ECI750 Multimedia Data Compression

Lecture 11
Context-based Compression

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Context-based Compression

Examples of Context

- For the word "*probability*",
  - "*b*" is the first-order context for "*a*".
  - "*ob*" is the second-order context for "*a*".

- For an alphabet of size "*M*",
  - The number of first-order contexts is M.
  - The number of second-order contexts is M^2.

- For an alphabet of size of 256 using contexts of order 5,
  - We will need 256^5 or 1.09951×10^{12} probability distributions.

Context-based Compression

Prediction with Partial Match (PPM)

- Proposed by Cleary and Witten in 1984.

- Not as popular as Lempel-Ziv-based algorithms, mainly because of the faster execution speeds of the latter.

Context-based Compression

Burrows-Wheeler Transform

- The transform, which forms a major part of the algorithm, was developed by Wheeler in 1983.

- The BWT compression algorithm, which uses this transform, was developed in 1994.

  - Requires that the entire sequence to be coded be available to the encoder before the coding takes place.

Context-based Compression

BWT Compression Algorithm

- Given a sequence of length N, create N-1 other sequences where each of these N-1 sequences is a cyclic shift of the original sequence.

- Arrange the N sequences in lexicographical order.

- Transmit the sequence of length N created by taking the last letter of each sorted, cyclically shifted sequence.

- This sequence of last letters L, and the positon of the original sequence in the sorted list, are coded and sent to the decoder.

  - This information is sufficient to recover the original sequence.