

## ABSTRACT

The illegal distribution of digital data is increasing rapidly along with the Internet development, especially in digital audio. Data hiding is a technology that can solve this problem and one of the branches of data hiding is watermarking. Therefore, hiding data through watermarking is able to protect copyright by embedding data information into audio imperceptibly.

In this thesis, the audio watermarking method utilizes the Multibit SS algorithm, where Hadamard code sequence represents multiple watermark bits spread throughout the host signal spectrum for a large watermark embedding capacity. With CS method the audio watermarking system in this thesis is able to reconstruct and recover the watermark from compressed audio. Both techniques unlock the capability of hide information and host audio compression simultaneously.

In this thesis, the audio watermarking system has proven to be effective after multiple simulation experiments on 10 audio samples. Experimental data shows that the ODG value has a value in the range of  $-0.07 - 0.27$ , average SNR 31.84, Capacity in the range of 300–800, Compression Ratio(CR) in the range of 1 – 32, and the average Bit Error Rate (BER) is 0%. The experimental results indicate that the audio watermarking system in this thesis has good imperceptibility, has large embedding capacity and strong robustness.

**Keywords:** Data hiding; compressive sampling; Discrete Cosine Transform; Multibit spread spectrum ; Sparsity Technique.