

## ABSTRACT

Many people work using the internet, thanks to advanced technology that makes us easier to distribute data and information. But on the other hand, this also causes piracy and illegal distribution over the internet. We need a technique to protect copyright and ownership to solve the problems. Watermarking is the solution to answer these problems. Combining with a microcomputer technology, Raspberry Pi, so we able to protect digital contents is more practical and portable.

This Final Project proposal presents an audio watermarking system on Raspberry Pi 2 Model B with Discrete Wavelet Transform (DWT) and Statistical Mean Manipulation (SMM). Before the watermark is embedded, the authors use the DWT to decompose the audio host into frequency subbands. After decomposing, watermark embeds into the selected subband with the SMM method. SMM is a method to divide the audio host into frames, and makes the mean of a frame to be zero.

This study uses a binary image with  $8 \times 15$  pixels as the embedded information and five audio hosts. The results of the proposed method show good watermark robustness and watermarked audio quality, with BER 0, maximum SNR 34.7008 dB, maximum ODG -0.04, capacity 0.6729, and MOS greater than 4. The proposed method is also robust to most signal processing attacks, such as Low Pass Filter (LPF), resampling, time scale modification, linear speed change, equalizer, echo, MP3 compression, AAC compression, MP4 compression, and delay.

Keywords: Audio Watermarking, Raspberry Pi, Discrete Wavelet Transform, Statistical Mean Manipulation