CHAPTER 1

INTRODUCTION

1.1 Scientific Rationale

Problems related to a large size of map images, which have many details, numbers, characters, symbols, and contour lines, are that they have large data size and use a large amount of memory for storage. Moreover, much time is used for sending that data through a computer network or communication channel. Thus, it is very important to find an efficient data compression method to minimize the amount of memory required as well as data transmission time. For many years, many compression techniques have been proposed to minimize those problems such as Huffman, Run-Length, Arithmetic, Predictive, Contour, and Transform coding.

This research presents a way of map images compression using an Indexed Color System and Huffman Coding. Optimized Run-Length Coding, which is modified from basic Run-Length Coding, is applied to get higher compression ratio. The concepts behind this technique are done by the conversion of each pixel's color value of map images from RGB to index numbers in an Indexed Color System. Optimized Run-Length Coding eliminates spatial redundancy by grouping the adjacent pixels that have same colors into single code. These data is then converted from fixed length codes and saved in variable length codes with Huffman Coding. The advantages of this technique are that despite a high compression ratio, there is no loss of the content of the map images. Also, unauthorized persons can not open the

computer file because commercial application programs can not be supported unless a created decompression program is used. The results obtained from this technique will be compared with a commercial compression program, Winzip 7.0, in terms of compression ratio and compression-decompression time. Also, the original map image data and the output data from the created program will be printed out by offset printing and digital printing and will be determined in term of printed image quality.

1.2 Objective

To create a compression-decompression program for map images using an Indexed Color System, Optimized Run-Length and Huffman Coding techniques for long distance distributive digital printing.

1.3 Scope of the Research

This research uses digital RGB map images of L7018 series acquired by Automate Mapping Office of the Royal Thai Survey Department (RTSD) as samples. The compression process starts from the conversion of images in the RGB Color System to index numbers in the Indexed Color System, writing data with the Optimized Run-Length coding technique, and calculating the probabilities of occurrences to assign the Huffman codes. The decompression process starts from reading the data stream, comparing the code with Huffman and Indexed tables, and converting back to RGB. The run of each index is read in order to assign the number of adjacent pixels available. This data is then written in a new file that represents the original map image in Raw format.

The compressed files obtained from the compression function of created program and Winzip 7.0 are determined with the original image files in terms of compression ratio and compression-decompression time. The original map image data and the output map image data from the created program will be printed out by offset printing and digital printing and will be determined in term of printed image quality. The result of this research will lead to a way of lossless map image compression that gives high compression ratio while maintaining an acceptable printed image quality and can secure the data from opening by unauthorized persons.

1.4 Content of the Thesis

This thesis consists of 5 chapters including (1) introduction, (2) theory and literature review, (3) experiment, (4) results and discussion, and (5) conclusions and suggestions. Chapter 2 presents the RGB and Indexed Color System, image compression fundamental, image data redundancies, image compression techniques, Run-Length and Huffman Coding, and overview of related studies. Chapter 3 discusses the details about the materials, apparatus, and experiment, including the procedure of created compression-decompression techniques. Chapter 4 presents the differences of compression ratio and compression-decompression time between the obtained results from this research and Winzip 7.0 compression program compared with the original map image data. The paper maps of the original data and the created program obtained from offset printing and digital printing will be determined. The last chapter discusses the advantages and disadvantages of the created compression-decompression program.