Developer Student Clubs

Introduction to Image Processing

Beginner-friendly | No prerequisite needed

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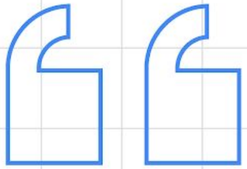
Google Developers

What to expect

You won’t become a Image Processing Expert in an hour, but you’ll have clarity on topic

- How are images stored
- What are role of matrices?
- Colour Spaces
- Image Manipulation
- Code Sample



“Entire world can be mapped as a matrix”

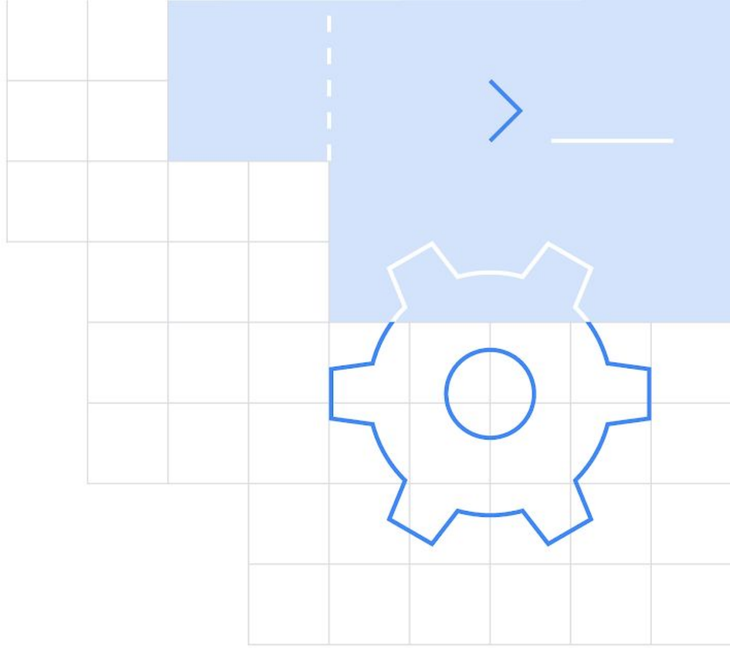
-Someone 

18.06SC, Fall 2011

Linear Algebra

Gilbert Strang

Course Introduction



Decoding Images

Transparency, Colour Model and Channels

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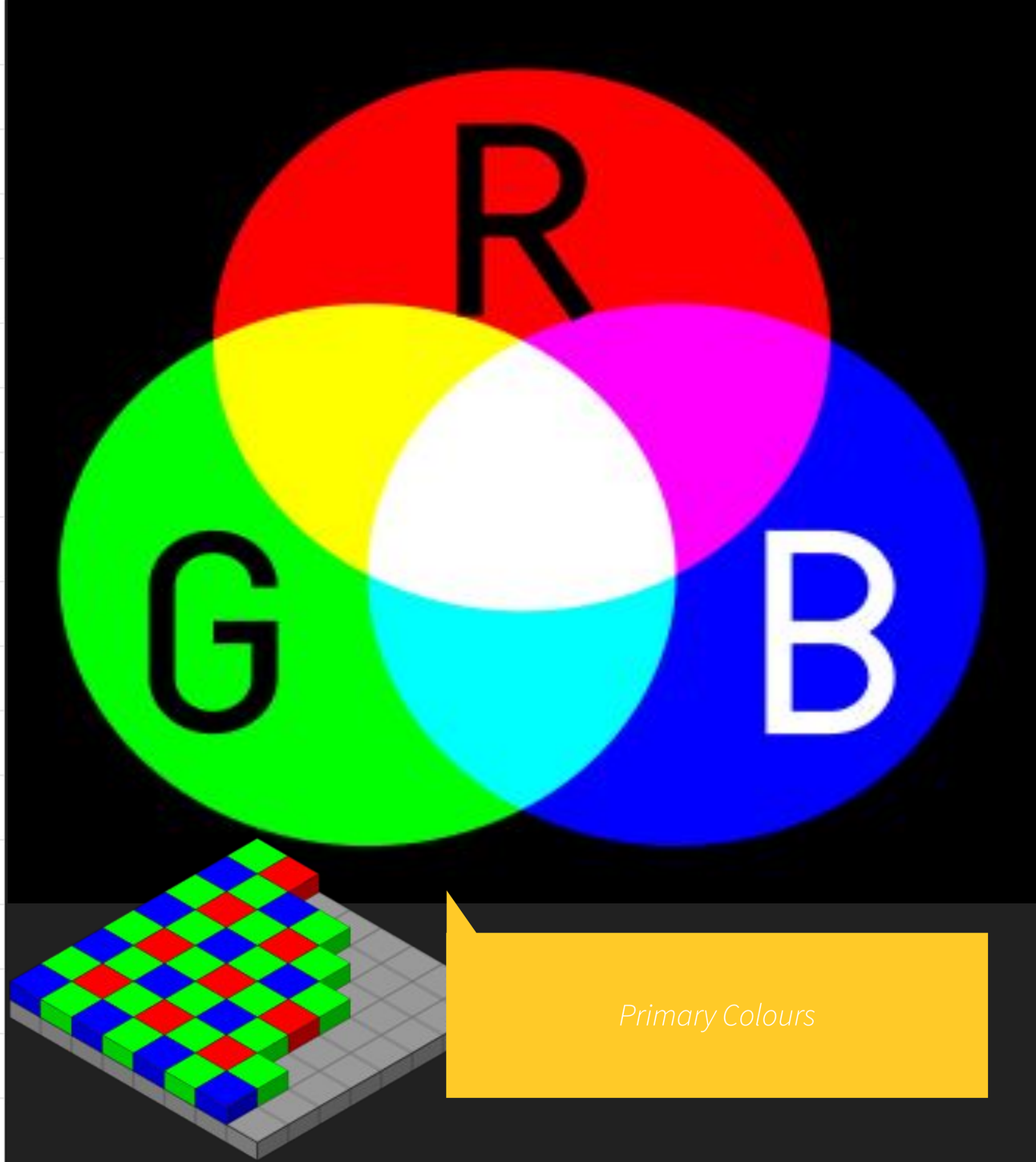
RGB(A)

