

# EEC269A - Error Correcting Codes I

## Project Report

Chenye Yang, Pranav Kharche, Parisa Oftadeh

June 4, 2023

## 1 Workload

Function	Workload	Contributor
Source	Text string (TXT), Image (PNG), Audio (WAV)	Chenye
Encoder	(7, 4) Systematic Linear Block (Hamming) Code	Chenye
	( $n, k$ ) Systematic Cyclic (Hamming) Code	Pranav, Chenye
Channel	Binary Symmetric Channel (BSC), error probability $p$ adjustable	Chenye
Error Corrector	Syndrome Lookup Table for (7, 4) Linear Code	Chenye
	Syndrome Lookup Table for ( $n, k$ ) Cyclic Code	Chenye
	LFSR for ( $n, k$ ) Cyclic Code	TODO
Decoder	(7, 4) Systematic Linear Block (Hamming) Code	Chenye
	( $n, k$ ) Systematic Cyclic (Hamming) Code	Chenye
Destination	Text string (TXT), Image (PNG), Audio (WAV)	Chenye
Advanced	Create generator matrix for ( $n, k$ ) cyclic code	Pranav
	Adjustable ( $n, k$ )	Pranav

## 2 (7,4) Systematic Linear Block (Hamming) Code

### 2.1 Syndrome Decoder

#### 2.1.1 Text string

Original	Without correction	Corrected
Hello World! EEC269A Error Correcting Code Demo	Hello Wopld! EEC269A Arror Correcting Kode Demo	Hello World! EEC269A Error Correcting Code Demo



(a) Original (b) Without correction (c) Corrected

Figure 1: Image encoded with Linear Hamming passed through BSC (entire)

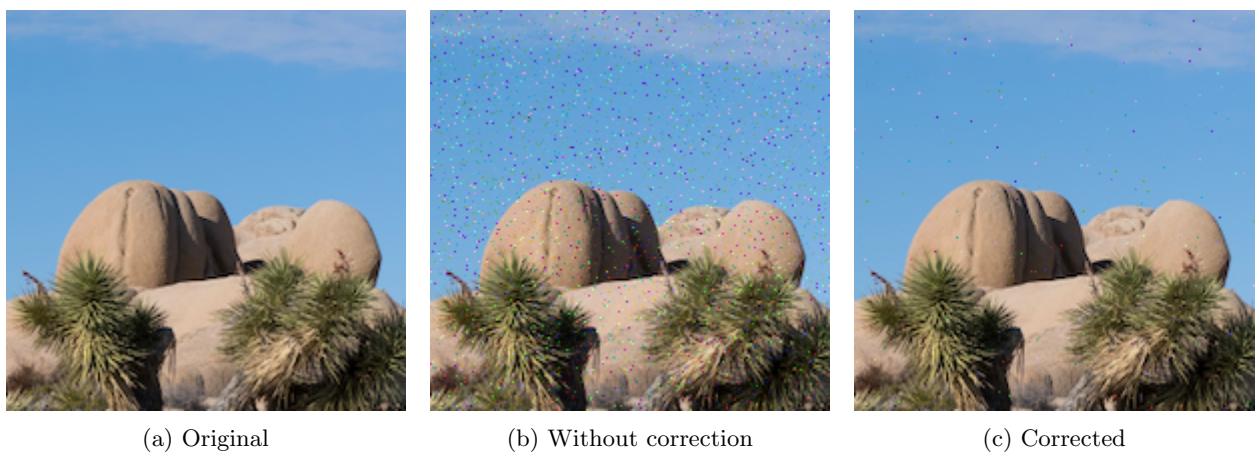


Figure 2: Image encoded with Linear Hamming passed through BSC (details)

