Rainbow - colours in the eye and on the screen

who I am

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play with colours

• colour is surprisingly complex
  – physics, aesthetics, psychology
• using colour can be fun
  – experiment, play with it!
• context matters
  • we all see colours differently
  • perception of colour depends on surroundings
  • different at midday or night

the eye of the beholder
context matters

good use of colour

• using conventions (red for alarms etc.)
• ‘branding’ parts of an interface
• occasional emphasis
• redundant coding
  – i.e. in addition to other means
  • e.g. web link colours - also underlined
  – for diagrams, etc.

bad use of colour

• over use - without very good reason (e.g. kids’ site)
• colour blindness
• poor use of contrast
• do adjust your set!
  – adjust your monitor to greys only
  – can you still read your screen?
'physics' of colour

• 'colour' is the wavelength of light
  • like pitch is the wavelength of sound

• spectrum
  – from red - longest
  – to violet - shortest
  – and beyond …
    • red → infra red (heat) → microwaves → radio
    • violet → ultraviolet → … nasty radiation

mixing colour

• mixing paint
  blue + yellow = green
  (really cyan)

• mixing lights
  red + green = yellow

• called additive and subtractive colour

additive colour - mixing light

– physically both colours in the mixed light
– like a chord in music
– light is really red + green
– we see yellow

subtractive - mixing paint

– cyan paint absorbs a lot of red
– yellow paint absorbs a lot of blue
– cyan + yellow absorbs most of the red and blue
  leaving mainly green light reflected
– so we see green

primary colours

• in music we hear chords and harmony
  \[ C + G \neq E \]
• there are no primary ‘notes’ in music

  so why three primary colours?
  not physics … but the eye

in the eye

two types of sensory cells:

• rods
  – see black and white and grey
  – best in low light
  – good at seeing movement

• cones
  – see colours
  – best in bright light
how we see colour

... three types of cones:
– red, green and blue!
– well nearly...
  … like 3 radios tuned to different stations
– each type sensitive to a range of light frequencies
– eye compares ‘response’ of each kind
– each mix has same response as some pure colour
– 3 receptors => 3 dimensions of colour

rods and cones

• how many
  – more in the centre (fovea) than the edges
  => better central vision
• where they are
  – cones towards centre, rods towards edge
  => peripheral vision
  low-light, good at movement, black and white
• how fast
  – black and white faster (in brain) than colour

how computers do colour

• lots of spots of red, blue and green
• eye merges them to form colours
• like pointillist painting

• colours described using RGB
  – amount of each colour they have
  – e.g. #ff00ff = purple

variations

• different colour models:
  – HSL, CMYK, CIE
  – used for different purposes
• screen depth
  – number of bits used per pixel
  – 24 = 8 bits per colour (RGB) = 16 million colours
  – 32 as above, also ‘alpha channel’ (transparency)
  – 16 = 5 bits per colour = ‘thousands of colours’
  – 8 too few to split, need designed palettes

palettes

• mapping:
  256 colours (8 bits) → selection of full (24 bit) RGB
• options:
  – application palettes (‘why funny things happen’)
  – system palette (slightly different between platforms)
  – ‘web safe’ colours
    • 6 colour levels for each RGB channel 6x6x6 = 216
    • combinations of hex 00,33,66,99,cc,ff
    • e.g. #cc3300, #0000ff, #999999

who it was

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