ENGR 101 Tutorial 3 Part B (Week 5) for Zoom:

Improving Your Image Even More

Review - What is an image?

We have learned that an image is a 2D array with colour numbers. Each element in the array represents a pixel. Each pixel needs an 8 bit (one byte) number for each of the "primary" lights: red, green, and blue. Using byte shifting we can combine these into a single 24-bit number as follows:

Colour number = 256*256*Red + 256*Green + Blue.

Computers are often said to use "32 bit colour" which is really 24 bit colour plus 8 bits of transparency data.

We saw that an Excel file can be used as a 2D array that can be displayed as an image and learned that this is a commonly used technique in the sciences. We can display as an image for example temperature versus position (with an IR camera), magnetic field versus position, and so on.

About RGB

We learned in the last tut that the "primary" lights "combine" to fake colours as follows. The human vision system is based on electronic light detectors on the retina of the eye called rods and cones. Rods detect gray scale while cones detect colour, and we learned that there are three flavours of cones: red-sensitive, green-sensitive, and blue-sensitive. We learned that the fact that the eye has these three kinds of cones is what makes RGB primary lights for humans. Red, green, and blue are not special except to us. We also learned that this is an imperfect process, with RGB faking some colours very convincingly but others not as well.

COMPLETION

Subtractive Colours - Class Experiment

Consider a blue surface that is illuminated by white light (all colours). It reflects the blue into our eyes and absorbs the other colours. Thus we see blue. See the diagram below.
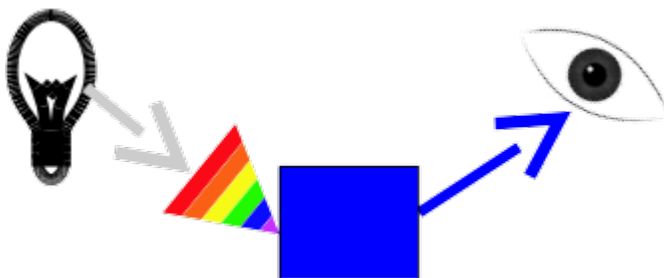
Predict what will happen if we shine blue light on a blue paper. What will it look like?

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it will look blue

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Test the prediction. Was it correct?

****

correct because blue reflects blue light

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Predict what will happen if we shine blue light on a red paper. What will it look like?

****

it will look purple

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Test the prediction. Was it correct?

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no because red absorbs blue light, making it look black

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Dyes and Inks

Printers use CYMK inks/dyes. What are these and how are they connected to RGB?

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RGB, add rgb to simulate or fake a target color

CMYK, cyan absorbs red and reflects blue and green. Magents absorbs green, and reflects red and blue. Yellow absorbs blue, and reflects red and green. Black absorbs all.

Start with white light (all colors), remove the amounts of RGB you do not want (subtractive color mixing)

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How do you make yellow with lights? How do you make yellow with dyes/inks?

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lights, mix red and green

dyes, just use yellow

****

How do you make red with lights? How do you make red with dyes/inks?

****

lights, just red

dyes, magenta and yellow

****

Bytes and Bits

How many bytes of data would there be in an image with 3000 x 2000 resolution? Assume there is no transparency data.

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3000 x 2000 x 3 = 15 000 000 bytes

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How many bytes of data would there be in a movie with 600 x 400 resolution (not great), 24 frames per second, and 2 hours long?

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((600 x 400 x 3) x 24) x 7200 = 124 416 000 000 bytes

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Actually images and movies take far less disk space than suggested by these calculations. Why?

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compression lowers the amount of bits used per pixel. Removes redundancy in data which saves space.

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