Red Green Blue (Alpha)

- Additive
- Preferred for digital display
- Transparency support
- Human eyes not equally sensitive to all colours
- Sources of light
- How to show black?



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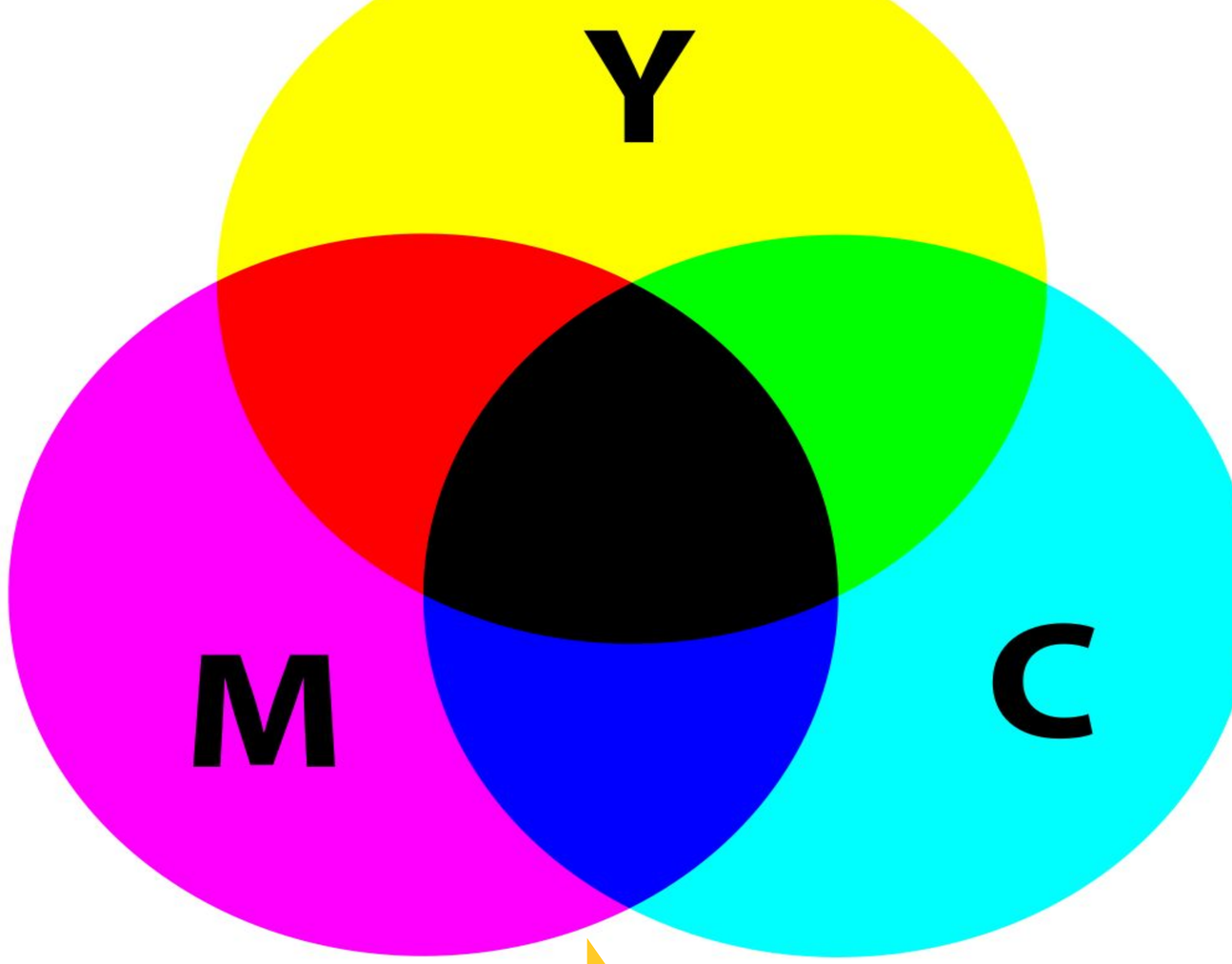
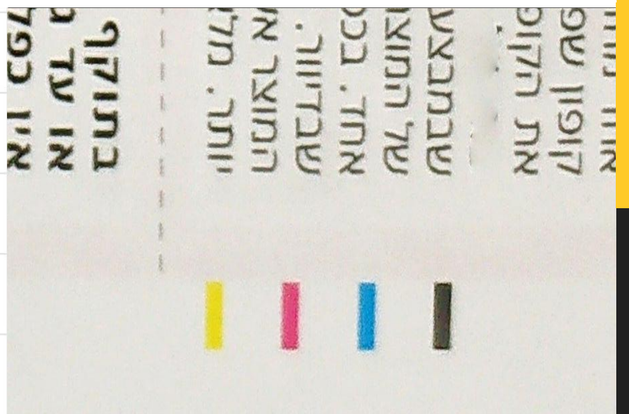
CMYK

Cyan Magenta Yellow Black

- Subtractive
- Preferred for print media
- Filters of light
- Separate black channel to save ink and get clearer print
- How to show white?





