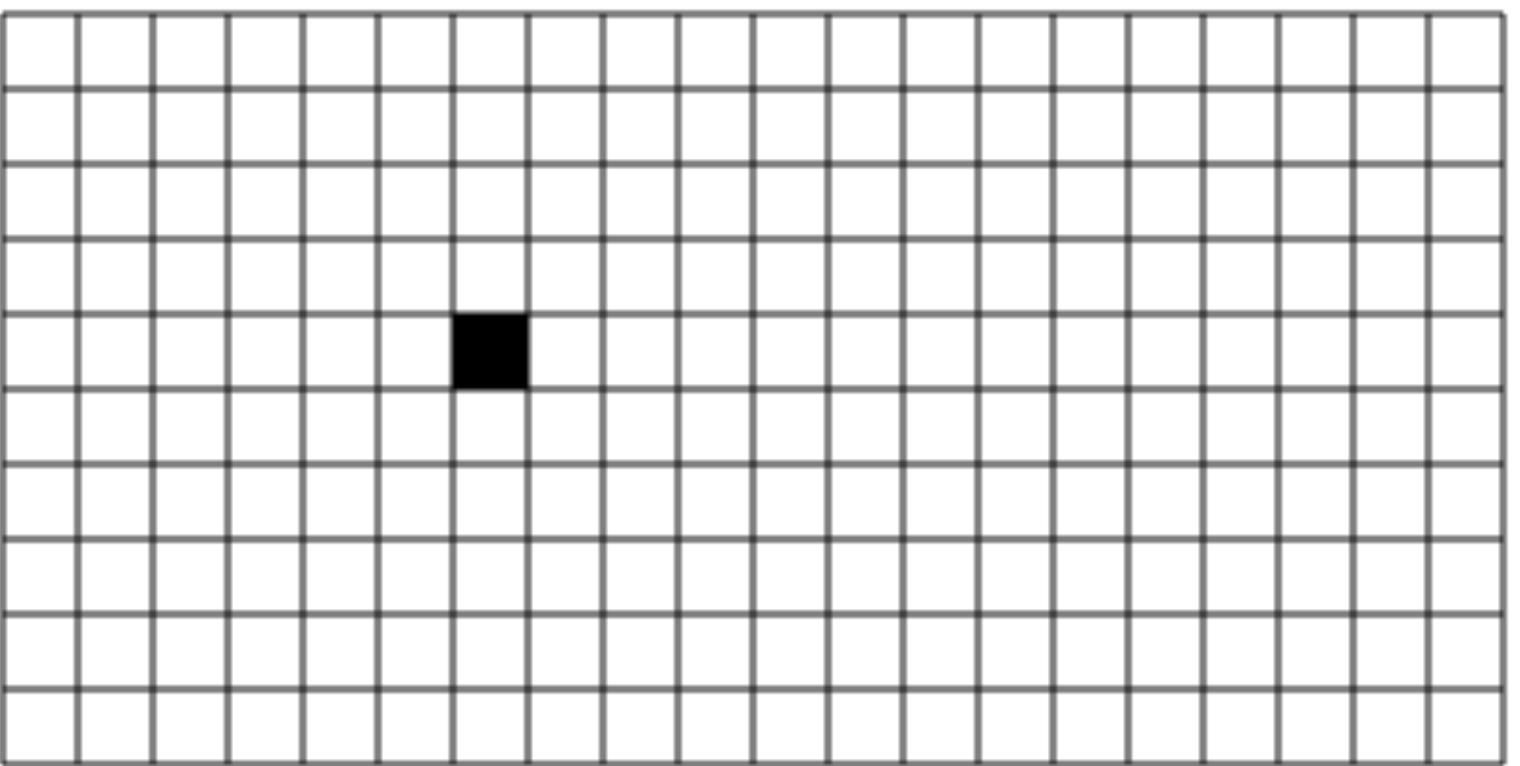
Choosing the right type of camera for your interactive installation is one of the most important technical choices you can make in your initial planning phases. Making the incorrect choice can really impact how well your installation reacts to its visitors and it can also impact its ability to perform robustly in a large amount of environments. You can always correct for certain things in software, but the hardware setup can often be the first line of defense against undesired behavior.

Whether you're working in [Processing](#), [OpenFrameworks](#), [Max/MSP/Jitter](#), [Quartz Composer](#), [Cinder](#), [VVVV](#), or really any artistically geared programming environment, your choice of camera can impact your work no matter the software. Some environments will give you more options with different cameras (maybe you need a Blackmagic capture card, or an IP cam, or a DSLR, or a Point Grey Firefly). Some environments won't have support for certain kinds of cameras, so do some checking before you think you can just plug your DSLR straight into Quartz Composer and expect it to be recognized. If the tool doesn't exist to port it in, there are a lot of technologies to do routing between applications (see [CamTwist](#) and [Syphon](#) for OS X), so you may have some luck there.

