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New Image Compression Technology of SFM5500 Series

Fingerprint Image Compression Certified by FBI WSQ Specification, Version 3.1

It has been nearly impractical to use the SFM series in sending fingerprint images, as it provides only UART serial communication, which supplies a stable network speed of 115,200 bps. For this reason, when sending a fingerprint image from SFM to Host PC, users used to quantize from the original format to 4-bit gray or binary format, which resulted in an image quality that is significantly compromised. (Figure 1)

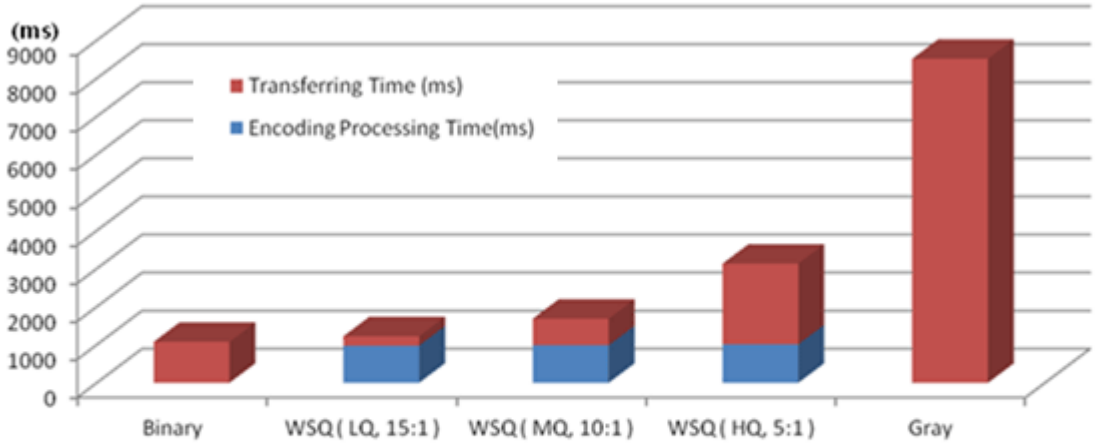
(a) Original gray image (b) Binarized image

[Figure 1] Compromised fingerprint image quality caused by binarization

The SFM5500 series overcame this problem and have been equipped with the new technology to compress fingerprint images and quickly send high quality images via a low bandwidth network environment. When compressing, the quality degradation is minimized (Figure 2), but the data size is lowered by 90%, reducing the time it takes to be sent by 90%, as well. Moreover, you can set the system to compress images in different levels, enabling you to appropriately adjust the transfer speed and the image quality according to its use (Figure 3).

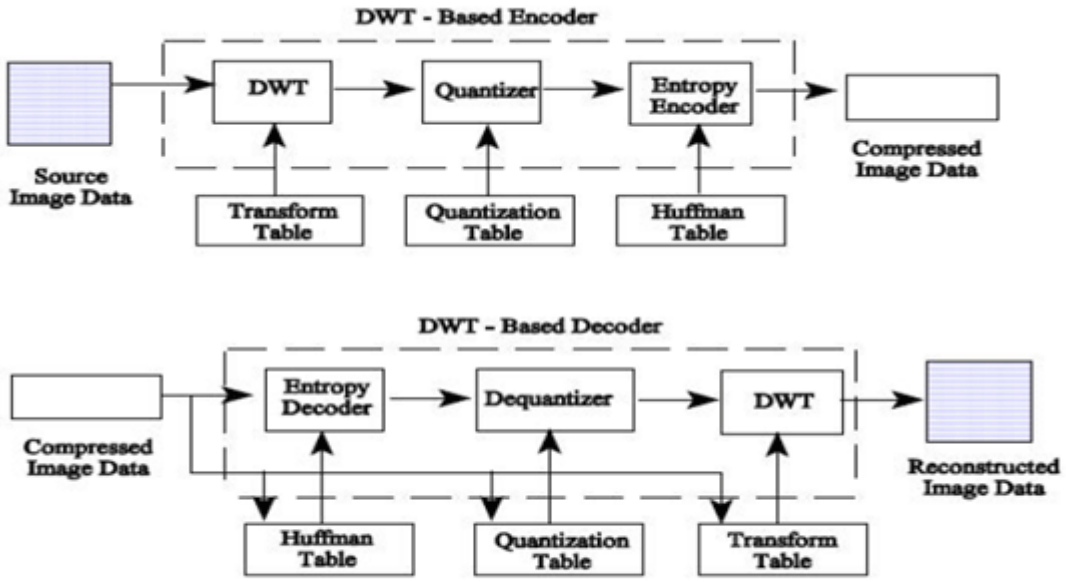
(a) Original gray image (b) Compressed image by WSQ (5:1) (c) Compressed image by WSQ (15:1)