Printers use one colour tone for each

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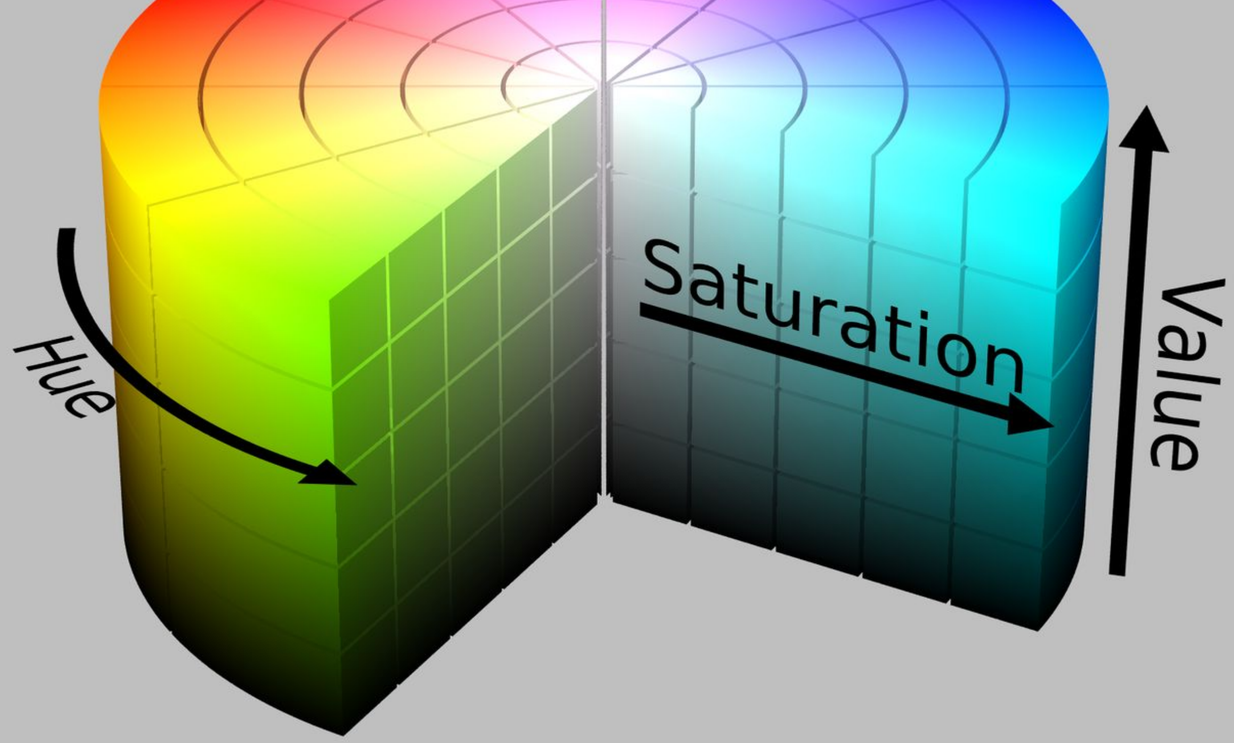
Press the spacebar to generate color palettes!

