Teaching KS3 Computing

Session 6

Theory: Representing images

Practical: Building on programming skills

Queen Mary University of London

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COMPUTING AT SCHOOL
EDUCATE · ENGAGE · ENCOURAGE

KING'S College LONDON

Today's session

5:00 – 6:00

Representing bitmapped images as data

Storage of files in memory

6.00 – 7.00

Building on programming skills

From the national curriculum- as last week

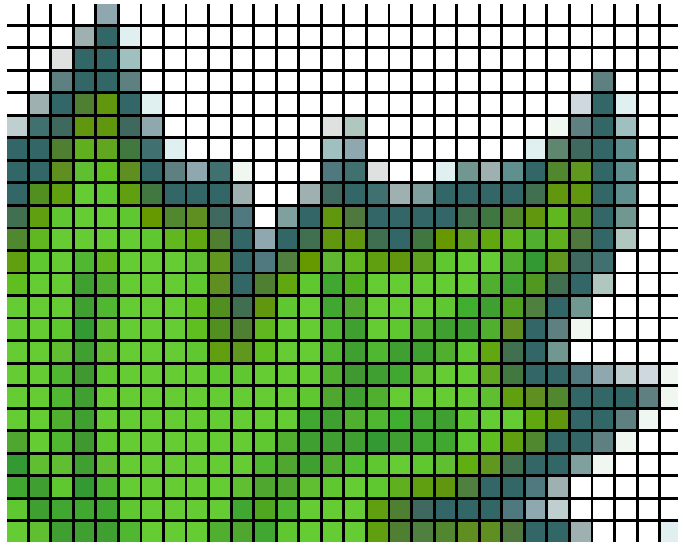
At KS3 students should be able to:

“understand how instructions are stored and executed within a computer system; understand how data of various types (including text, sounds and pictures) can be represented and manipulated digitally, in the form of binary digits”