Each type of imager typically has some amazing strengths and some really hindering downfalls, so it's important to keep these kinds of questions in mind when planning your installation. For beginners, don't expect that because it works in your workspace, it'll work on the classroom or gallery floor... if at all possible, test it early!

<http://www.creativeapplications.net/tutorials/guide-to-camera-types-for-interactive-installations/>

how computer think about pixel



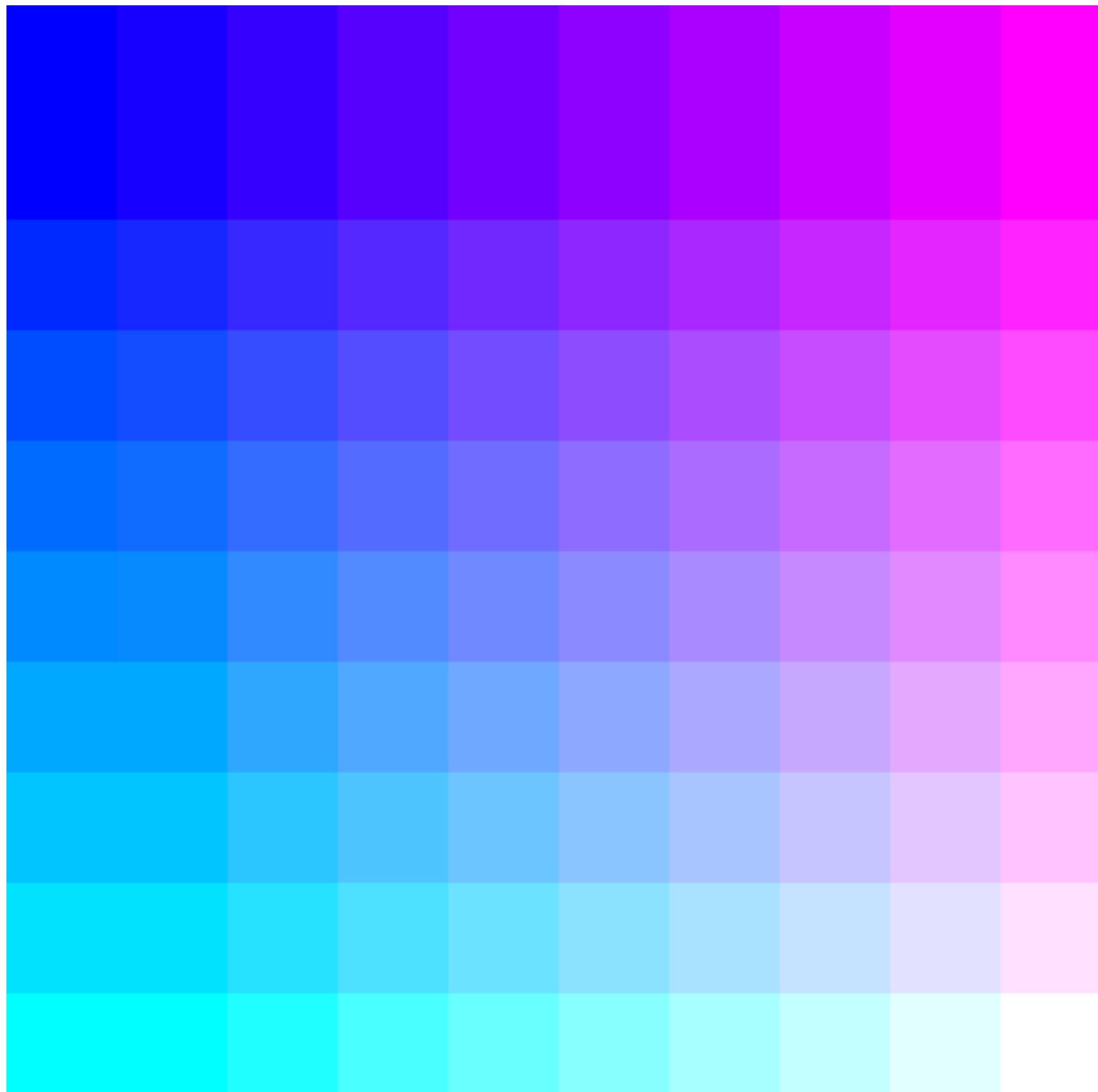
position = 86

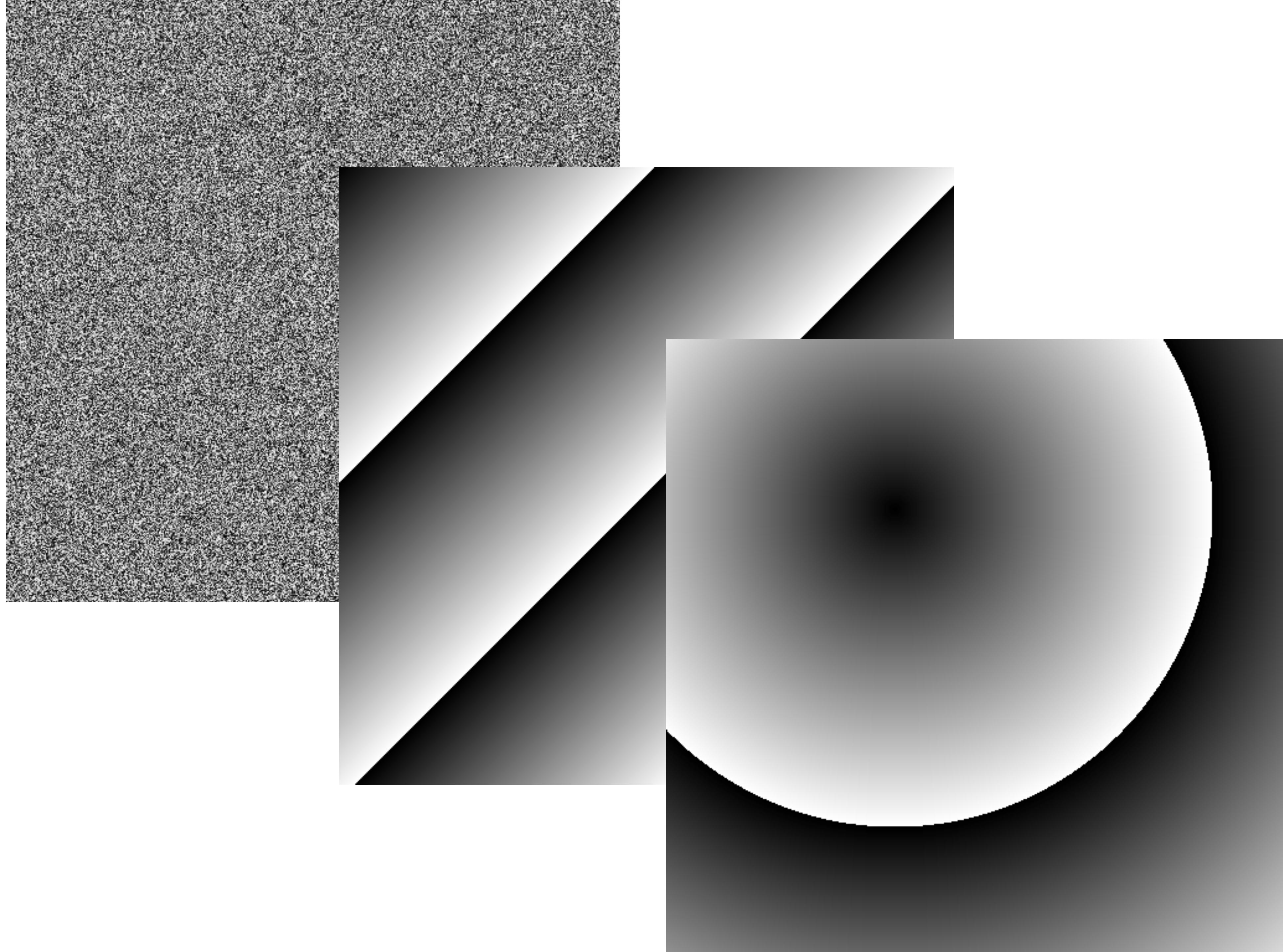