[Figure 2] Different image qualities according to WSQ compression ratio (minimal difference)

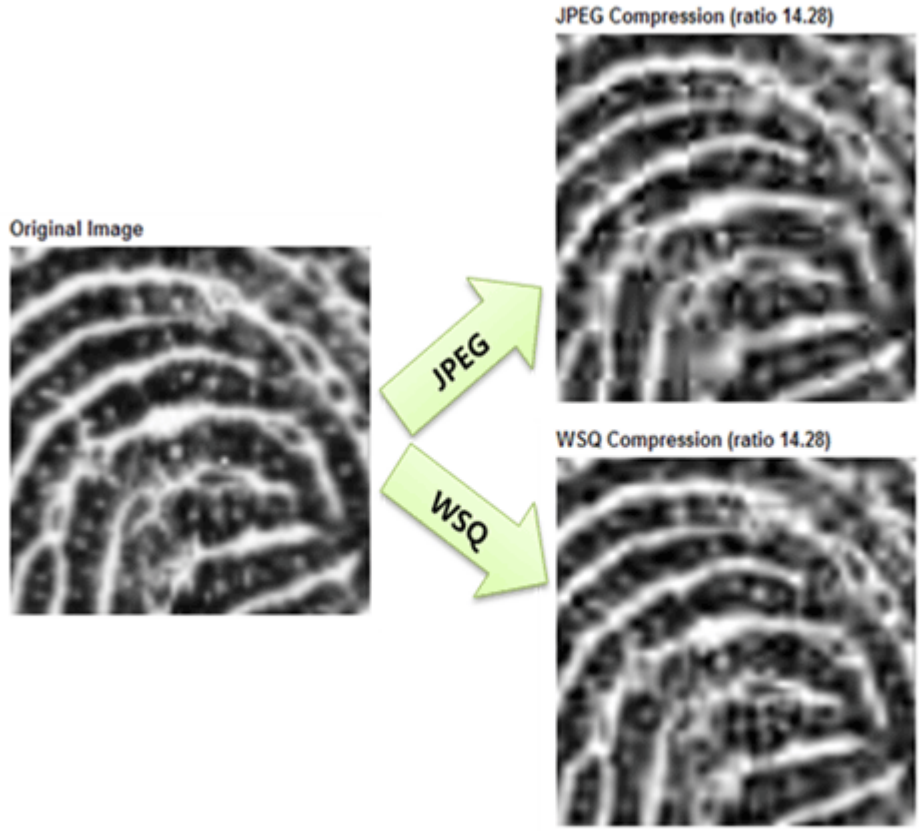


[Figure 3] Comparison of transfer speeds of a single fingerprint image according to WSQ compression ratio: In the case of a 15:1 compression ratio, the transfer speed is similar to that of a binary image, including the encoding

Moreover, starting with SFM SDK v1.6, it offers the WSQ decoding function, enabling the original recovery of the WSQ compression image sent by SFM. The WSQ image compression is an image compression method based on the wavelet transform (Figure 4), optimal for fingerprint images; and its strength is that it retains the image quality much better than block-based compression methods, such as JPEG. (Figure 5)



[Figure 4] WSQ Image Compression Algorithm



[Figure 5] Quality comparison of JPEG and WSQ fingerprint images based on the same compression ratio:
In JPEG, discontinuation of ridges occur due to blocking artifact

The image compression technology applied to SFM5500 is a standard WSQ image compression technology of NIST and has been certified by NIST and the FBI. Therefore, any WSQ compression stream sent from SFM is restorable using any viewer with an FBI-certified decoder.

CERTIFICATION OF COMPLIANCE

for

SUPREMA, INC.

WSQ Implementation Number:	11052
Platform:	VDK - VisualDSP++ 5.0 Kernel
	SFM5500 Series Fingerprint Module, Analog Devices Inc. Blackfin ADSP-BF533 DSP
	VisualDSP++ 5.0 (ANSI/ISO standard C and C++)
Criteria:	500 ppi grayscale image, 8 bits per pixel, at 5:1 and 15:1 target compression ratios

The FBI has certified that this implementation meets the accuracy requirements in the Wavelet Scalar Quantization (WSQ) Gray-Scale Fingerprint Image Compression Specification, Version 3.1. This algorithm is the standard for the exchange of 8-bit, 500 ppi fingerprint images within the criminal justice community. Within the frame header of the compressed image, the software implementation value (Sf) will be recorded as 11052, and the WSQ encoder algorithm (parameterization) value (Ev) will be set as 2.

This certification process is not intended to endorse one entity or implementation over another, but merely to certify that the implementation meets FBI standards. The authenticity of this certificate can be confirmed by checking the online registry at <fbibiospec.org>.

Date: August 29, 2014

[Figure 6] WSQ Certification on SFM5500 Series by the FBI