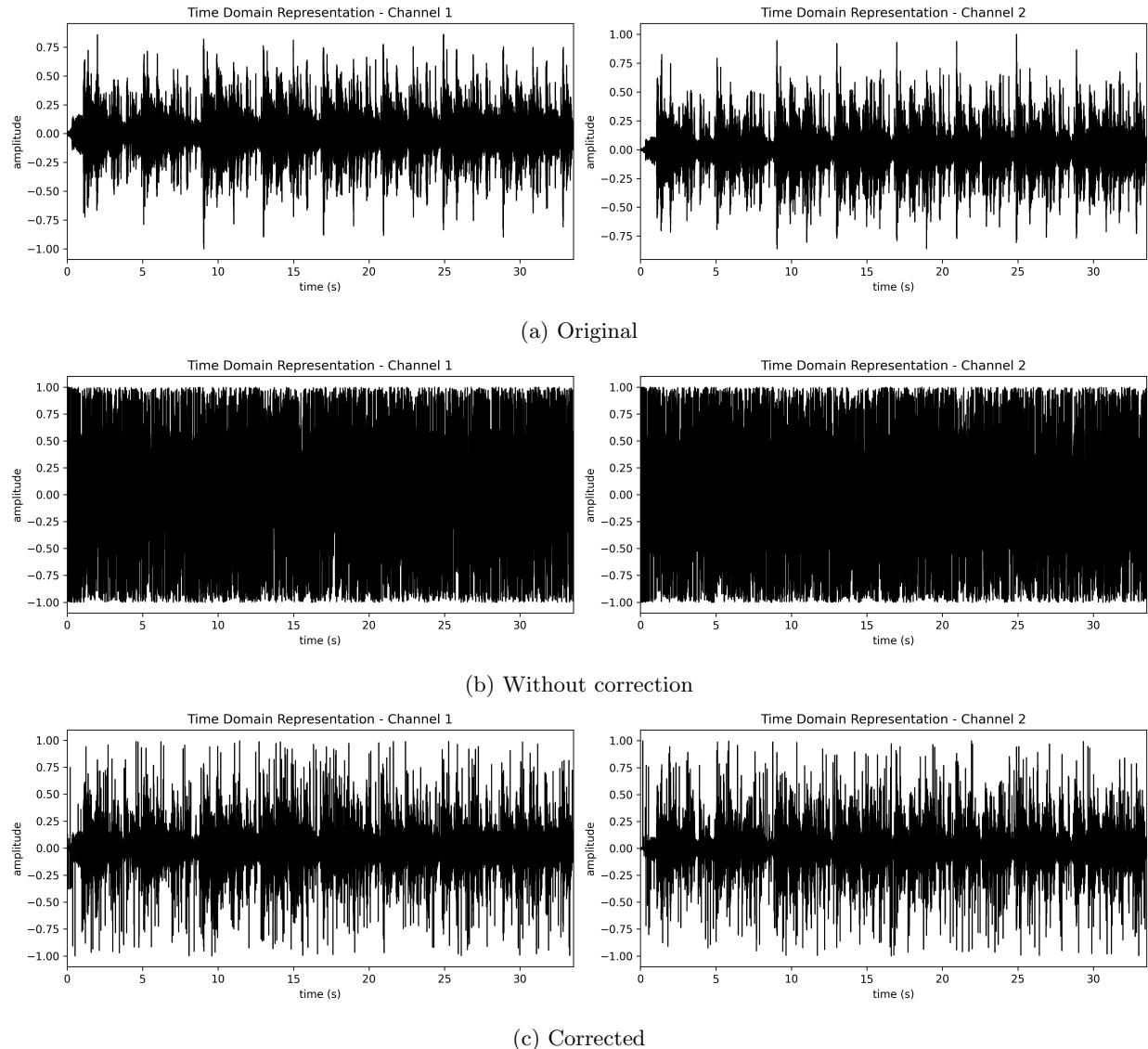


Figure 3: Audio encoded with Linear Hamming passed through BSC

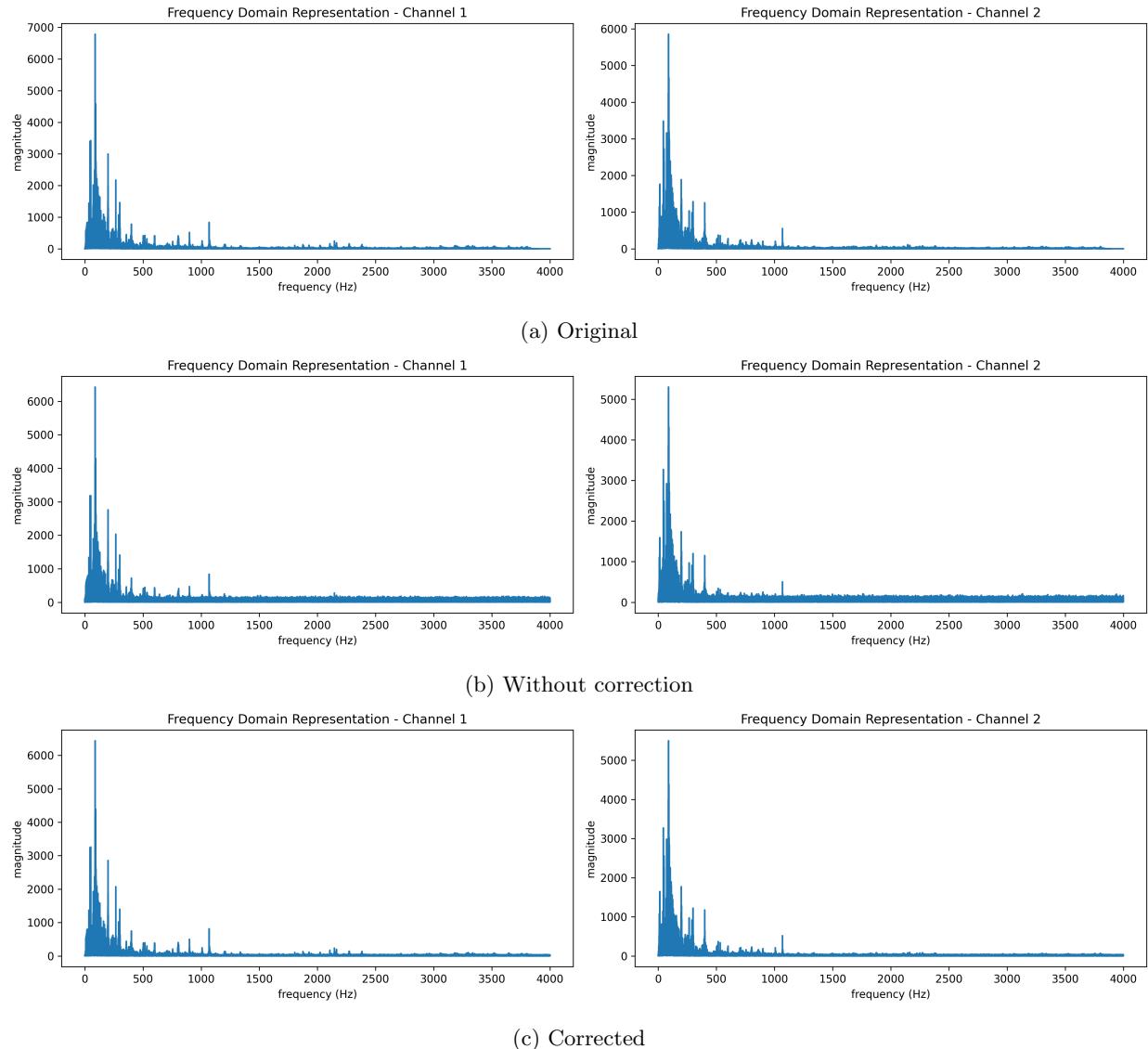


Figure 4: Audio encoded with Linear Hamming passed through BSC



(a) Original

(b) Without correction

(c) Corrected

Figure 5: Image encoded with Cyclic Hamming passed through BSC (entire)

### 2.1.2 Image

### 2.1.3 Audio

## 3 $(n, k)$ Systematic Cyclic (Hamming) Code

### 3.1 Syndrome Decoder

#### 3.1.1 Text string

Original	Without correction	Corrected
Hello World! EEC269A Error Correcting Code Demo	H <u>u</u> ,lo World! EEC269A Error Correctifg Code Demo	Hello World! EEC269A Error Correcting Code Demo