position / width (float) = 4.300

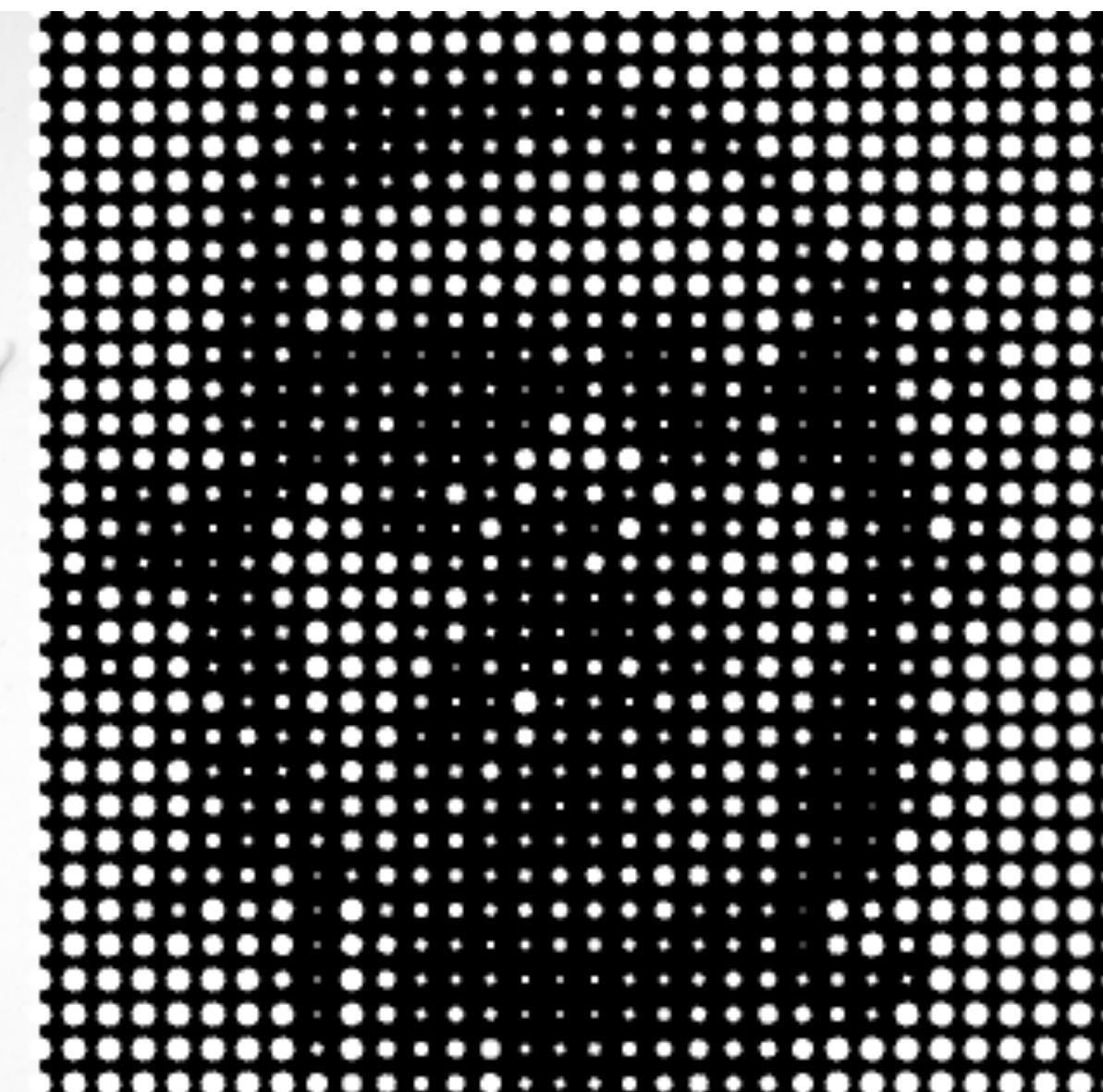
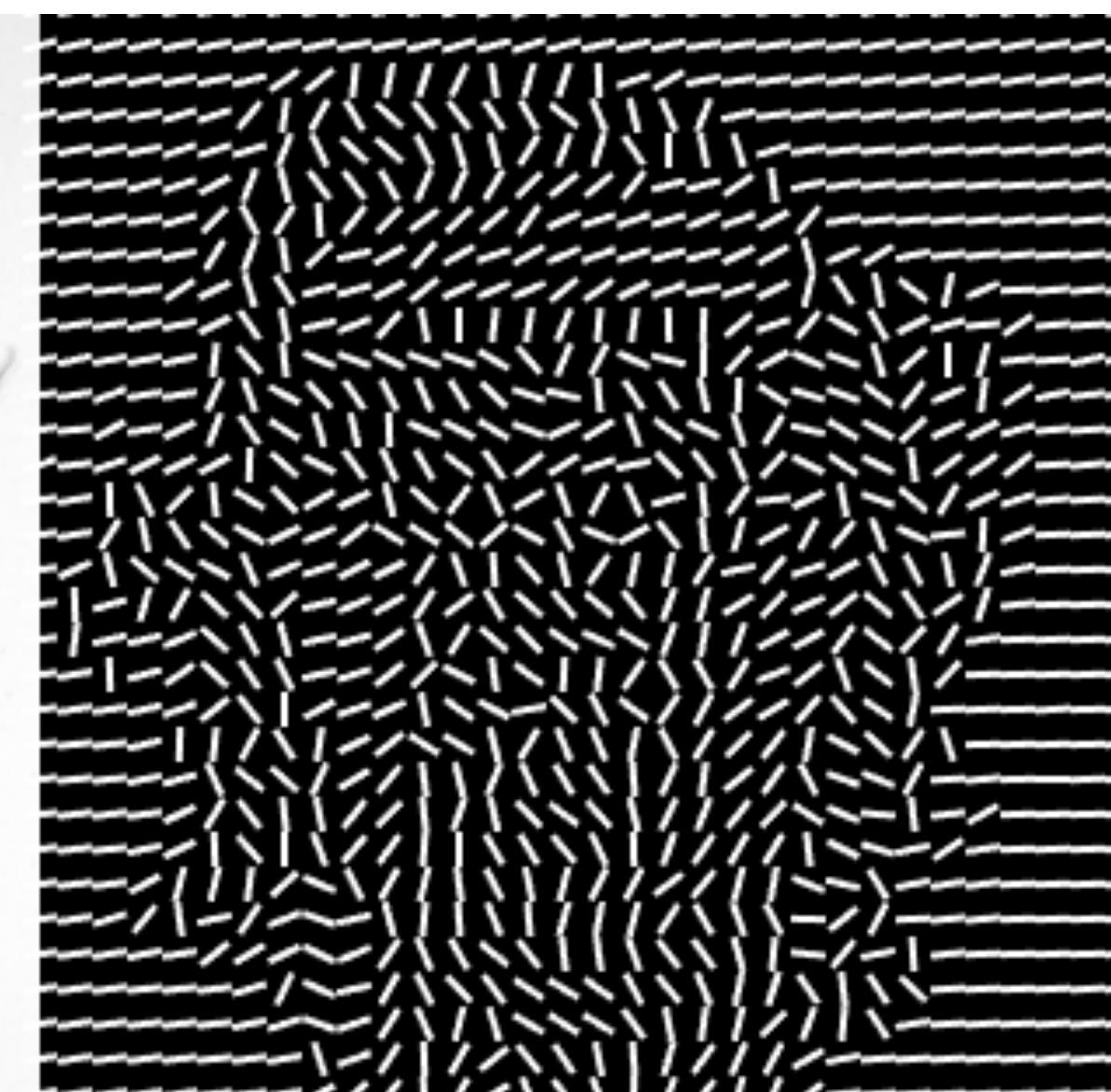
(y) position / width (int) = 4