Computing programme of study

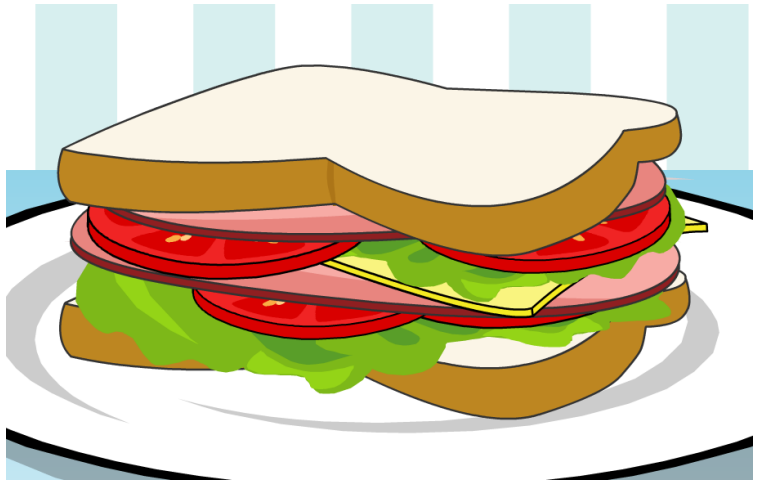
Storing images

Bitmapped graphic



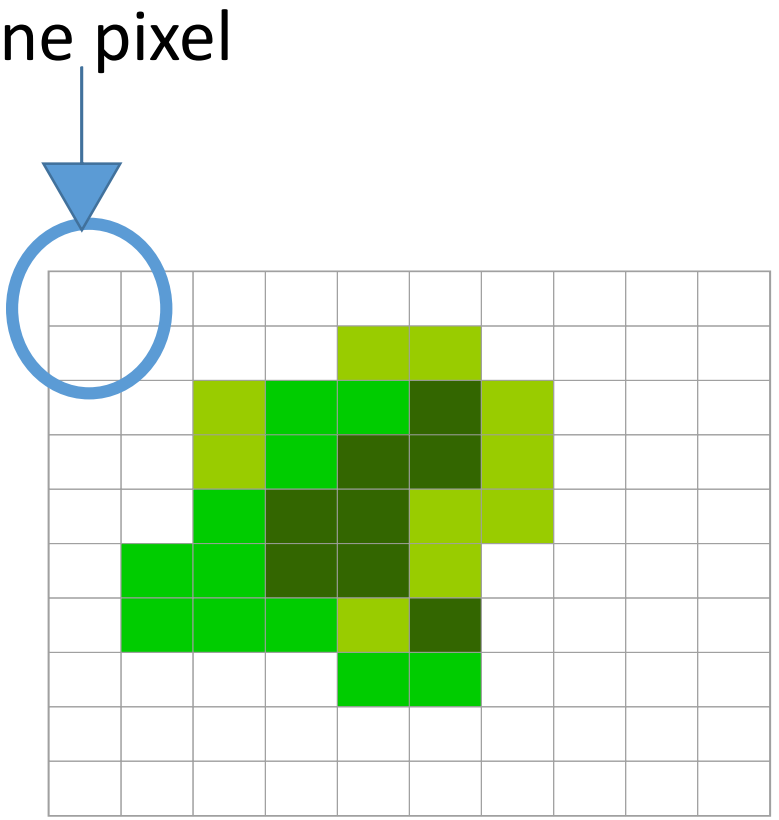
Vector-based graphic

(taken from http://www.bbc.co.uk/schools/gcsebitesize/dida/graphics/bitmapvectorrev2.shtml)



Bit-mapped graphic

- **Binary patterns** are used to store graphics.
- In a bit-mapped system the image is divided up into a grid.
- Each cell in the grid is called a PIXEL (picture element).
- A **pixel** is the smallest solid block of colour of an image.



Activity 1: Bit-mapped graphic activity

Take a paper grid (choose easy or hard)

Shade in some squares to create a picture. Keep your picture a SECRET!

Then code in binary, 1 bit per pixel, one row at a time, left to right

NEXT

Separate the binary from the picture and put your name on it.

Swap with somebody else

NEXT

Use a new grid to draw the image from their picture and check with your swapped person that it's correct!

Features of an image

Resolution

- The resolution of an image or screen is expressed as the number of pixels by row by the number of pixels per column.
- **For example**, an image with a resolution of
  1024 by 798 pixels has 1024×798 pixels (817,152 pixels)

Colour depth

- The number of bits used to represent the colour of a single pixel in a bitmapped image.
- 1 bit colour means only 1 bit per pixel where 1 = black and 0 = white

- 2 bit colour means 2 bits per pixel and four colours represented by 00, 01, 10, 11

How many colours? …. Fill in the yellow gaps

Number of bits in a pixel	Possible values	Number of colours
1	0, 1	2
	00, 01, 10, 11	4
3	000, 001, 010, … etc. …. 111	
	0000, 0001, 0010, 0011, etc. …1111	16
5	00000, 00001, 00010, 00011, …. Etc. … 11111	
		64
8	00000000, 00000001, 00000010, … 11111111	
16	0000000000000000, 0000000000000001, …. 1111111111111111	

How big are image files ….?

Use these numbers to fill the gaps **4,473** **894,784** **341** **256** **640**

1 GB represents _____ web pages

1 GB would store _____ pictures

1 GB would store _____ plains of plain text

1 GB would store _____ MP3 audio files

1GB would store _____ books of 200 pages each

Computer memory

There are two kinds of computer memory:

1. **Volatile**

Contents are lost when the power is turned off

RAM (random access memory) is volatile

2. **Non-Volatile**

Contents are kept when there is no power

e.g. stored on a hard disk

Which computer has the best spec?

ACER Aspire C24-760 23.8" All-in-One PC - Gold

★★★★½ (72)

1 deal available

- Style: Premium design with powerful processing
- Windows 10
- Intel® Core™ i5-6200U Processor
- RAM: 8 GB / Storage: 1 TB HDD
- With built-in WiFi

£499.97

Inspiron 15 3000
£229.00

Intel® Celeron® Processor (Dual Core)

Ubuntu Linux 14.04 SP1

4GB Memory

500GB Hard Drive

Budget-friendly entry laptop with Ubuntu Linux and a big harddrive for all your favourite photos and home movies at a fantastic price.

ASUS Republic of Gamers G20CB Gaming PC

★★★★½ (13)

1 deal available

- Windows 10
- Intel® Core™ i7-6700 Processor
- RAM: 12 GB / Storage: 1 TB HDD & 128 GB SSD
- Graphics: NVIDIA GeForce GTX 980

Apple iMac with Retina 4K display MK452B/A All-in-One Desktop Computer, 3.1GHz Quad-core Intel Core i5, 8GB RAM, 1TB, 21.5", Silver

Compare RAM and hard disk size of each advertised computer

Summary

Images and sound need to be represented in a way that they can be understood by the computer

Images can be stored as bitmaps or vector files

The smallest unit of a bitmap is a pixel

Compression methods can be used to make files smaller

When the computer is on, currently used files are stored in RAM

Long-term storage uses the hard disk

Next week: how the computer works

Break