

Truncated Speech based VPR

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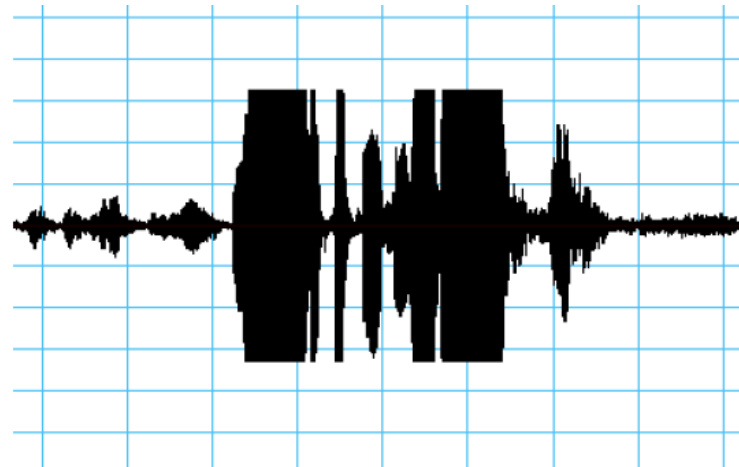
outline

1. Truncated Speech Segments
2. Frequencies of truncated sine wave
3. Impact on VPR system
4. Detection for Truncated Speech Segments
5. Different Types of Truncated Speech
6. Recovery of truncated speech

Truncated Wave

1. Wave for truncated speech

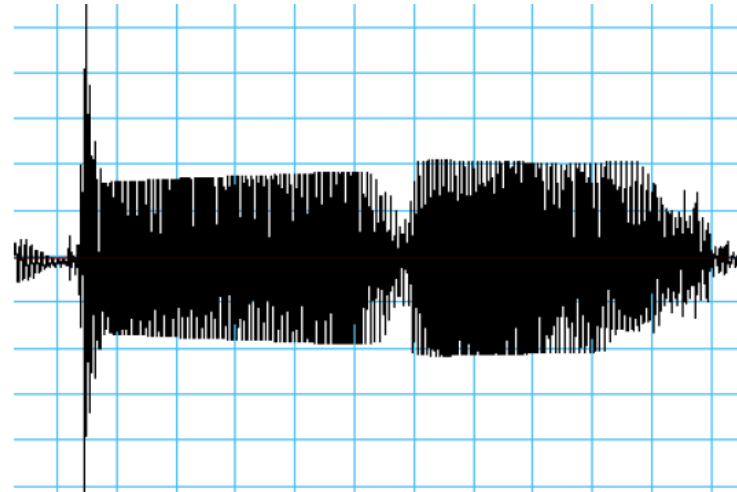
- 1) The value has exceeded the maximum value
- 2) The energy of the voice has exceeded the maximum of the AD



Truncated Wave

1. Wave for pseudo truncated speech

Because of the auto gain control (AGC), the contour is similar to the truncated speech.

