

Compressing Pictures

When storing pictures it is often useful to make them take up less space. There are a variety of different ways to do this.

One way to save space is to look for patterns and repeats in the data. For instance the code 00000000 could be represented as 8w for 8 lots of white or 80 (8 lots of zero). So this code

```
000000000111111000011000000110000001100001011000011110000000000
```

Could be written

```
9061402160216021401110214041110
```

This means 9 zeroes, then six ones, then 4 zeroes, then 2 ones etc

This method of shortening the stored digits is known as **run length encoding** or **RLE**. Note that none of the data has been lost, it can easily be turned back into a long list of ones and zeroes. This is known as a **lossless** data compression technique.

Shorten the number below using RLE.

```
0000000001100110000000000001100001000010010000100011110000000000_
```

Other methods of compressing pictures involve simplifying the pictures by reducing the level of detail or the number of colours. This is **lossy** data compression as the picture cannot be returned to the previous level of detail.

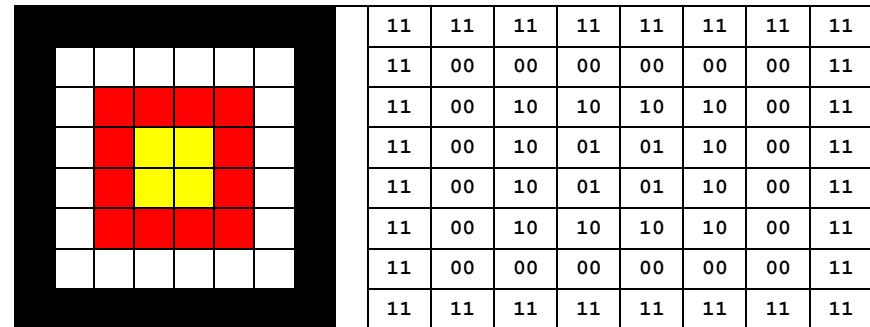
This may seem like a bad idea but our eyes might not be able to tell any difference between an image before and after compression. So a picture with thousands of almost identical shades of blue might be replaced with only hundreds of them.

<http://www.oxfordsparks.ox.ac.uk/content/what-machine-learning>

Coloured Pictures

In order to store or transmit coloured pictures a similar process is followed, but rather than each pixel being recorded as a one or zero each colour is given a different binary code.

E.g. the picture below has been created using 4 colours where 00 = white 11=black 01=yellow and 10=red



Each colour requires **two** digits (each a combination of 1 and 0). This means that a picture with 4 different colours is said to have a **colour depth** of 2.

How many colours could you use with a colour depth of 3?

Meta data

Meta data means *data about data* and is often needed by the computer to know how to display pictures correctly. For instance, an example of meta data for the picture above is that it is 8 pixels high, 8 pixels wide and has a colour depth of 2.

Additional meta data stored might include information about when and where the picture was taken as well as camera settings etc.