論文提要內容:

資料壓縮的主要目的即在一列資料中借可能減少某些多餘或不重要的信息，進而減少所需的資料量。大致上，資料壓縮可分為兩大類：一是資料保存(information preserving)，一是資料遺失(lossy)。

第一部分我們將介紹一個應用在二元資料(binary sources)屬於第一類的演算法。利用巴斯卡三角形的演算法，一般將碼字(codewords)分為兩個部分：前部(prefix)和後部(suffix)。我們提出了一個方法，致力於降低前部碼字(prefix codewords)所需的位元數。

對於影像資料，利用視覺上的容忍度，第二類會遺失部分資料的演算法可得到很高的壓縮比。向量化演算法(vector quantization)是目前被廣泛使用的演算法之一。不少變形也已經被提出來了。分類向量化演算法(classified vector quantization)致力於保留影像中重要的，眼睛可知免的造線部分。而格子向量化演算法(trellis coded vector quantization)則致力於減少失真誤差(error distortion)。為了利用比二種方法的優點，結合分類向量化法和格子向量化法是第二部分我們所要探討的主要課題。

對於這兩部分的演算法我們都做了模擬，也和傳統的方法做比較。證明了我們所提出的方法確實較傳統的方法有了較好的結果。
Abstract

The fundamental goal of data compression is to reduce as much redundant and insignificant information from a sequence of data as possible. Compression coding techniques can fall into two broad categories: information preserving and lossy. In part I, we introduce a variable-to-variable coding technique belonging to the first category for sequential data compression. In part II, we propose a lossy compression technique in the application of image coding.

The use of a Pascal triangle for the binary memoryless data compression has been presented. According to the coding diagram, i.e. a subset of the Pascal triangle, this scheme can be classified as a variable-to-variable coding. The fundamental concept of this algorithm is dividing the source symbols into variable-length subintervals (segments) such that every ensemble has the same probability. Two modes are introduced. The basic mode is used for the case when the probability \( f \) of the number of 1's in the source sequence is known a priori or acquired through a two-pass algorithm. An adaptive method which is a modification of the basic scheme computes the parameter \( f \) based on past statistical source information also presented. This algorithm allows a sequence of data to be compressed and decompressed without losing any information.

For image data compression, a lossy algorithm which takes advantage of psychovisual tolerance to obtain higher compression ratio is desirable. Vector quantization is widely used in the application of image data compression. This algorithm selects one codevector in the codebook, a subset of all possible vectors, to encode an input vector. Several variations employing the vector quantization have been presented. The classified vector quantization devotes itself to preserving the perceptual edge using the vector classification. The trellis-coded vector quantization minimizes the error distortion by finding the shortest path. In Part II, a new algorithm that combines the above two algorithms is presented. This algorithm simultaneously preserves the perceptual features of an image and reduces the error distortion.

Simulations are performed on both parts to compare the proposed methods with traditional ones. The results demonstrate both algorithms are efficient and obtain better restoration quality.