ABSTRACT

Cardiovascular diseases are the leading cause of global mortality, accounting for 19.8 million deaths annually. The diagnosis of cardiovascular diseases through traditional auscultation is compromised by environmental noise, limitations in hearing sensitivity, and low heart sound intensity. This study develops an integrated digital stethoscope system with database capabilities to record, archive, and facilitate the analysis of heart sounds with high accuracy. The system utilizes an electret condenser microphone with an operational amplifier, analog and digital low-pass filters, and an SQLite3 database to store audio recordings in Waveform Audio File Format (WAV). A desktop application interface was developed using Python with PyAudio, Matplotlib, and wxPython libraries, featuring extraction of dominant frequency parameters, maximum amplitude, BPM, and graphical visualization. Testing on three subjects through seven recording sessions with durations of 8-14 seconds per session showed that the system detected dominant frequencies of 25.5-50 Hz with amplitudes of 3805-7193 counts under quiet conditions. BPM measurement accuracy reached 99.5% compared to the Huawei Watch GT-4, with a 100% data storage success rate. The system effectively differentiated S1 and S2 sounds and provided patient recording history. The main limitation is the system's sensitivity to environmental noise, which produces anomalous frequencies (130.4-156.6 Hz) under noisy conditions. The system demonstrates potential as a digital medical record documentation tool for clinical implementation.

***Keywords** : Cardiovascular Disease, Digital Stethoscope, Heart Sound Analysis, Signal Processing, Python, Database Integration.*