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Homework 1

Music424
April 12, 2019

Problem 1

(a) Done.

(b) In this question, Input Gain = 0.09, Threshold of compression = 0.09, By converting the linear scale to log scale: Input Gain = -20.9151 dB, Threshold of compression =-20.9151 dB. Figures are generated in Matlab:
Attack time 10ms; Release time: 200ms

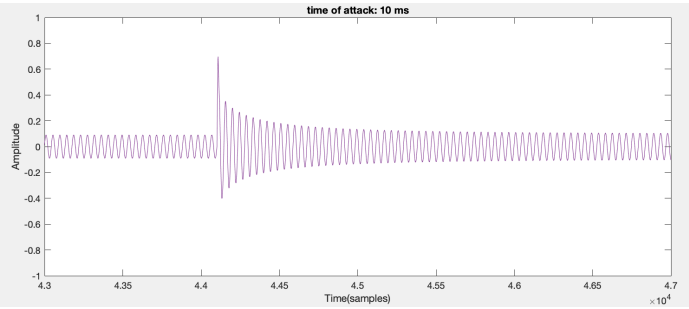

Figure 1: Signal at time of attack: 10 ms

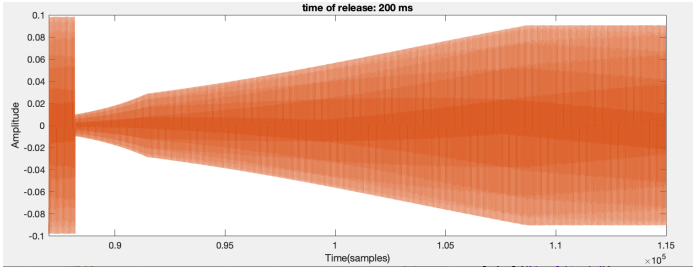

Figure 2: Signal at time of release: 200 ms

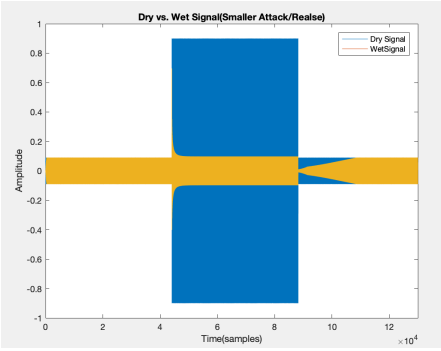

Figure 3: Dry Signal vs Wet Signal

Attack time 1ms; Release time: 50ms

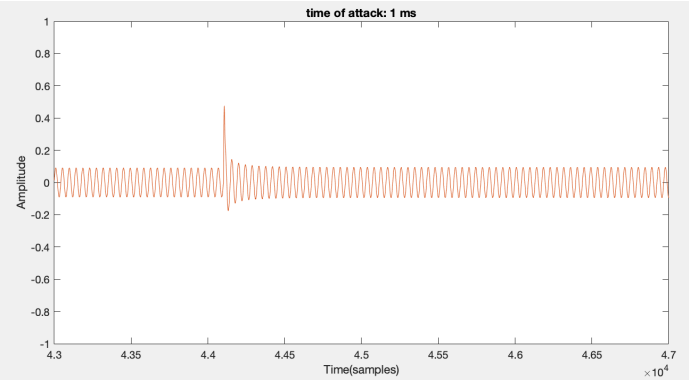

Figure 4: Signal at time of attack: 1 ms

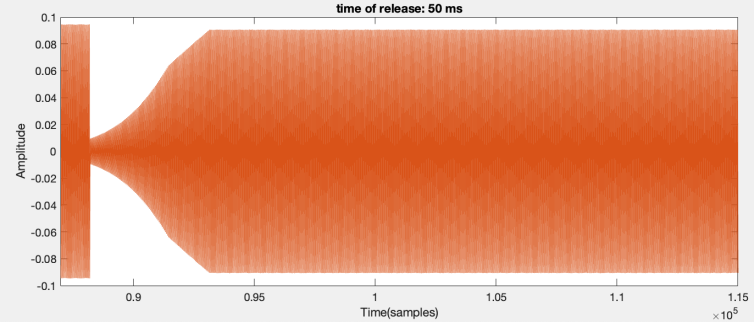

Figure 5: Signal at time of release: 50 ms

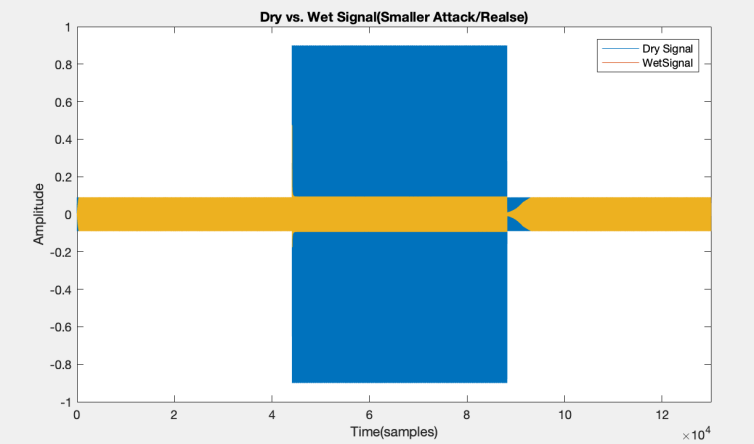

Figure 6: Dry Signal vs Wet Signal

(c) Drum signal, Release Time 200 ms, input gain +3dB, output gain -3dB, threshold at -12dB. Adjust Attack Time from 0.1 ms to 100 ms.

