

File Formats

We commonly perceive image compression to mean the ‘squashing’ of an image in reality many forms of image compression actually loose data. There are two forms of image compression

Lossy

Lossless

To start to understand the concept of image compression we should just take a look at two concepts

Redundancy

Irrelevancy

Redundancy

This relates to the statistical properties of an image and is a function of resolution, bit depth, image noise and image detail.

Irrelevancy

This relates to an observer viewing an image and is a function of image noise, detail and viewing conditions.

Lossless compression

This process is reversible and it preserves the data bits.

The image after compression/decompression is numerically identical to the original on a pixel by pixel basis.

Only the statistical redundancy is exploited to achieve compression.

Compression ratios are usually around 2:1.

These types of files are generally TIFF or BMP.

TIFF developed by the ALDUS corporation and Microsoft released in 1986. The current release is version 6 released in 1992.

Lossy Compression

This process is irreversible

The reconstructed image contains degradations with respect to the original image.

The statistical redundancy as well as irrelevancy of the image data are exploited.

Much higher compression compared to lossless.

The term virtually lossless is often used to characterize lossy compression schemes that result in no visible degradation.

Fingerprint Data storage

Latent fingerprints developed via chemical means should not be stored with lossy compression algorithms as this is destructive to the image detail.

It is therefore recommended that all digitally captured fingerprint images are stored in either TIFF (tagged image file format) or BMP bitmaps. Neither of these formats are destructive to the image detail. JPEG (a commonly used format for lossy compression) is not suitable for fingerprint compression as it both creates blocking artefacts and loses high frequency information that is vital to the evaluation of the final image.

When you capture an image via the Mason Vactron interface it automatically activates the Veridata software, this software will automatically prompt you for a file name and save your 'digital negative' in a default location.

If you have substantially enhanced your fingerprint and wish to save a copy select File-save as on the Image Pro Plus toolbar. You can now enter a file name and save your image to the folder of your choice.

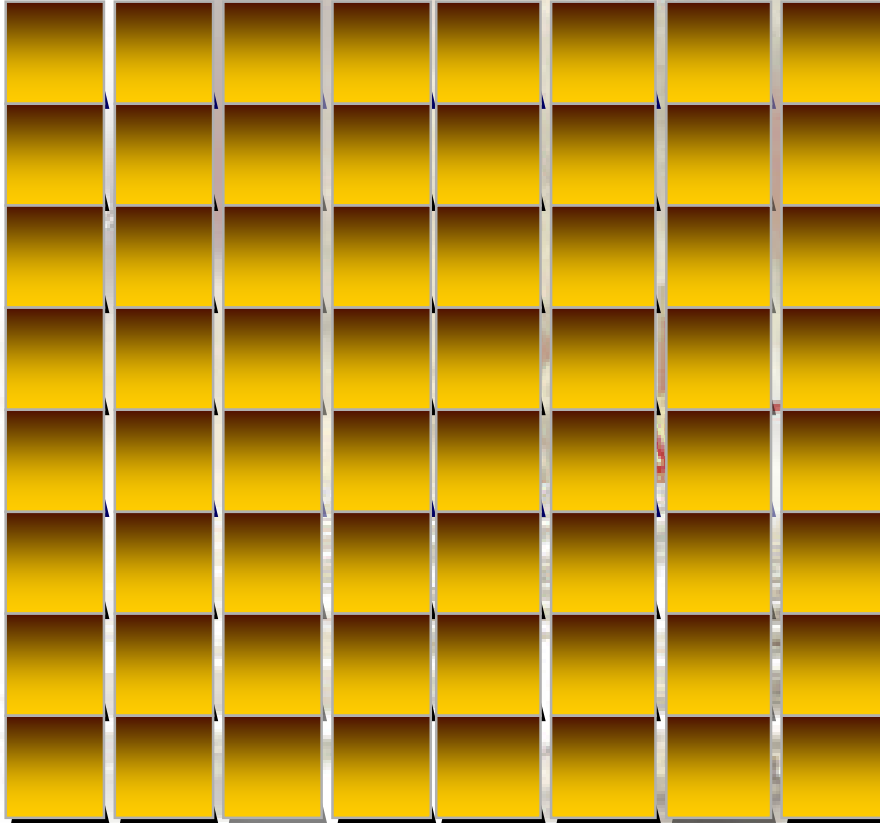


TIFF



400% ZOOM

JPEG(JPG)