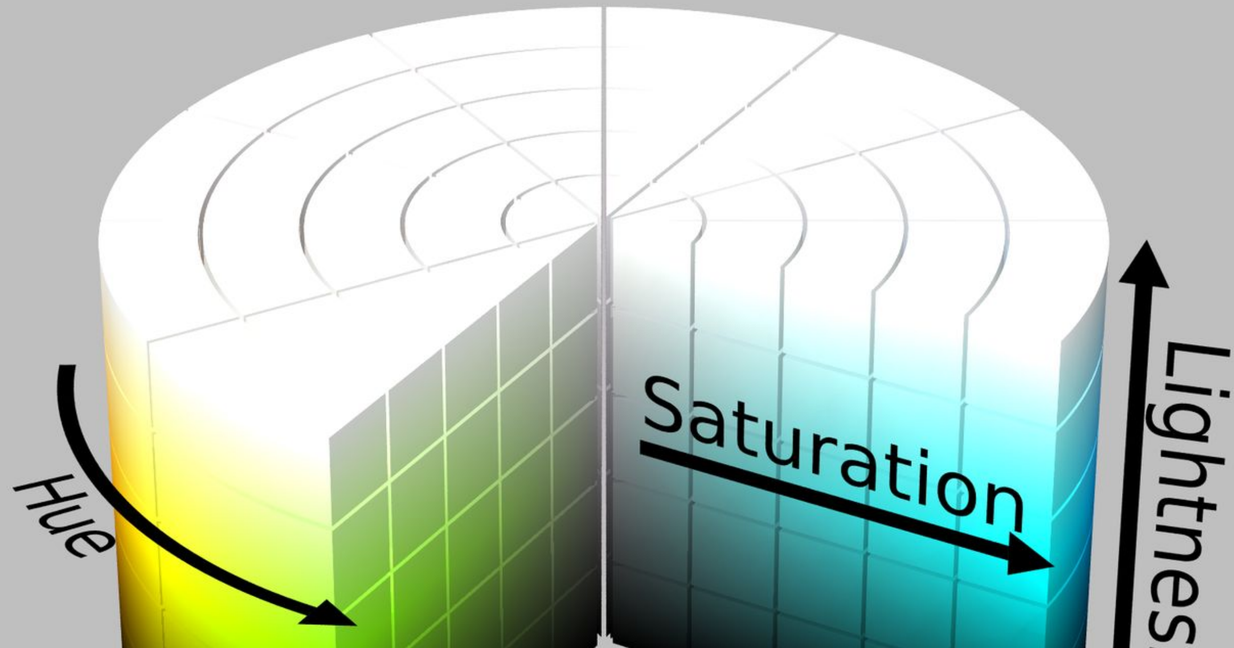
View Export Save

HSL/HSB/HSV

Hue, Saturation, Lightness/Brightness/Value

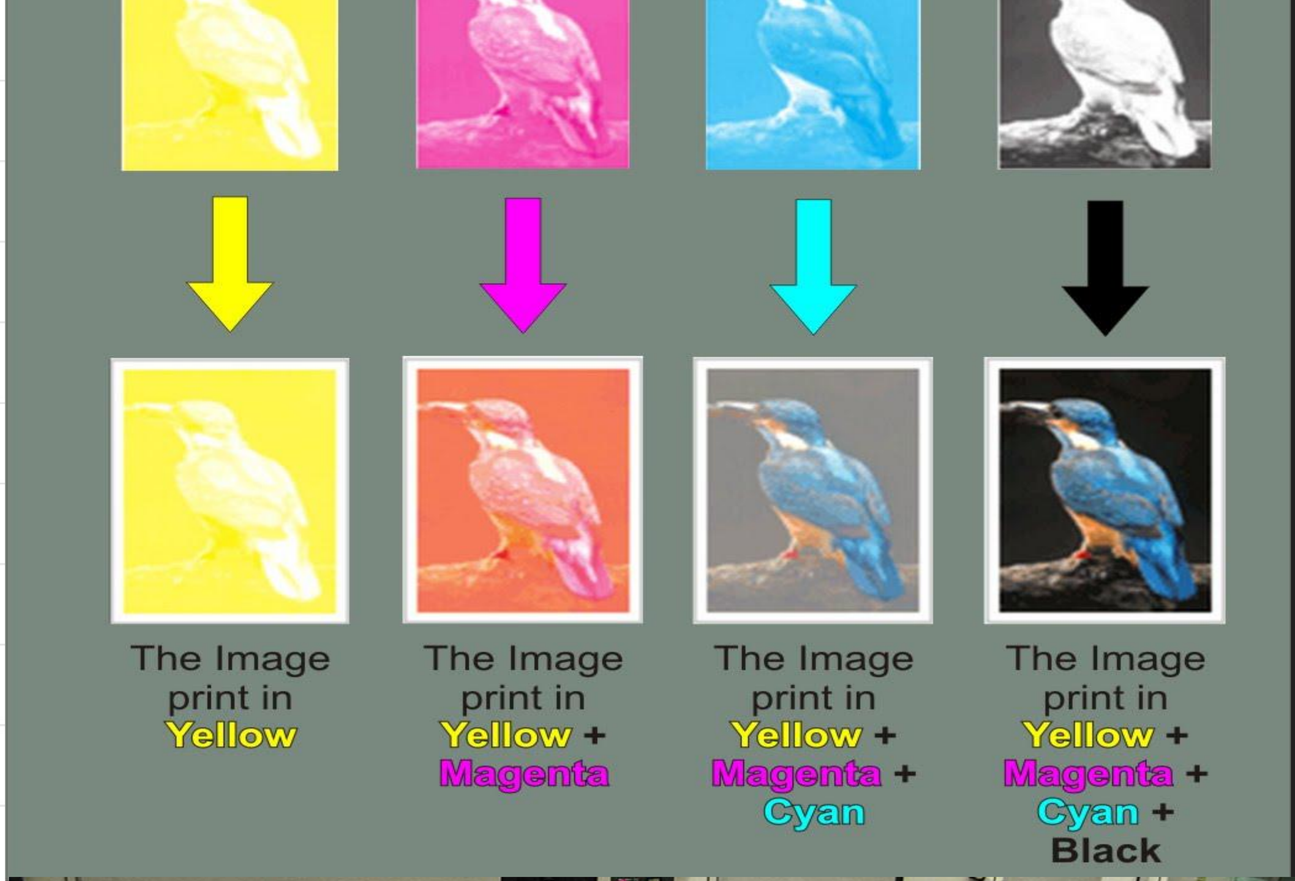
- Intuitive
- Preferred intermediate processing
- Extension of RGB
- HSB(V) is not exactly same as HSL





Channels

- Independent segments of colour-space
- Alpha channel is for transparency
- Channel value is 0 to 255 in 8-bit
- All colours, irrespective of colour model can be represented by three values
- Greyscale is one channel



