CHAPTER 4

RESULTS AND DISCUSSION

4.1 Compression Ratio and Compression-Decompression Time

First, image I is saved at a resolution of 600 dpi and image II is saved at a resolution of 300 dpi. All two images are saved in a 24 bit Raw file format. For image I, RTSDZIP gives a compression ratio of 65.79:1 while the compression ratio obtained from WINZIP is 36.88:1. RTSDZIP and WINZIP give compression ratios of 34.74:1 and 24.84:1 for image II. In term of computation time, RTSDZIP uses 4 hours to compress and 12.23 hours to decompress while WINZIP uses 48 minutes to compress and 4 minutes to decompress for image I. For image II, RTSDZIP uses 47 minutes and 1.45 hours while WINZIP uses 10 minutes and 10 seconds to achieve the same result. All results are shown in Table 4-1.

Table 4-1 : A comparison of image data sizes, compression ratios, and compression-decompression times between RTSDZIP and WINZIP

	Size (MB)	Compression ratio	Compression time	Decompression time
Image I	993.0			
RTSDZIP	15.0	65.79 : 1	4 h	12.23 h
WINZIP	26.9	36.88 : 1	48 min	4 min
Image II	197.0			
RTSDZIP	5.67	34.74 : 1	47 min	1.45 h
WINZIP	7.93	24.84 : 1	10 min	40 sec

Results show that RTSDZIP give smaller images' memory size than WINZIP. The compression performance of RTSDZIP is better than that of WINZIP 44.24% in Image I and 28.45% in Image II. This benefit is evident but longer computation times are an obstacle. To decrease it, we have to run lower resolution images. It is possible to do that using on screen ruling of offset printing. Generally, the resolution (dpi) of a scanned image should be at least 2 times the screen ruling number for printing. In map offset printing at RTSD, we use 100 lpi, and hence recommended dpi will be 200. It is found that the computation times are decreased to 20.84 minutes to compress and 33.73 minutes to decompress respectively. Table 4-2 shows the results.

Table 4-2 : A comparison of image data sizes, compression ratios, and compression-decompression times of image II between RTSDZIP and WINZIP using AMD 475 MHz CPU and 32 MB RAM at the resolutions of 300, 250, and 200 dpi.

Image Resolution	Size (MB)	Compression Ratio	AMD 475 MHz CPU 32 MB RAM	
			Compression Time (min)	Decompression Time (min)
300 dpi				
ORIGINAL	197.0			
RTSDZIP	5.67	34.74 : 1	47	105
WINZIP	7.93	24.84 : 1	10	0.67
250dpi				
ORIGINAL	137.4			
RTSDZIP	4.30	31.95 : 1	32.78	53.15
WINZIP	6.40	21.47 : 1	7.41	0.47
200 dpi				
ORIGINAL	87.9			
RTSDZIP	3.06	28.73 : 1	20.84	33.73
WINZIP	4.53	19.40 : 1	5.32	0.32

In addition, using a higher CPU clock speed and more RAM can decrease the computation times. Our experiment used the CPU clock speed at 475 MHz and 32 MB of RAM. We changed the CPU clock speed to 733 MHz and 128 MB of RAM and found that the computation times are dramatically decreased, compared with the results before. Table 4-3 shows the results.

Table 4-3 : A comparison of image data sizes, compression ratios, and compress-decompress times of image II between RTSDZIP and WINZIP using PIII 733 MHz CPU and 128 MB RAM at the resolutions of 300, 250, and 200 dpi.

Image Resolution	Size (MB)	Compression Ratio	PIII 733 MHz CPU 128 MB RAM	
			Compression Time (min)	Decompression Time (min)
300 dpi				
ORIGINAL	197.0			
RTSDZIP	5.67	34.74 : 1	10.85	12.56
WINZIP	7.93	24.84 : 1	7.25	0.22
250dpi				
ORIGINAL	137.4			
RTSDZIP	4.30	31.95 : 1	7.57	8.73
WINZIP	6.40	21.47 : 1	5.49	0.18
200 dpi				
ORIGINAL	87.9			
RTSDZIP	3.06	28.73 : 1	4.77	5.68
WINZIP	4.53	19.40 : 1	3.55	0.13

4.2 Printed Image Quality Comparisons

4.2.1 Offset Prints

Offset prints using original map image data (Print I) and the output data from the RTSDZIP (Print II) were compared using a test form target. The results of printing characteristic plots are shown in Figure 4-1 and 4-2.

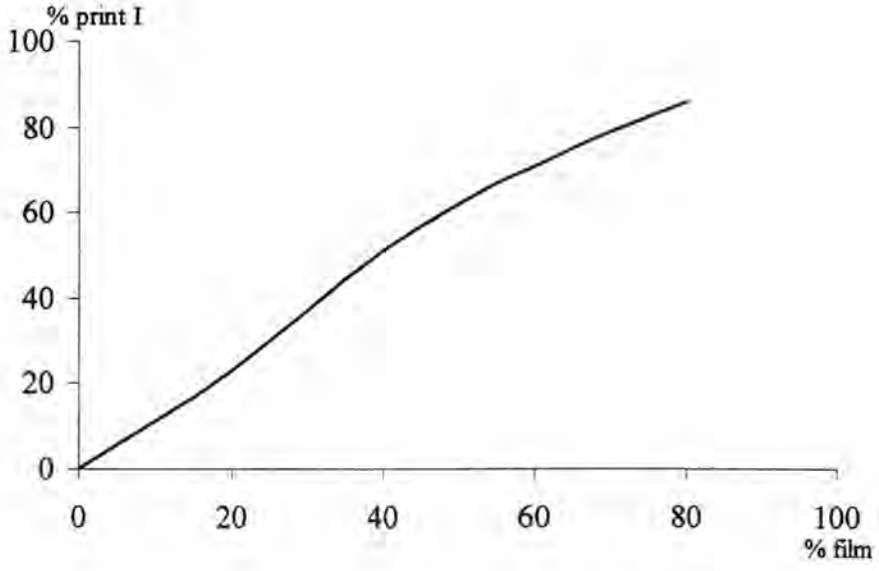

Figure 4-1 : Printing characteristic curve of offset print, using the original map image data