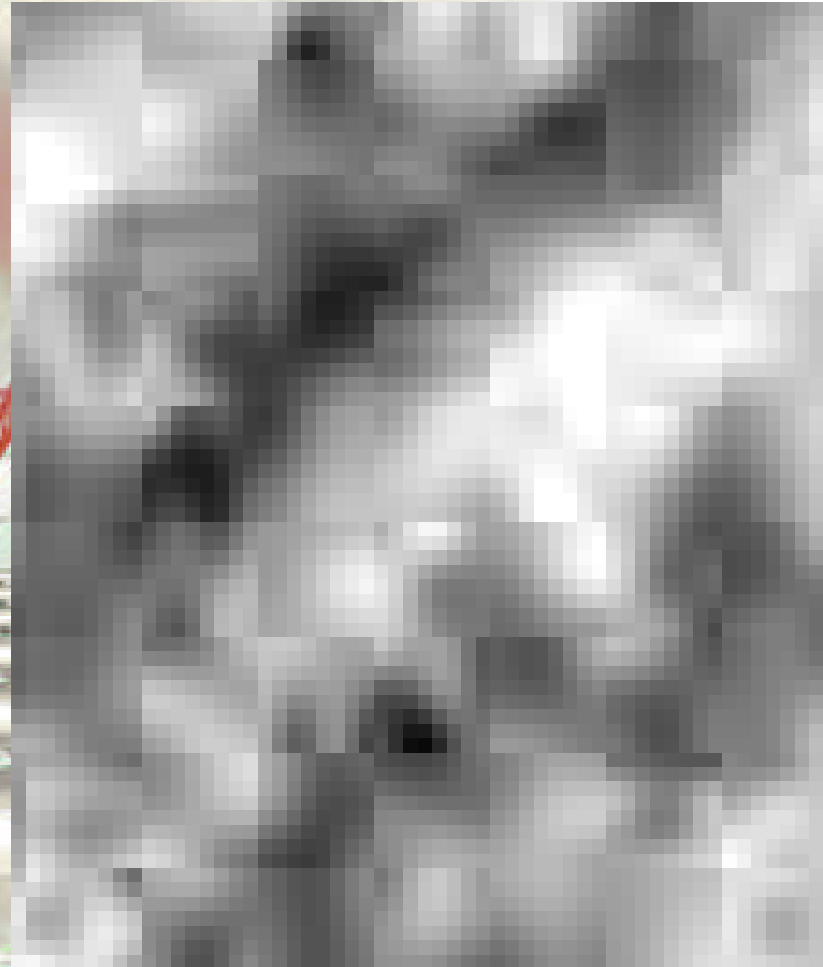
The current JPEG algorithm(DCT) compresses the image into 8x8 blocks and places them in the file one after the other. The algorithm discards frequency information in order to achieve lossy compression. When used to a high ratio this form of compression conveys the essential image but loses most of the fine detail.

For the fingerprint the fine detail is the most important part to preserve.