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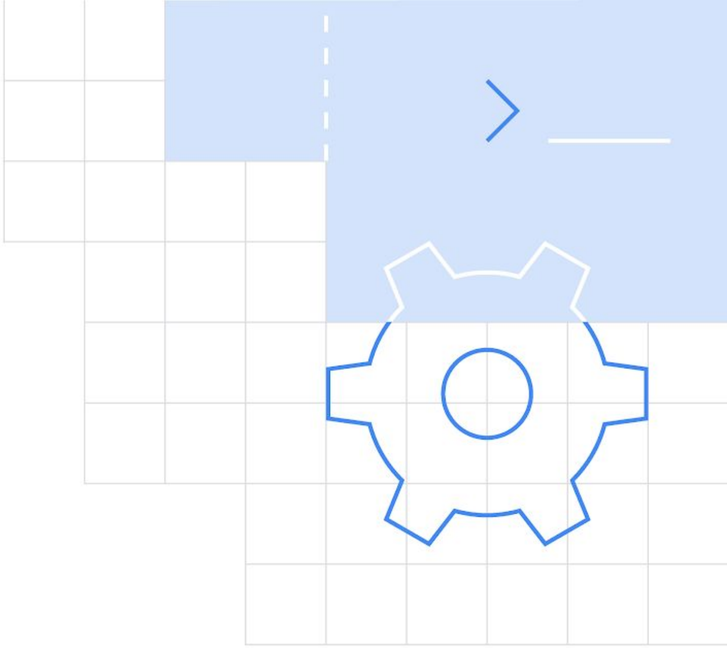

Matrix and Images

Convert a matrix to image

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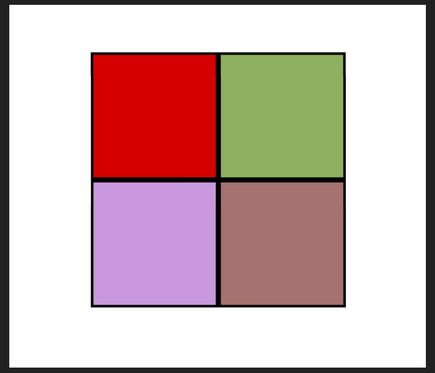
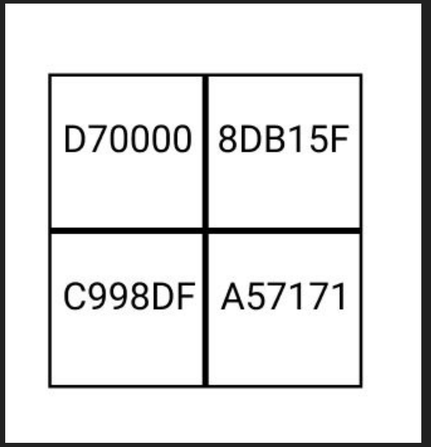
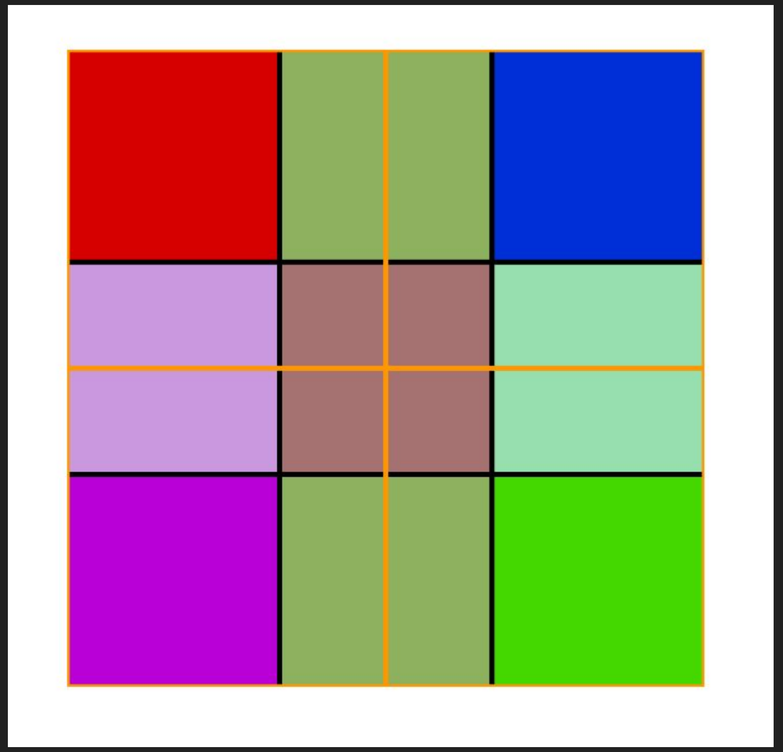
Decoding Pixels

- Pixel is the building block
- One value per pixel
- Can a pixel have multiple values?







