Wavelet Compression of ECG Signals by JPEG2000

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JPEG2000 is the latest international standard for compression of still images. Although the JPEG2000 codec is designed to compress images, we illustrate that it can also be used to compress other signals. As an example, we illustrate how the JPEG2000 codec can be used to compress electrocardiogram (ECG) data. Experiments using the MIT-BIH arrhythmia database illustrate that the proposed approach outperforms many existing ECG compression schemes. The desirable characteristics of the JPEG2000 codec, such as precise rate control and progressive quality, are retained in the presented scheme.

To compress the ECG data using a JPEG2000 codec, the one-dimensional ECG sequence is processed to produce a two-dimensional matrix. Since it is desirable to exploit both the intrabeat and interbeat dependencies, we first separate each "period" of the ECG. Each period is normalized to account for their differences in length and stored as one row of a matrix. This matrix is then encoded using JPEG2000.

In Table 1, the proposed method is compared to other methods in the literature for different compression ratios (CR) and records. The methods in this table include other wavelet-based coders, as well as the parametric ECG signal coder ASEC [3]. The results indicate that the proposed method compares favorably with existing ones.

Table 1: Percent root mean square difference (PRD) comparison of different algorithms.

Algorithm	Record	CR	PRD(%)
Lu et. al [4]	117	8:1	1.18
Hilton [2]	117	8:1	2.6
Djohan et. al [1]	117	8:1	3.9
Proposed	117	8:1	0.86
Wei et. al [5]	117	10:1	1.18
Proposed	117	10:1	1.03
ASEC [3]	119	21.6:1	5.5
Lu et. al [4]	119	21.6:1	5.0
Proposed	119	21.6:1	3.76

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