HEART MURMUR DETECTION AND ANALYSIS USING MULTIPOINT AUSCULTATION SYSTEM

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Dedicated to my beloved wife Azlin Abd Jamil, my beloved children, Dania Sofea, Danny Iskandar, Daniel Akashah and Diana Maisara, and my beloved father, mother, brothers, sisters & friends.
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The study of phonocardiogram (PCG) in diagnosing valvular heart disease has gathered increasing attention over the past few years. Heart sound auscultation is performed at the primary care center by physician and the results are subjected to the skills and hearing ability. This has caused unnecessary referral and send home subject with potential heart disease. This issue has led to the establishment of standardized and computerized system to analyze the heart sound. This thesis investigates the optimal approach in establishing a reliable system to acquire and process heart sound to differentiate between normal and abnormal pattern. Previous studies are based on the analysis using heart sound that is recorded from single stethoscope which provides limited information regarding the heart disease. In this study, the recording based on four stethoscopes is used to record sound from four different valves with optimized analog instrumentation design. Beamforming algorithm is utilized to localize the actual source of the disease sound from all of the four recorded sound by focusing with respect to the angle of arrival of the desired disease signature. It is then followed by the implementation of Time Frequency (TF) algorithm with optimal Extended Modified B-Distribution (EMBD) kernel to suppress noises, analyze and represent the features. The experiments were conducted utilizing PCG signal that was recorded from real subject from Hospital Sultanah Aminah Johor Bahru. Each subject was screened by an echocardiogram machine. The disease was confirmed by cardiologist before the PCG recording procedure was performed. The result shows significant improvement in the quality of information that is preserved in the beamformed signal. The suggested framework is able to improve the heart murmur detection rate up to 95%. In conclusion, the localization of the exact location of the diseased sound has helped to improve the disease detection accuracy based on multi-point heart sound diagnostic system.
ABSTRAK