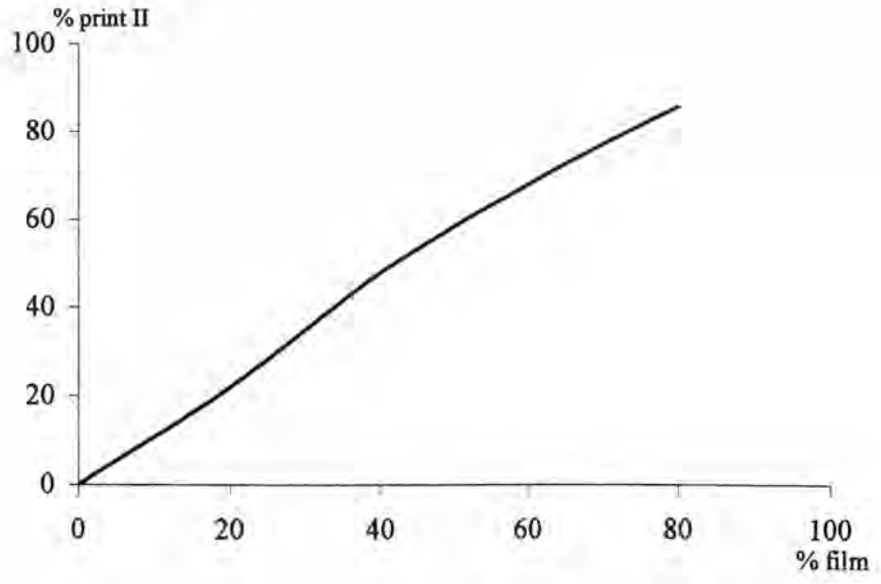

Figure 4-2 : Printing characteristic curve of offset print, using the output data from the RTSDZIP

The curve shows that there are no differences in tone reproduction between these two images. For reduction determination, the criterion of 0.1 point line width is considered. The result shows that it can be compressed and decompressed without loosing detail.

To determine color change, red, green, and blue color tones in the offset prints using the original map image data and that using the output from the RTSDZIP were measured in L*a*b* by densitospectrophotometer and ΔE were determined. Table 4-4 shows the results.

Table 4-4 : A comparison of L*,a*, b*, and ΔE between offset prints using the original map image data and the output data from the RTSDZIP in red, green, and blue color tones

Color Tone	Image	L*	a*	b*	ΔE
Red	Original	63.1	31.5	16.4	
	RTSDZIP	66.3	26.4	14.8	6.4
Green	Original	70.4	-24.2	15.9	
	RTSDZIP	67.2	-26.7	19.3	5.6
Blue	Original	76.7	-9.2	-8.8	
	RTSDZIP	77.1	-9.8	-8.8	0.6

The table shows that there is a little ΔE difference in the blue and much value in the red and green color tones but it is within the acceptable range. This problem occurred because a control strip was not put into the images, so inking was not precisely controlled.

4.2.2 Digital Prints

The original map image data and the output data from the RTSDZIP were printed by digital printer and were compared together. The resulting printing characteristics are shown in Figure 4-3 and the comparison of L*, a*, b*, and ΔE is presented in Table 4-5.

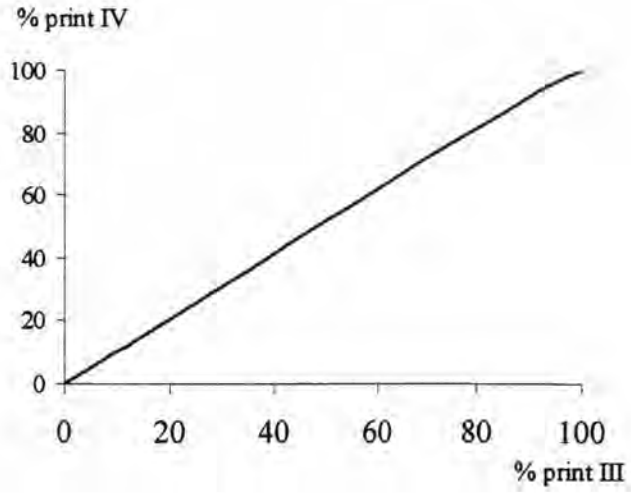

Figure 4-3 : Printing characteristic curve of digital prints, using the original map image data (Print III) and the output data from the RTSDZIP (Print IV)

Table 4-5 : A comparison of L*,a*, b*, and ΔE between digital prints using the original map image data and the output data from the RTSDZIP in red, green, and blue color tones

Color Tone	Image	L*	a*	b*	ΔE
Red	Original	70.0	25.4	23.3	
	RTSDZIP	70.5	24.5	22.9	0.7
Green	Original	42.3	-50.7	-26.4	
	RTSDZIP	41.7	-50.3	-26.4	1.4
Blue	Original	77.0	-6.6	-20.1	
	RTSDZIP	76.7	-7.1	-20.6	0.4

The printing characteristic curve can be assumed to be a straight line and there are very small numbers of ΔE. That is because inking problem does not occur in digital printing and errors originating from a film and plate exposure and printing process control are rejected. Thus, we can conclude that the compression-decompression algorithms did not cause the differences of printing characteristic and color tones.