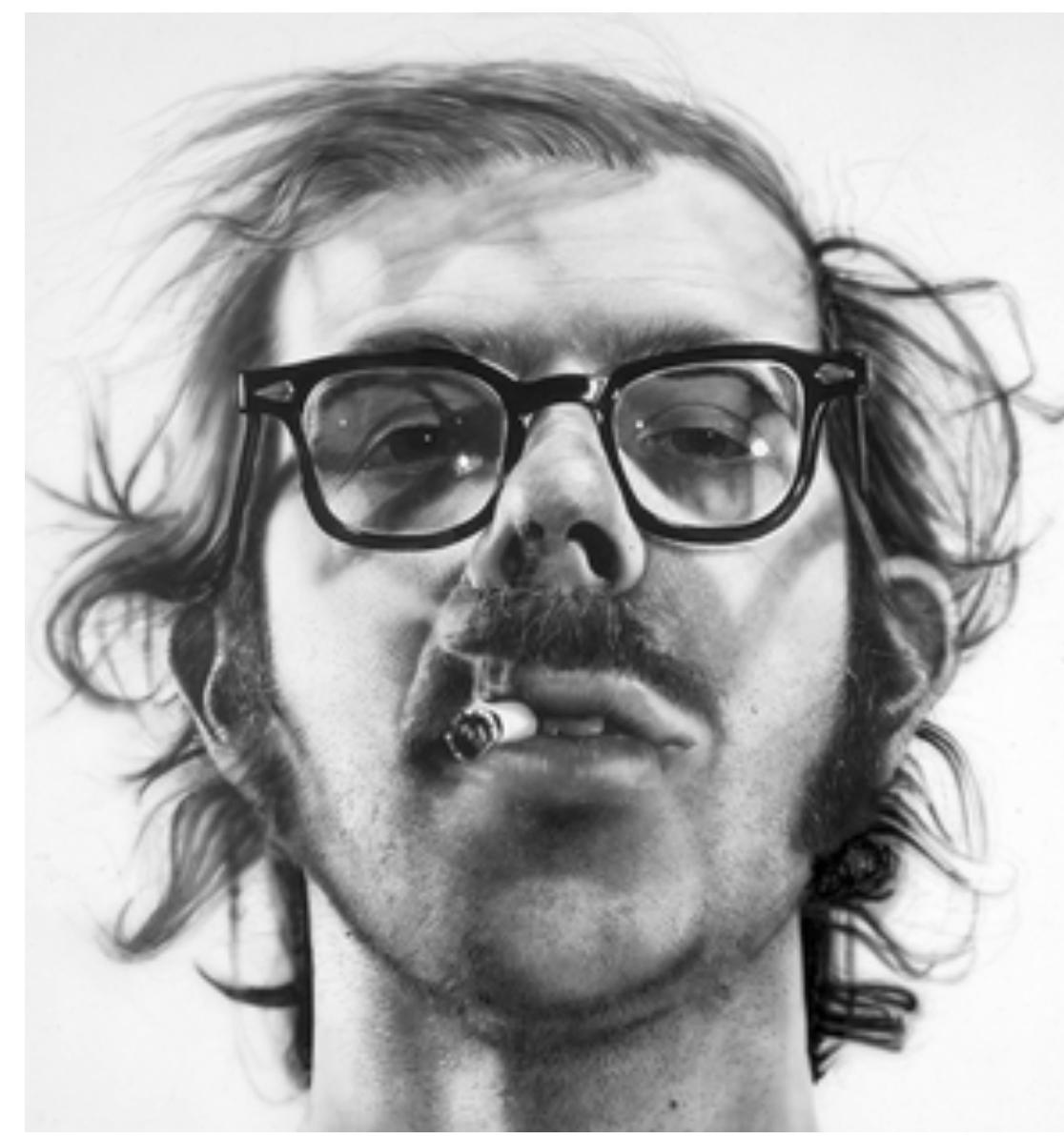
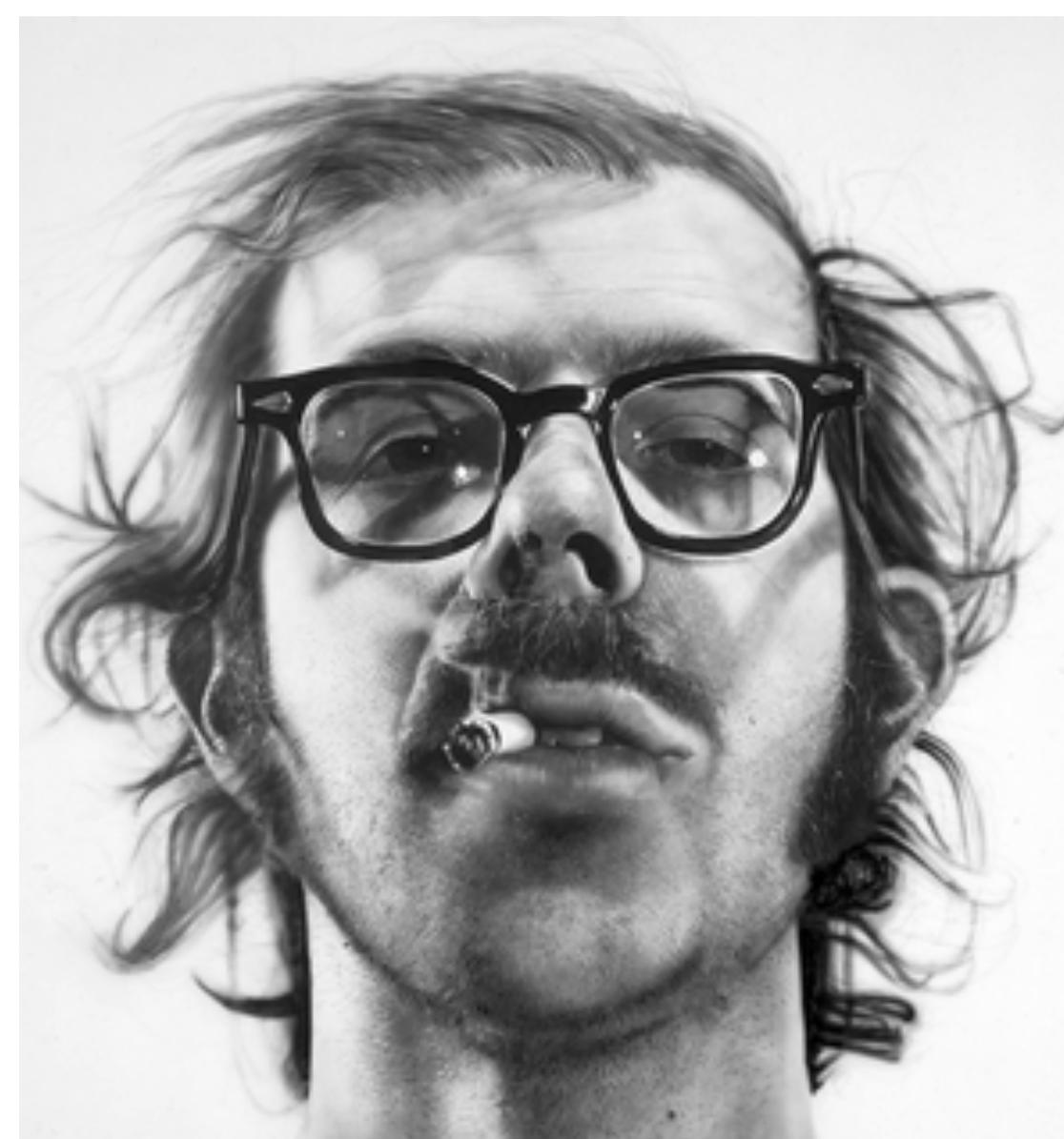
(x) position % width = 6

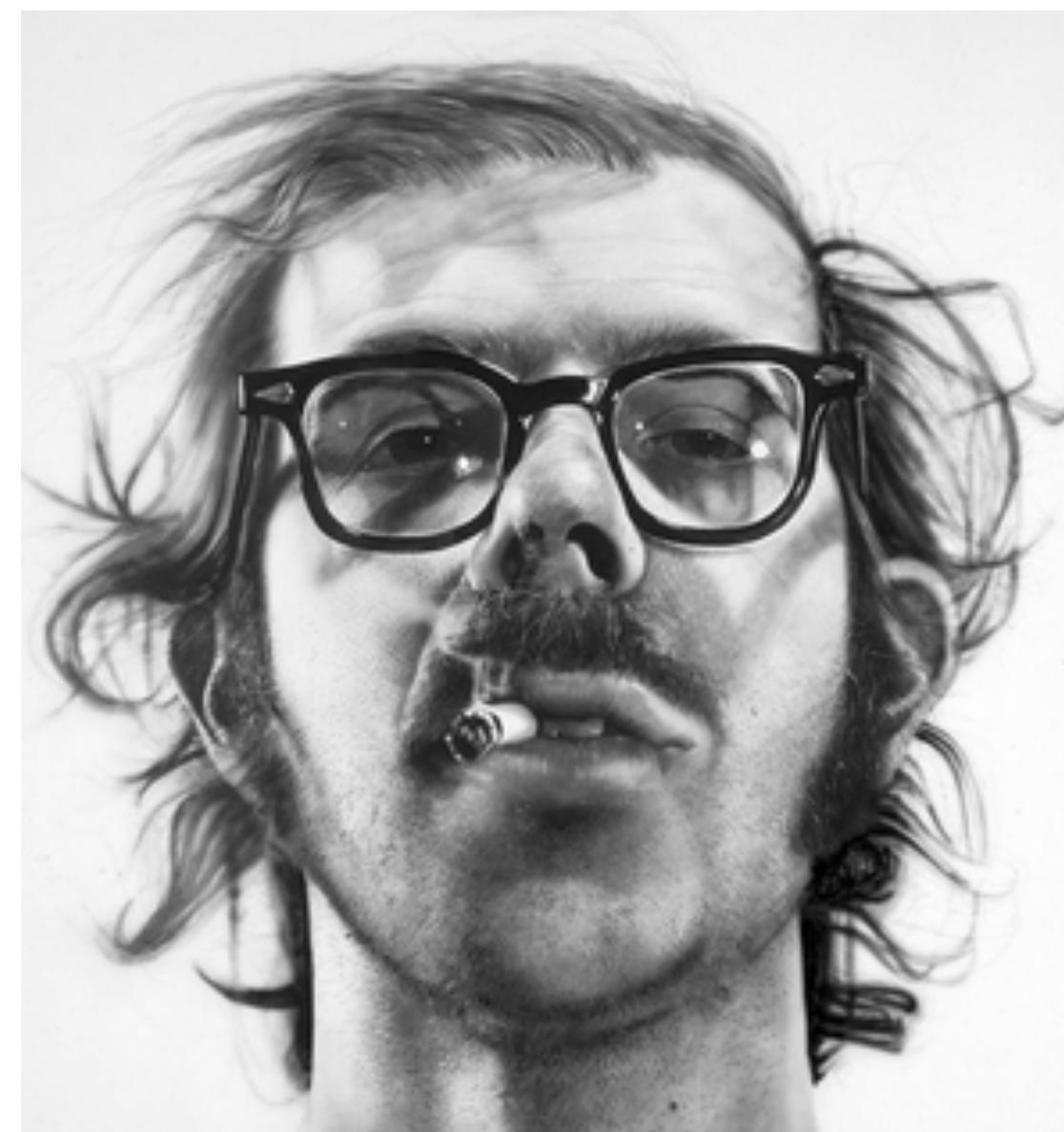
y * width + x = 86