- smooth/round: Around 0.1 ms
- tinky/small: Below 0.5 ms
- thuddy/muddy: Between 10 ms
- transparent: Above 20 ms

Attack Time 0.1 ms, Release time from 20 ms to 200 ms.

-buzzy: 25 ms
-roomy: 50 ms
- even: 200 + ms

Problem 2

(a) The code for RMS detector is shown:

```
//RMS Detector
struct RMSDetector {
    float b0_r, a1_r, b0_a, a1_a, levelEstimate;

    RMSDetector() {
        this->a1_r = 0; // release coeffs
        this->b0_r = 1;
        this->a1_a = 0; // attack coeffs
        this->b0_a = 1;
        reset();
    }
    void setTauRelease(float tauRelease, float fs) {
        a1_r = exp( -1.0 / ( tauRelease * fs ) );
        b0_r = 1 - a1_r;
    }

    void setTauAttack(float tauAttack, float fs) {
        a1_a = exp( -1.0 / ( tauAttack * fs ) );
        b0_a = 1 - a1_a;
    }

    void reset() {
        // reset filter state
        levelEstimate=0;
    }

    void process (float input, float& output) {
        input = pow(input,2);//suqare input
        levelEstimate += b0_r*(fabs(input)-levelEstimate);
        output = pow(levelEstimate,0.5);
    }

};
```

Figure 7: RMS code

(b) Comparisons between peak detection and rms detection:

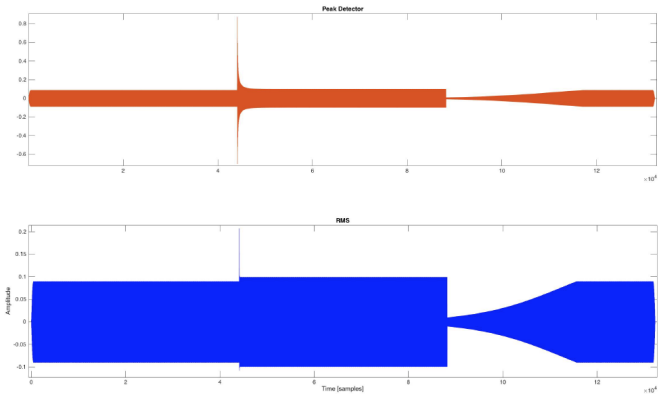

Figure 8: Whole

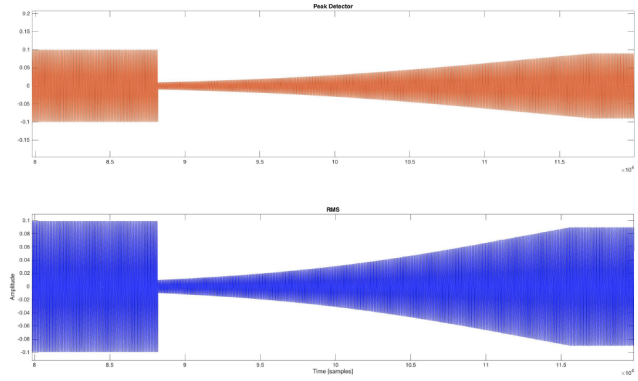

Figure 9: Release

The RMS is more flat.

Problem 3

(a) plots of the response of your modi

ed compressor to the test signal for three cases, p = [2; 5; 10], for a Release Time of 100 ms.

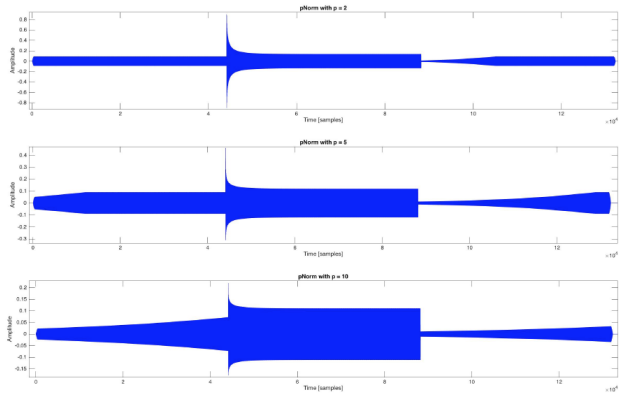

Figure 10: Plots of p = [2; 5; 10], for a Release Time of 100 ms.