#### 3.1.2 Image

#### 3.1.3 Audio

### 3.2 LFSR Decoder

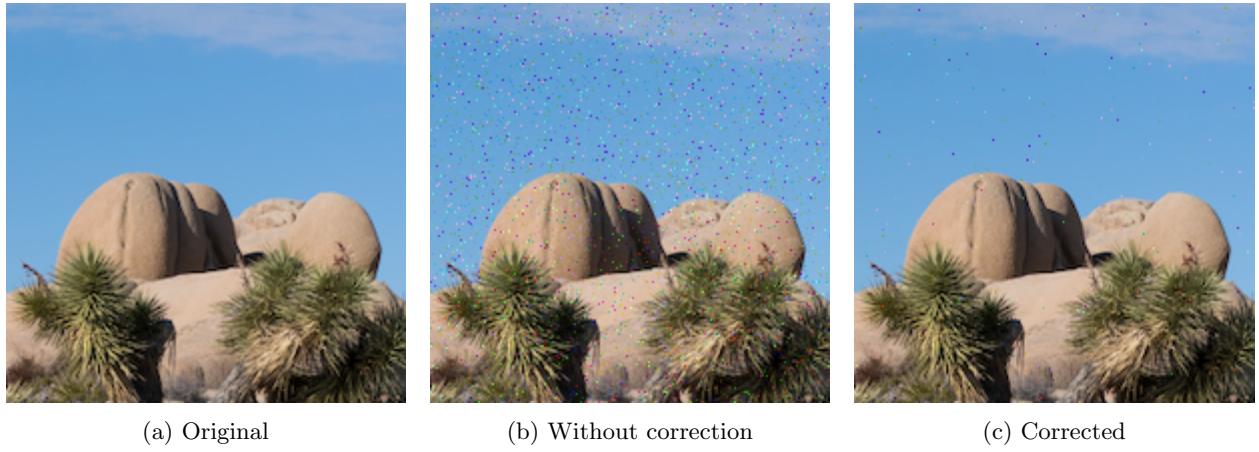


Figure 6: Image encoded with Cyclic Hamming passed through BSC (details)