Wavelet v Discrete cosine transformation

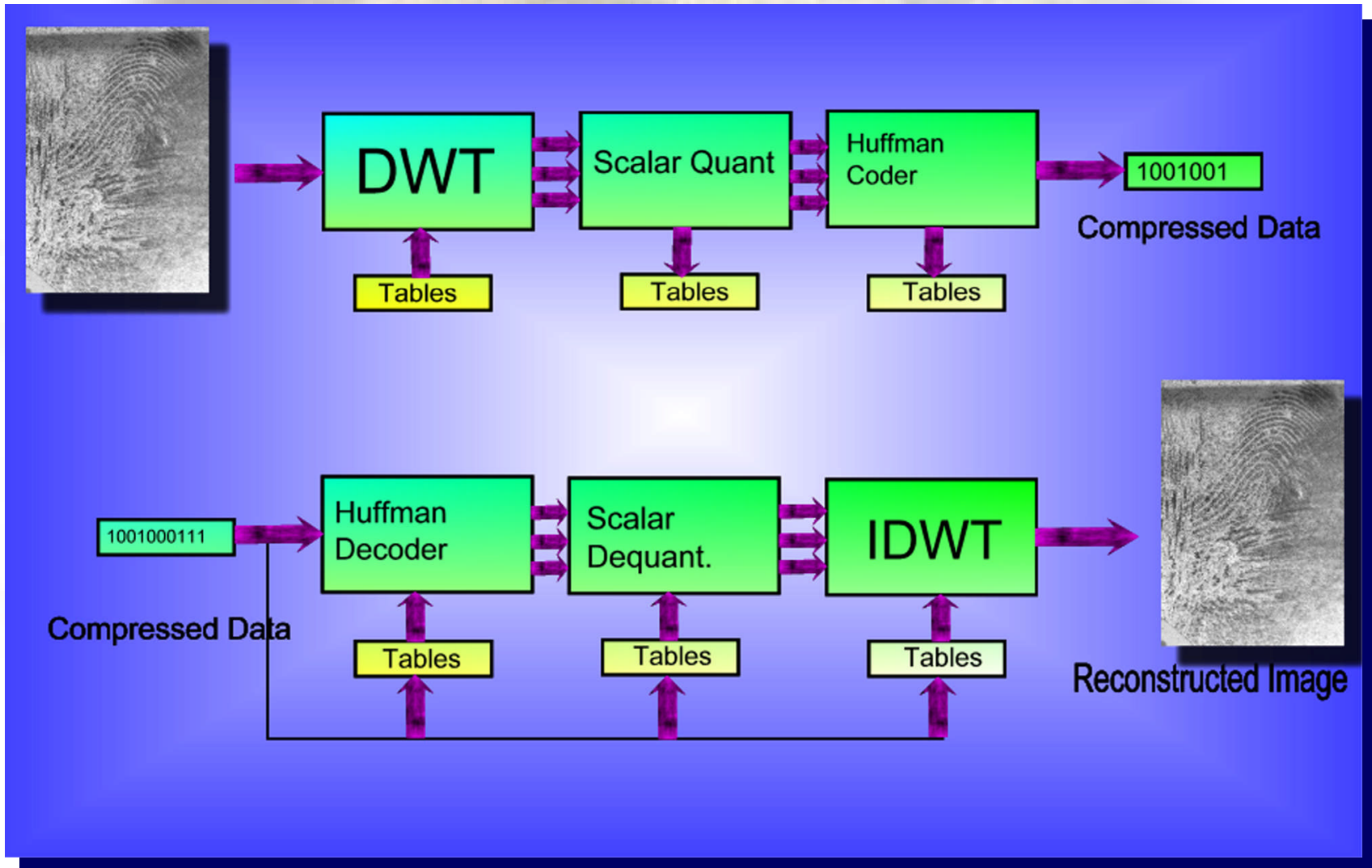


JPEG



JPEG 400% ZOOM

WSQ

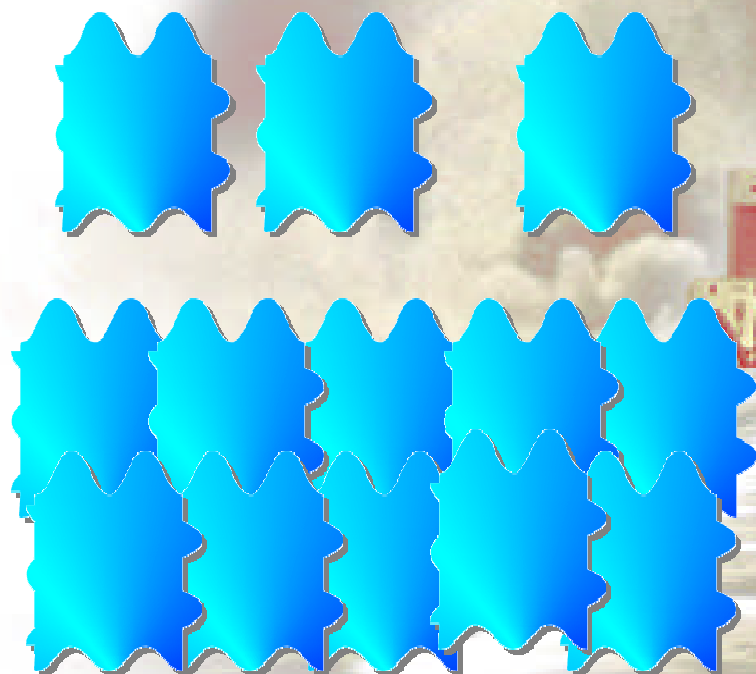


WSQ

In the DWT step the digital image is split into 64 spatial frequency bands by a 2-dimensional discrete wavelet transform, which is a cascaded multirate digital filter bank. The precision of the floating point DWT output is then truncated (quantised) by the scalar quantisation step; this is the irreversible part ('lossy') of the process. Finally the quantised DWT output is Huffman coded (a form of entropy coding) to minimize the number of bits that need to be transmitted.

