

# Fetal Heart Rate Extraction from Abdominal Electrocardiograms through Multivariate Empirical Mode Decomposition

Praveen Gupta

Government Polytechnic College, India



## Abstract

Assessment of fetal heart rate (FHR) and fetal heart rate variability (fHRV) reveals important information about fetal well-being, specifically in high risk pregnancies. Abdominal electrocardiogram (abdECG) recording is a non-invasive method to capture fetal electrocardiograms. In this paper, we propose a methodology to extract FHR (fetal RR time series) from the abdECG recordings using the recently introduced multivariate empirical mode decomposition (MEMD) technique. MEMD breaks a signal into a finite set of intrinsic mode functions (IMFs). First, elimination of the noisier abdECG channels, based on comparison of similar indexed IMFs that were obtained through the MEMD technique, is conducted. Thereafter, denoising of the remaining abdECG channels is performed by eliminating certain similar indexed IMFs. The unwanted mother QRS complexes are removed from these noise-free abdECG channels, and the candidate fetal R-peaks are detected through a wavelet based approach. The proposed methodology is validated using an open source real-life clinical database. The proposed technique resulted in a high value (0.983) of cross correlation between the detected and true FHR signal.

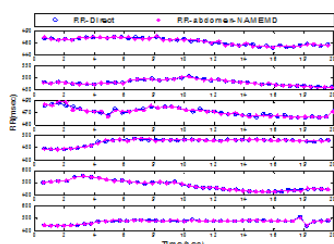


Fig. RR time series of all abdominal ECG recordings from top to bottom (rec\_1, rec\_2, rec\_3, rec\_4, rec\_5, and rec\_6) obtained using the NA-MEMD and its comparison with direct fetal scalp recordings



## Biography

Praveen Gupta has expertise in biomedical signal processing, specifically abdominal ECG signal processing, intra cellular neuronal recordings and algorithms related to direct applications in medical field. In recent past, his research work using Wavelet Transforms (WT) and latest novel algorithms such as Multivariate Empirical Mode Decomposition (MEMD) received great attention in medical and research fraternity. He has wide experience in teaching, evaluation, research and administration in educational institutions. He has also worked as Technical Advisor in Government of Rajasthan. He earned his Ph.D., Masters and Bachelor's. Degrees from prestigious National Institutes of Technologies (NITs). He has a professional membership of IEEE.

## Publications

1. P. Gupta, K. K. Sharma, and S.D. Joshi, "Fetal heart rate extraction from abdominal electrocardiograms through multivariate empirical mode decomposition," Elsevier J. Compt. Biol. Med., vol. 68, pp. 121-136, 2016.
2. P. Gupta, K. K. Sharma, and S.D. Joshi, "Baseline wander removal of electrocardiogram signals using multivariate empirical mode decomposition," IET Heal. Technol. Lett., vol. 2, pp. 164-166, 2015.
3. P. Gupta, K. K. Sharma and S.D. Joshi, "Investigations on instantaneous frequency variations of RR time series in intrinsic mode functions of congestive failure subjects," in Proc. IEEE ISSP, Gujarat, India, 2013, pp.160-165. (Available online at IEEE digital explore.)

10<sup>th</sup> World Congress on Otolaryngology | June 22-23, 2020

**Citation:** Praveen Gupta, Fetal Heart Rate Extraction from Abdominal Electrocardiograms through Multivariate Empirical Mode Decomposition, Otolaryngology 2020, 10th World Congress on Otolaryngology, June 22-23, 2020, PP. 8