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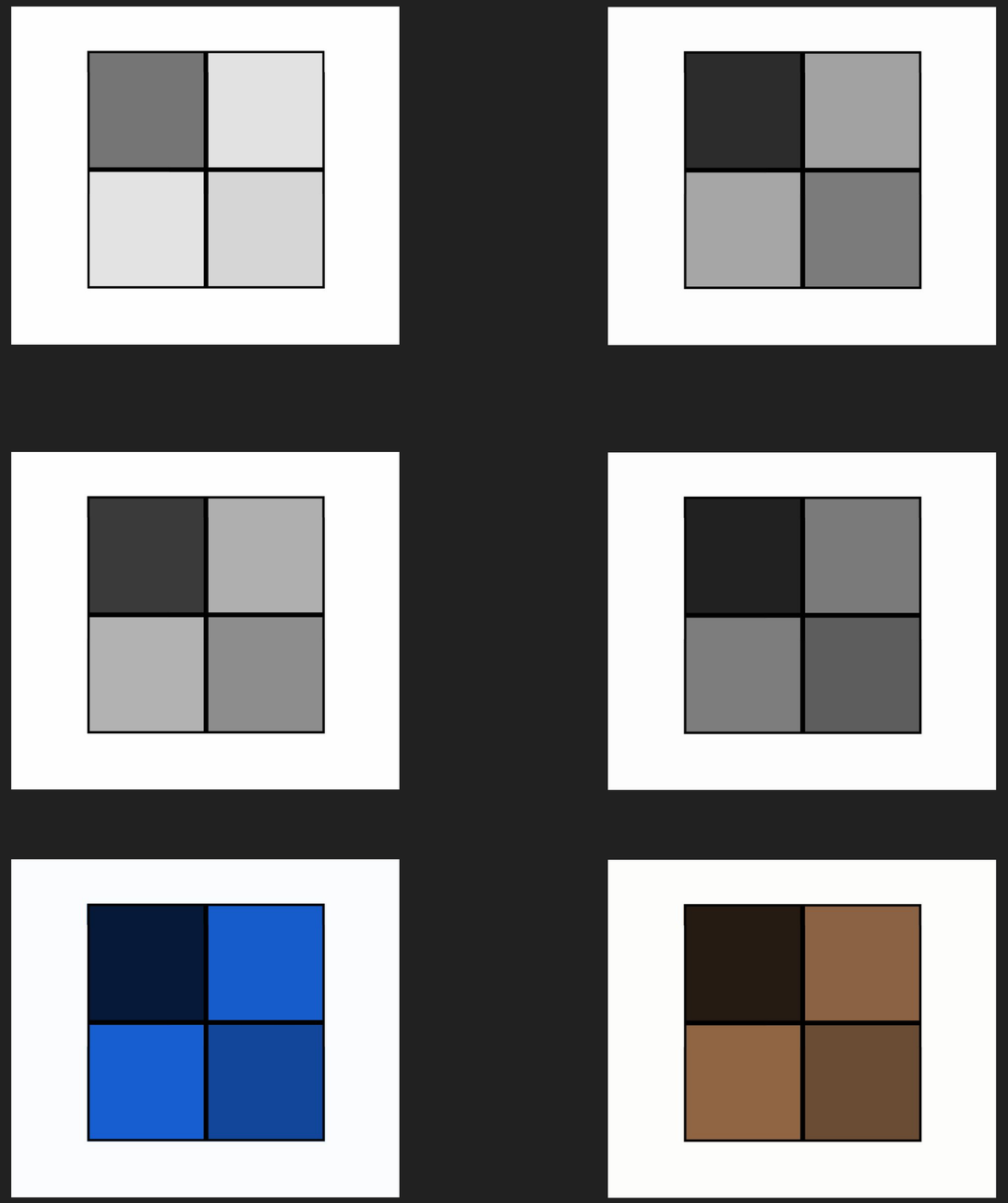
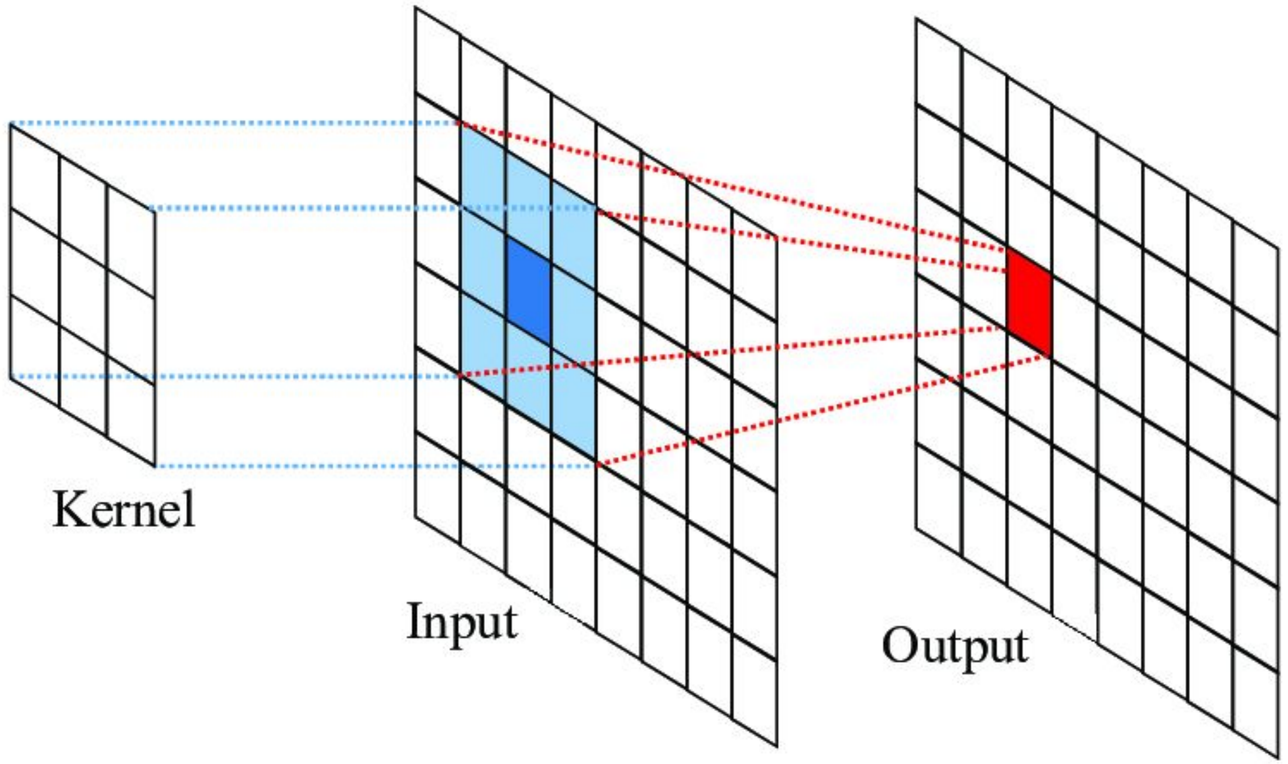
Monochrome