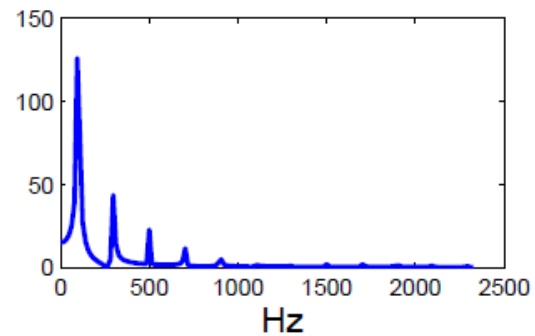
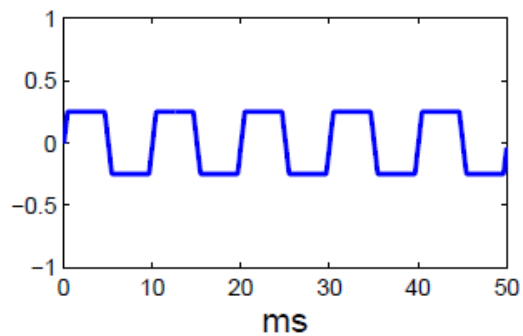
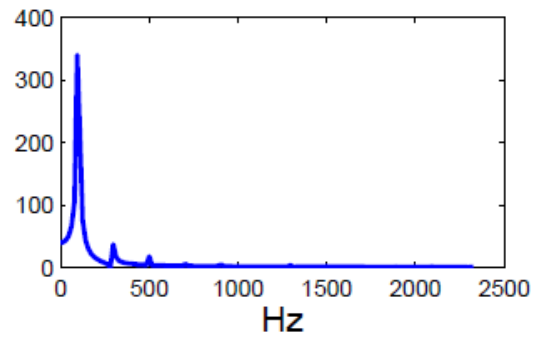
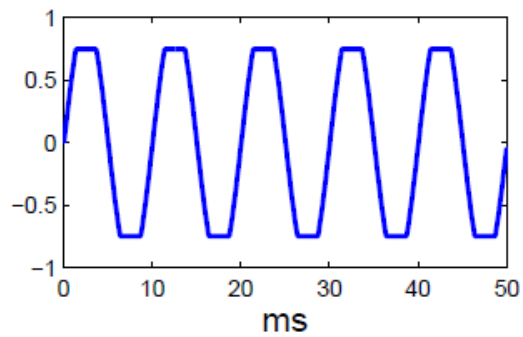
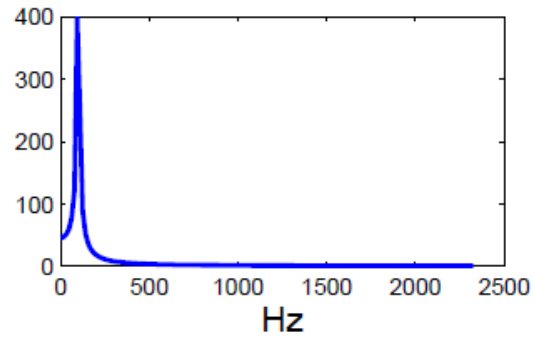
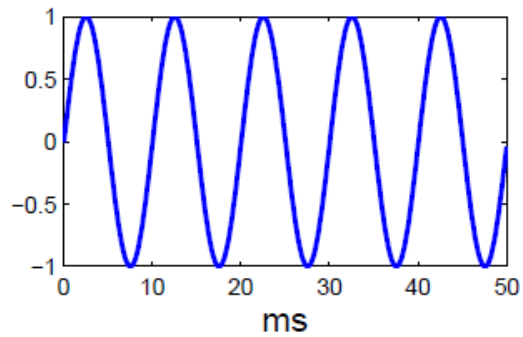


Sine Wave Truncated

2. Frequencies of truncated sine wave

- 1) The speech can be decomposed into the sum of sine waves of different frequencies.
- 2) Truncate the wave by its maximum volume of 60% and 20%
- 3) The frequencies have extended to the harmonics of the odd times

