ABSTRACT

Audio signals play a central role in various aspects of human life, including entertainment, telecommunications, and medical technology. However, the increasing complexity and volume of audio data pose new challenges in storage, transmission, and processing. The Kalimba musical instrument, also known as Mbira or Thumb Piano, is an instrument with unique characteristics that can produce a diverse range of sound frequencies. However, the size and complexity of audio data from the Kalimba instrument can lead to issues in storage and transmission. Compressive Sensing (CS) technique emerges as a promising solution to address the efficiency challenges in data storage and transmission.

CS method involves three stages: Sparsity transformation, Reduced Sensing, and Reconstruction. Sparsity transformation converts the representation of an audio signal into a sparse form. In this study, Fast Fourier Transform (FFT), Discrete Cosine Transform (DCT), and Discrete Wavelet Transform (DWT) are employed for sparsity transformation. Reduced Sensing is used to obtain reduced audio data. Reconstruction is utilized to retrieve the reconstructed audio signal, where Orthogonal Matching Pursuit (OMP) and Basis Pursuit (BP) algorithms are applied. The research data involves Kalimba audio signals.

Based on the conducted CS experiments, the best Peak Signal to Noise Ratio (PSNR) and Root Mean Square Error (RMSE) values were obtained from the DCT sparsity transformation algorithm with BP reconstruction algorithm, specifically at a Compression Ratio (CR) of 0.8, yielding PSNR of 88.648 dB and RMSE of 0.00938. Additionally, the fastest computation time was observed with the DCT sparsity transformation algorithm and OMP reconstruction algorithm, at a CR of 0.2 with a duration of 2.197 seconds.

Keywords: *Compressive Sensing, Discrete Cosine Transform, Basis Pursuit, Orthogonal Matching Pursuit, Kalimba audio signal.*