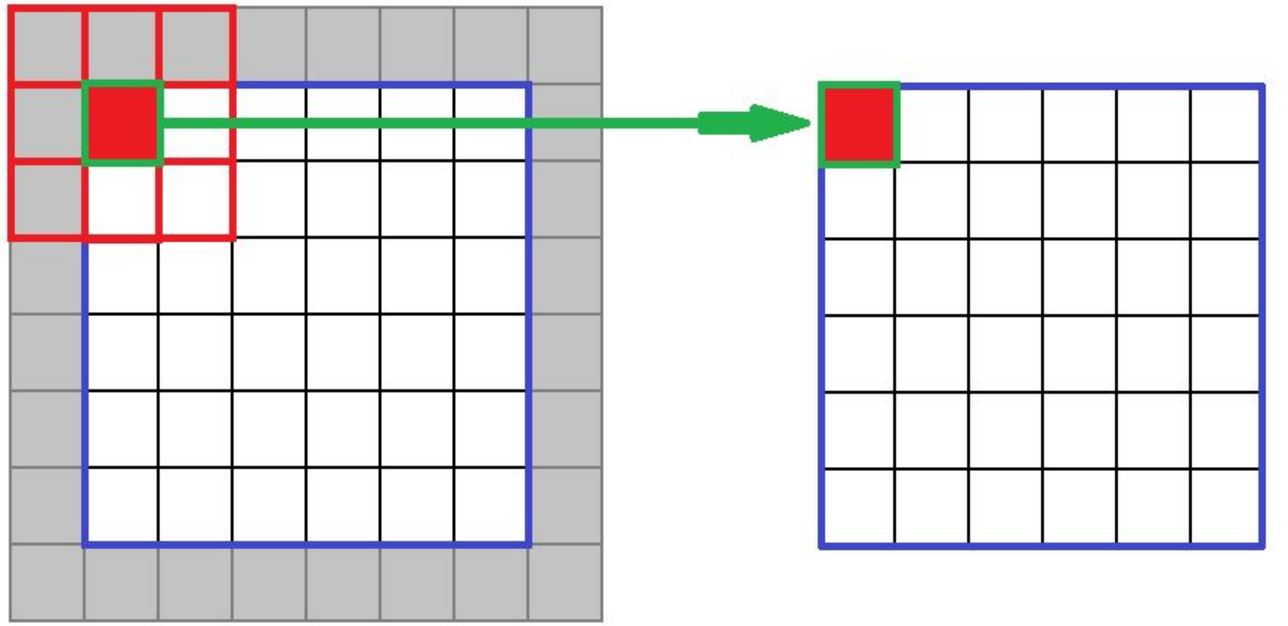
- Only one colour channel needed
- Many to one relation
- Not necessarily greyscale
- Human eye is more sensitive to green colour
- Multiple ways to get a monochrome image



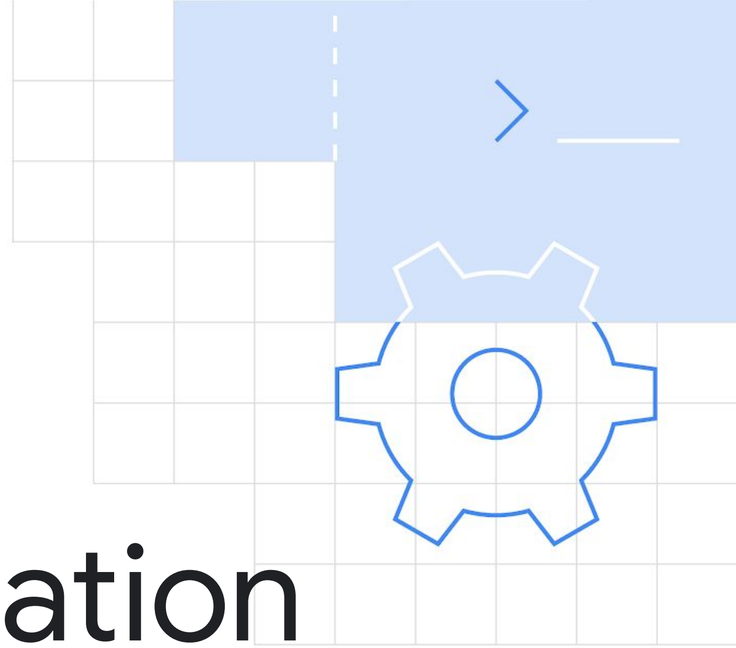
Kernels

- Take a small matrix, and use it step by step to manipulate image
- Edges are approximated
- Normalise the kernel





Chaliye, let us write some code!



