A Vital Approach to compress the Size of DNA Sequence using LZW (Lempel-Ziv-Welch) with Fixed Length Binary Code and Tree Structure

Abstract

The genome of an organism contains all hereditary information encoded in Deoxyribonucleic Acid (DNA). Molecular sequence databases (e.g., EMBL, Genbank, DDJB, Entrez, SwissProt, etc) represent millions of DNA sequences filling many thousands of gigabytes and the databases are doubled in size every 6-8 months, which may go beyond the limit of storage capacity. There are several text compression algorithm used for DNA compression. This paper proposes a new hybrid algorithm is used to compress DNA sequence, the algorithm is designed by combining the fixed length binary code with the LZW (Lempel-Ziv-Welch) compression algorithm. Initially the input sequence is divided in to fragments where each fragment consist of four nucleotides and fixed length binary code is assigned to each nucleotide then the pattern (STR and CHR) in LZW used the same for creating the dictionary. Assigning a new binary code for each pattern in the dictionary using a binary tree, and the sequence is replaced binary code for the longest match in the dictionary while compression. The proposed approach attains maximum compression in DNA sequences.

References

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