To reconstruct the image after compression the WSQ decoder undoes the Huffman coding, maps the quantised DWT coefficients back to close the approximation of their original floating point values, and runs these quantised DWT coefficients through an inverse DWT.

Wavelets



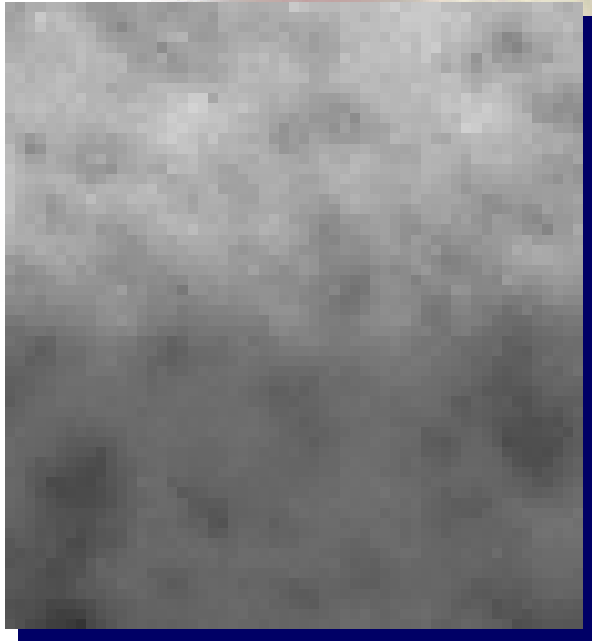
The wavelet

Wavelet compression converts the image into a series of wavelets which can be stored more efficiently than pixel blocks. Wavelets have rough edges which render pictures by eliminating the square artifacts that are common with DCT compression.