Optimising Matrix Multiplication

Bring in the GPU

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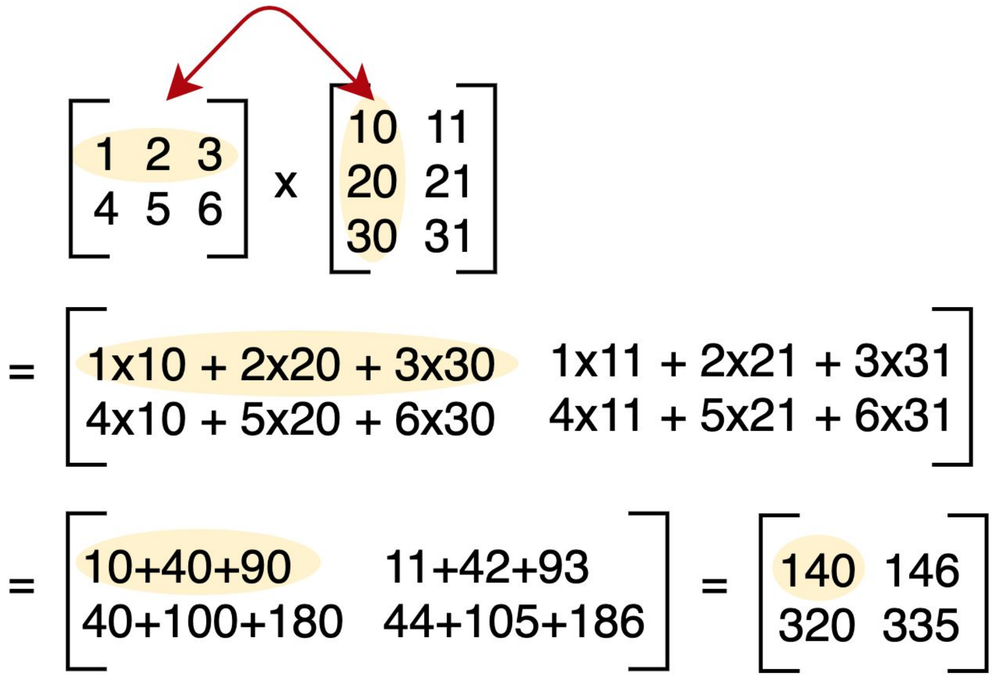
Parallel Processing

- Calculation of element (i,j) is independent of other element
- GPU is highly efficient at matrix manipulation
- Matrix multiplication is in general O(N^3)
- Can be reduced by non-intuitive algorithms, like Strassen Algorithm(O(N^log7) less than above)



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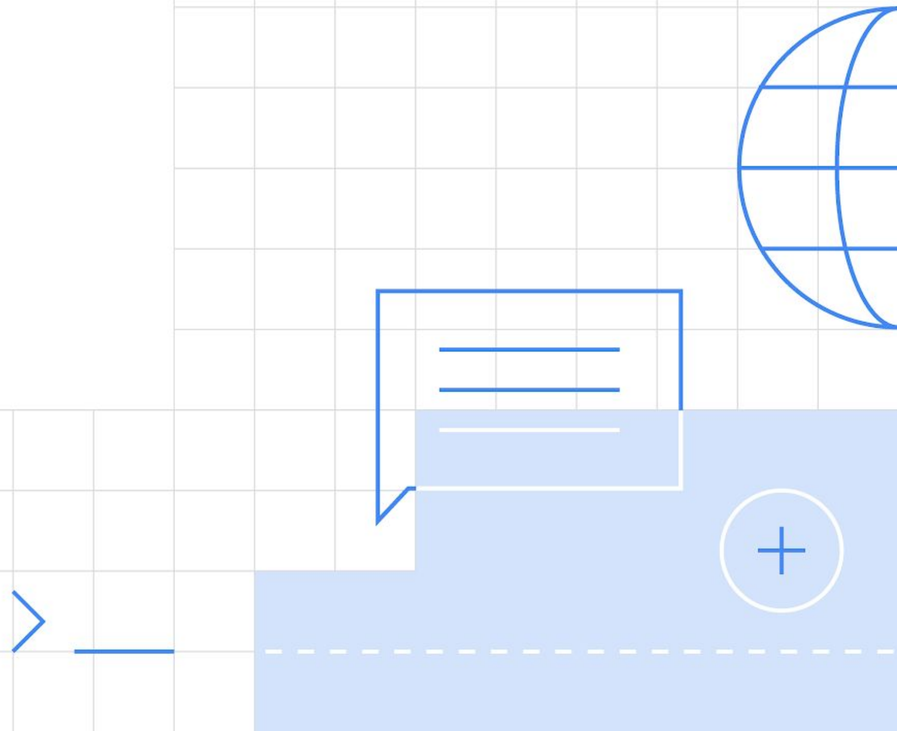
What next?

- Optimise code
- Implement in different language
- Share your learning to the world, via article
- Recording will be shared at our YouTube
- Code will be shared at our GitHub



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Thank You!

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