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Compressed Sensing of Fetal Electrocardiogram Signals Based on Joint Block Multi-Orthogonal Least Squares Algorithm

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Abstract : With the rise of medical IoT technologies, Wireless body area networks (WBANs) can collect fetal electrocardiogram (FECG) signals to support telemedicine analysis. The compressed sensing (CS)-based WBANs system can avoid the sampling of a large amount of redundant information and reduce the complexity and computing time of data processing, but the existing algorithms have poor signal compression and reconstruction performance. In this paper, a Joint block multi-orthogonal least squares (JBMOLS) algorithm is proposed. We apply the FECG signal to the Joint block sparse model (JBSM), and a comparative study of sparse transformation and measurement matrices is carried out. A FECG signal compression transmission mode based on Rbio5.5 wavelet, Bernoulli measurement matrix, and JBMOLS algorithm is proposed to improve the compression and reconstruction performance of FECG signal by CS-based WBANs. Experimental results show that the compression ratio (CR) required for accurate reconstruction of this transmission mode is increased by nearly 10%, and the runtime is saved by about 30%.

Keywords : telemedicine, fetal ECG, compressed sensing, joint sparse reconstruction, block sparse signal
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