

ABSTRACT

Clinical detection of pregnancy in cats uses ultrasonography, radiography, and abdominal palpation, which have limitations in accessibility, cost, and require expert personnel. Fetal Doppler technology offers a non-invasive, cost-effective, and safe alternative across various species without side effects. This study aims to develop a signal processing method based on the wavelet transform to extract information from fetal Doppler audio signals for predicting fetal count in cats.

The study was conducted on four domestic cats (three pregnant with a minimum of 30 days of gestation, one control) with ground truth based on veterinary palpation. The methodology includes signal recording using Bistos BT-250 fetal Doppler, preprocessing, and two denoising scenarios: Scenario 1 (preprocessing-EMD-DWT) and Scenario 2 (BandLab-preprocessing-DWT). Feature extraction used the Discrete Wavelet Transform with Daubechies-6 basis at level 5, focusing on the approximation level 1 (A1) component. Prediction was performed using a 265-ms sliding window with an adaptive threshold, histogram analysis of 0.25–0.5-second intervals (equivalent to 120–240 BPM), and identification of dominant peaks as fetal count indicators. Results showed Scenario 1 provided better performance with an SNR of 53.93 dB compared to 17.21 dB in Scenario 2. The A1 component comprised 51.93–70% of the total energy. Prediction accuracy ranged from 55.56–88.89% with the best performance of 88.89% at P2-S2. Per-subject evaluation showed Subject 1 consistent across three approaches, Subject 2 successful in one approach, Subject 3 in two approaches; however, the system experienced limitations with 0% negative accuracy due to false positives in the control subject.

The study demonstrates that the wavelet transform is adequate for extracting information from fetal Doppler signals in predicting fetal count in cats. The system requires further development in feature selection and threshold adjustment to improve specificity in distinguishing fetal signals from maternal vascular signals.

Keyword: *Fetal Doppler, Wavelet Transform, Fetal Count Prediction, Cat Pregnancy, Audio Signal Processing*