

Wavelet-based encoding scheme for controlling size of compressed ECG segments in telecardiology systems

ABSTRACT

One of the major issues in time-critical medical applications using wireless technology is the size of the payload packet, which is generally designed to be very small to improve the transmission process. Using small packets to transmit continuous ECG data is still costly. Thus, data compression is commonly used to reduce the huge amount of ECG data transmitted through telecardiology devices. In this paper, a new ECG compression scheme is introduced to ensure that the compressed ECG segments fit into the available limited payload packets, while maintaining a fixed CR to preserve the diagnostic information. The scheme automatically divides the ECG block into segments, while maintaining other compression parameters fixed. This scheme adopts discrete wavelet transform (DWT) method to decompose the ECG data, bit-field preserving (BFP) method to preserve the quality of the DWT coefficients, and a modified running-length encoding (RLE) scheme to encode the coefficients. The proposed dynamic compression scheme showed promising results with a percentage packet reduction (PR) of about 85.39% at low percentage root-mean square difference (PRD) values, less than 1%. ECG records from MIT-BIH Arrhythmia Database were used to test the proposed method. The simulation results showed promising performance that satisfies the needs of portable telecardiology systems, like the limited payload size and low power consumption.

Keyword: ECG; Compression; Discrete wavelet transform; Running length encoding; Payload packets