

## ABSTRAK

Florensia Nadia Rosa Pangesti

REDUKSI *NOISE* FISIOLOGIS MENGGUNAKAN *FILTER DISCRETE WAVELET TRANSFORM (DWT)* PADA ALAT PHONOCARDIOGRAM

xvi + 33 Halaman+ 11 Tabel + 17 Lampiran

Phonocardiogram (PCG) merupakan alat untuk merekam suara jantung dalam analisis kondisi kardiovaskular, namun sinyal PCG sering terkontaminasi noise fisiologis seperti suara pernapasan dan aktivitas otot (EMG) yang menurunkan kualitas sinyal. Penelitian ini bertujuan untuk mereduksi noise fisiologis pada sinyal PCG menggunakan metode Discrete Wavelet Transform (DWT) dengan wavelet Coiflet 4 (coif4).

Penelitian diawali dengan akuisisi sinyal PCG dari lima responden, dilanjutkan proses prefiltering berupa high-pass 20 Hz, band-stop 50–60 Hz dan 180–190 Hz, serta low-pass 100 Hz, kemudian dilakukan dekomposisi DWT hingga level 4. Evaluasi dilakukan menggunakan parameter Signal-to-Noise Ratio (SNR) pada data normal, data dengan noise EMG, dan noise pernapasan.

Hasil menunjukkan peningkatan SNR tertinggi pada data normal sebesar 24,55 dB, diikuti noise pernapasan 23,97 dB dan EMG 22,22 dB. Analisis menunjukkan level DWT 1–2 menghasilkan performa optimal dibandingkan level 3–4. Metode DWT Coiflet 4 mampu meningkatkan kejernihan sinyal dengan tingkat keberhasilan  $\pm 85\%$ , keandalan sistem 90,2%, dan akurasi identifikasi sinyal jantung 91,4%.

Kata kunci: Phonocardiogram, Discrete Wavelet Transform, Coiflet 4, Reduksi Noise, Signal-to-Noise Ratio

## **ABSTRACT**

Florensia Nadia Rosa Pangesti

### **PHYSIOLOGICAL NOISE REDUCTION USING DISCRETE WAVELET TRANSFORM (DWT) FILTER ON A PHONOCARDIOGRAM DEVICE**

xvi + 33 Pages + 11 Tables + 17 Appendices

Phonocardiogram (PCG) is a device used to record heart sounds for cardiovascular condition analysis; however, PCG signals are often contaminated by physiological noise such as respiratory sounds and muscle activity (EMG), which degrade signal quality. This study aims to reduce physiological noise in PCG signals using the Discrete Wavelet Transform (DWT) method with the Coiflet 4 (coif4) wavelet.

The research began with PCG signal acquisition from five respondents, followed by a prefiltering process consisting of a 20 Hz high-pass filter, band-stop filters at 50–60 Hz and 180–190 Hz, and a 100 Hz low-pass filter. Subsequently, DWT decomposition was performed up to level 4. Performance evaluation was conducted using the Signal-to-Noise Ratio (SNR) parameter on normal data, EMG noise data, and respiratory noise data.

The results showed the highest SNR improvement in normal data at 24.55 dB, followed by respiratory noise at 23.97 dB and EMG noise at 22.22 dB. Further analysis indicated that DWT levels 1–2 provided more optimal performance than levels 3–4. The DWT Coiflet 4 method improved signal clarity with a noise reduction success rate of approximately 85%, system reliability of 90.2%, and heart sound identification accuracy of 91.4%.

**Keywords:** Phonocardiogram, Discrete Wavelet Transform, Coiflet 4, Noise Reduction, Signal-to-Noise Ratio