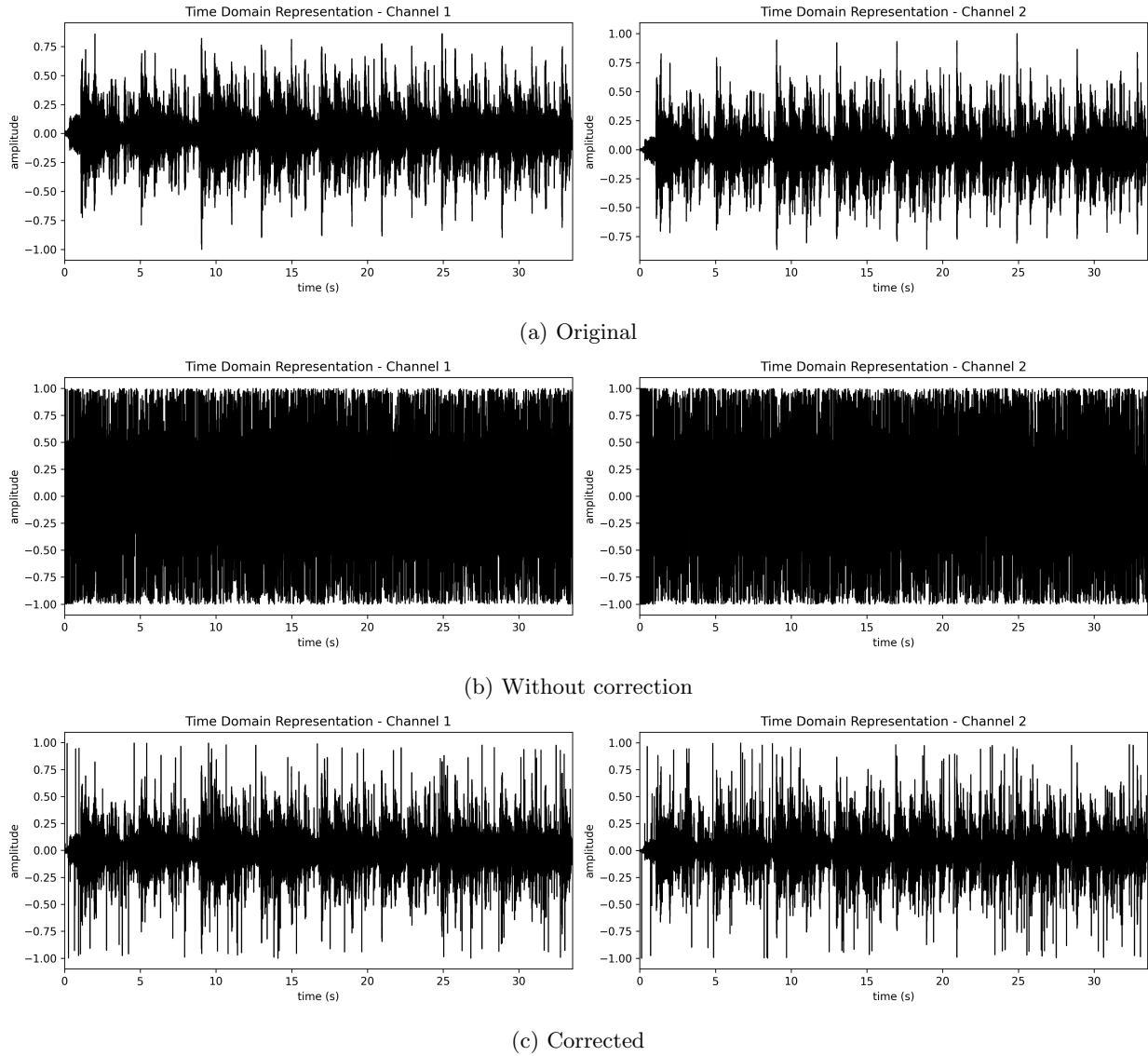


Figure 7: Audio encoded with Cyclic Hamming passed through BSC

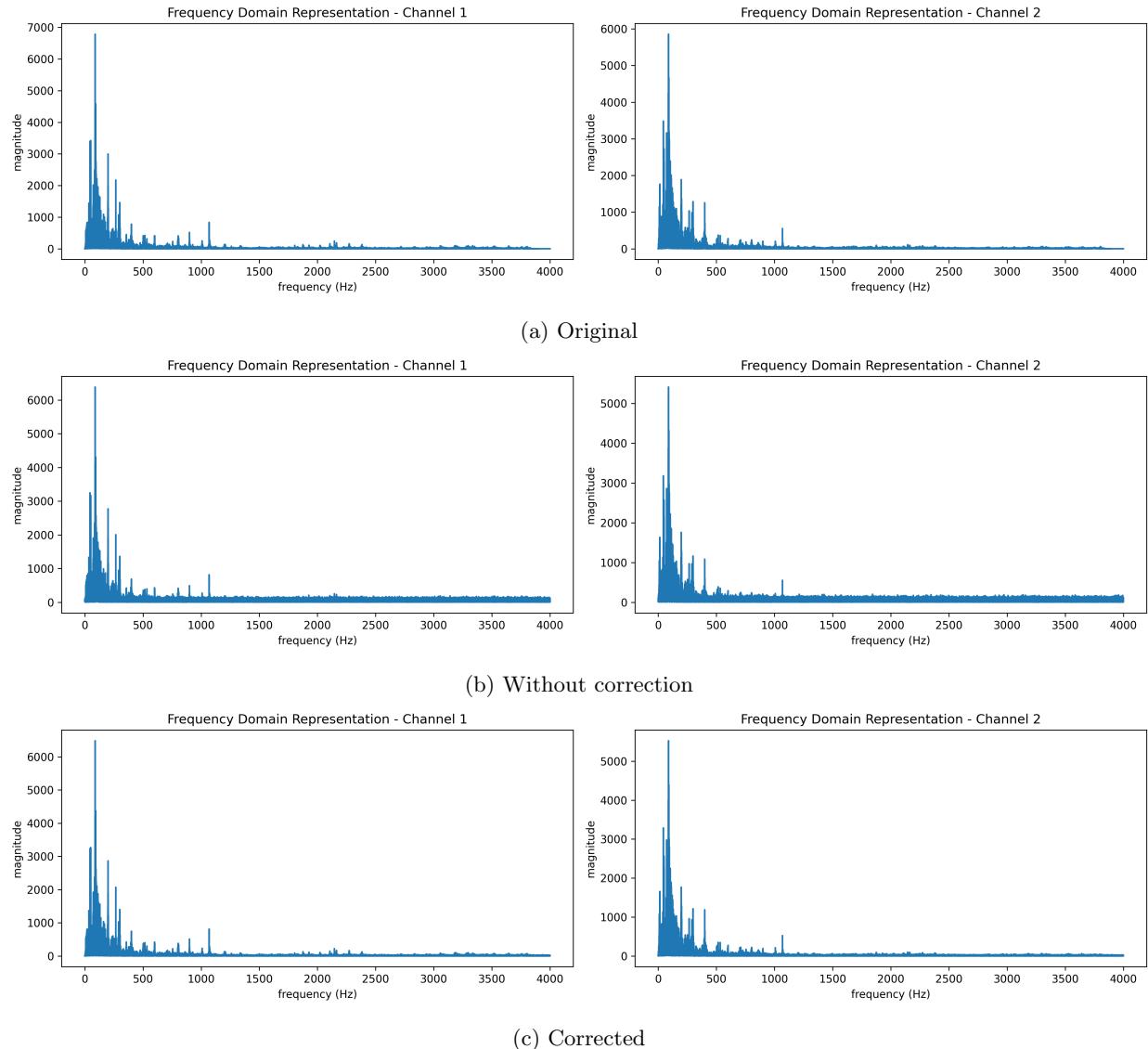


Figure 8: Audio encoded with Cyclic Hamming passed through BSC