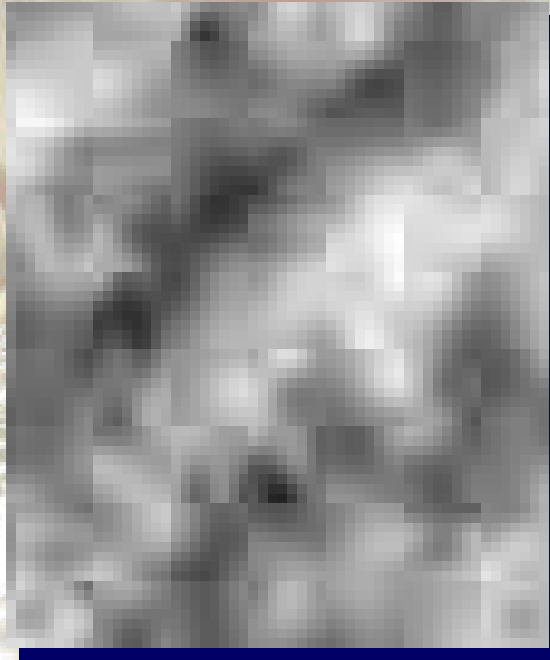
When an image is compressed various square holes are knocked out of one end of the wall. When you push the end of the wall to compress it, many gaps remain that need to be spackled. When these patches are visible we call them 'blocking artifacts'. These were visible in the 400 % zoom of our fingerprint image.

Wavelet compression creates gaps which have rough uneven edges. When one end of the wall is pushed these edges mesh together creating fewer noticeable gaps. Hardly any spackle is required resulting in a much smoother look.

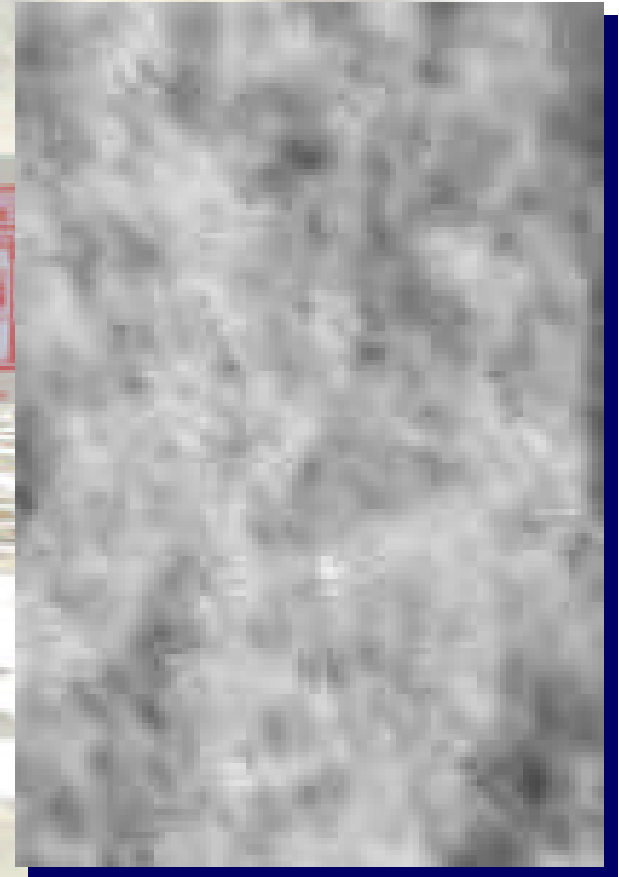
File Formats



Original TIFF File



JPEG High
compression ratio



WSQ Compression ratio
20/1

Data Transfer

Crime Scene

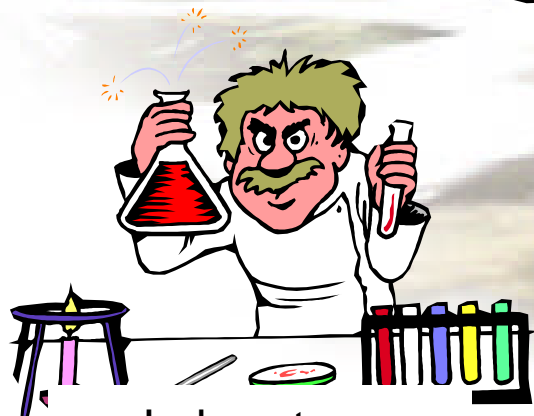


CSI

Interpol



AFIS



Laboratory