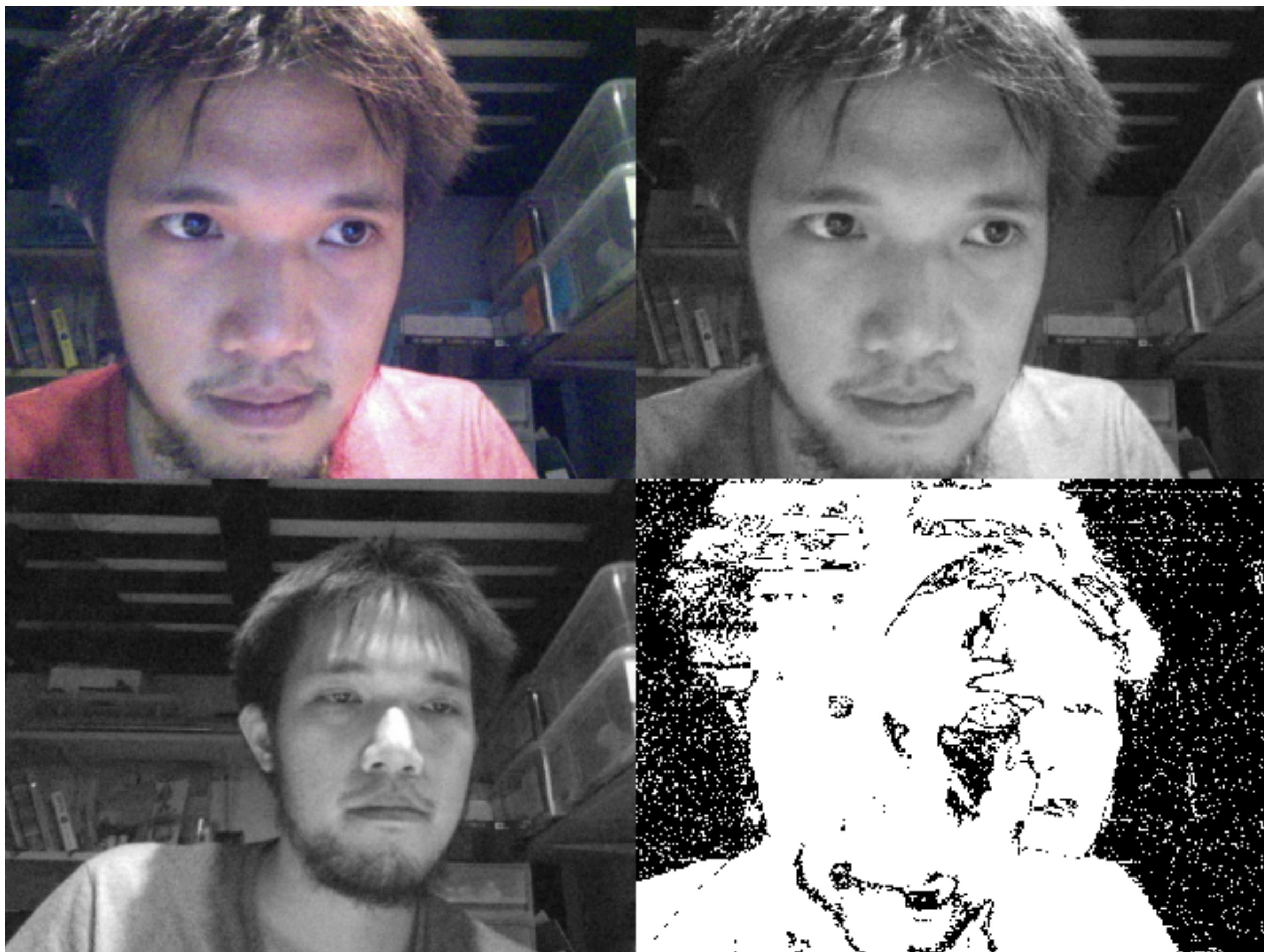














let's cut & paste all the fun!
make angle movement
with absDiff

HSB color space