Emotional Utterances



Sine Wave Truncated

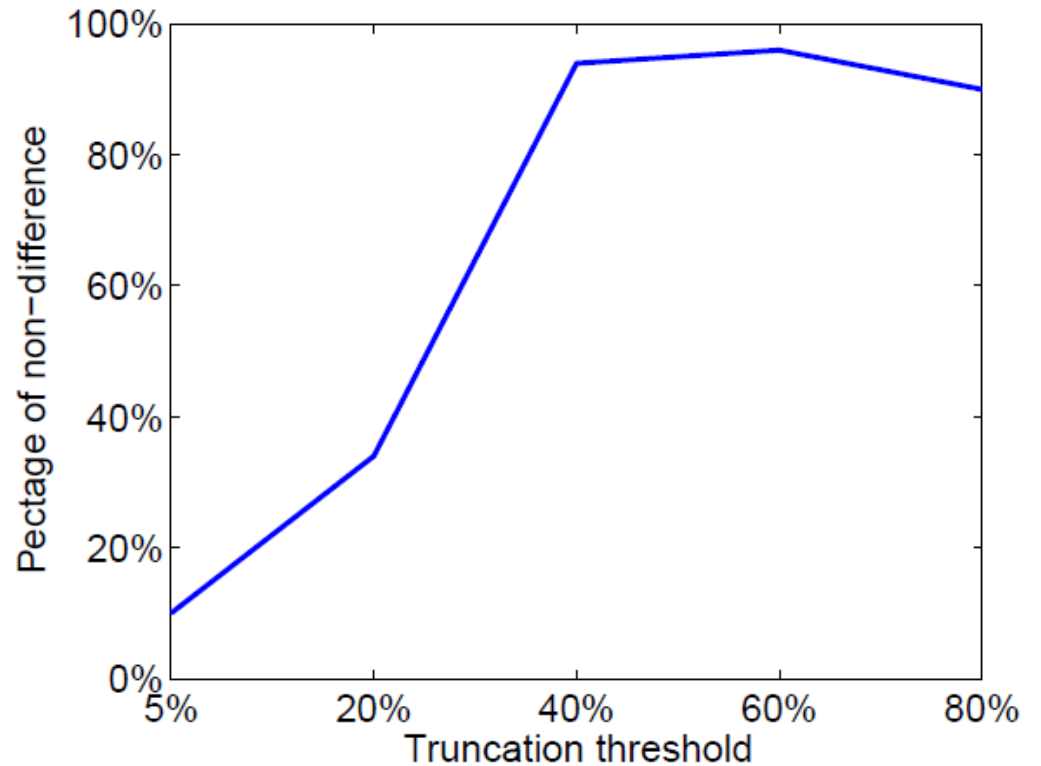
3. Impact on VPR system

- 1) Hearing Test
- 2) GMM-UBM
- 3) i-vector

Sine Wave Truncated

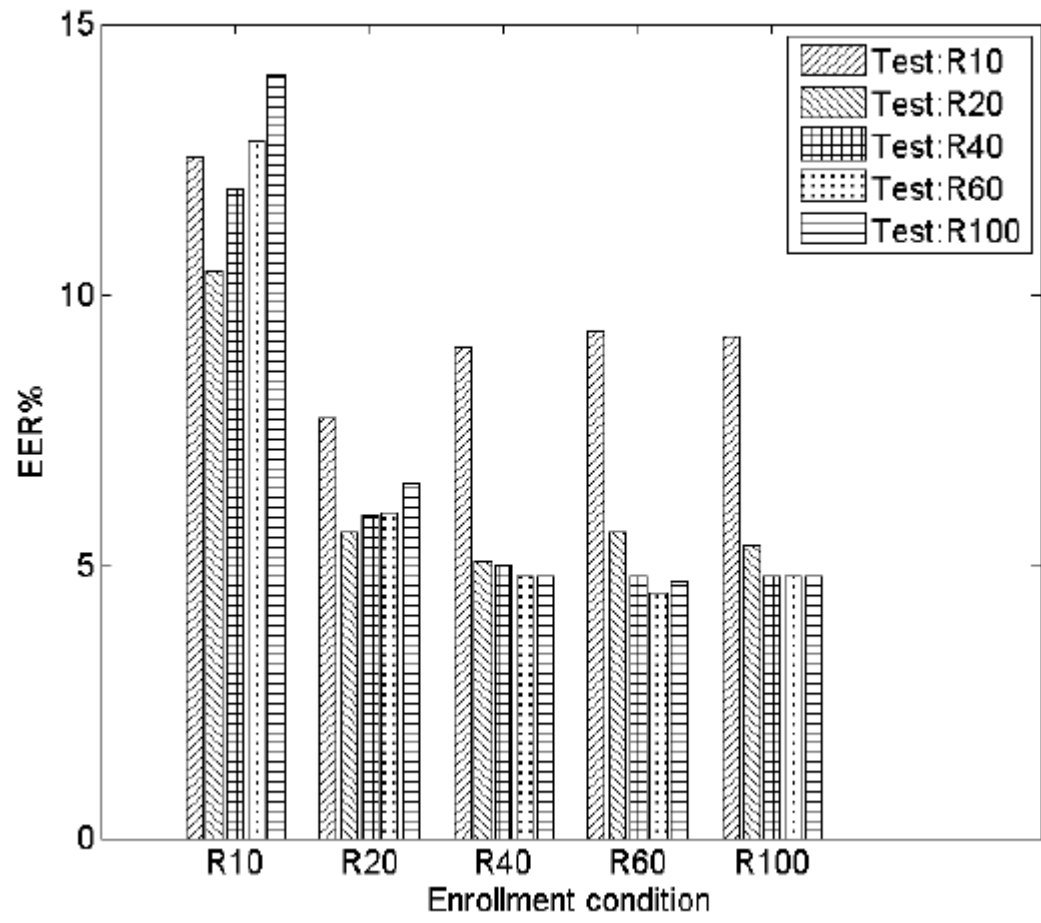
1) Hearing Test

After 5 students heard the speeches of different truncated ratio, they judged the speeches if they were of low quality.



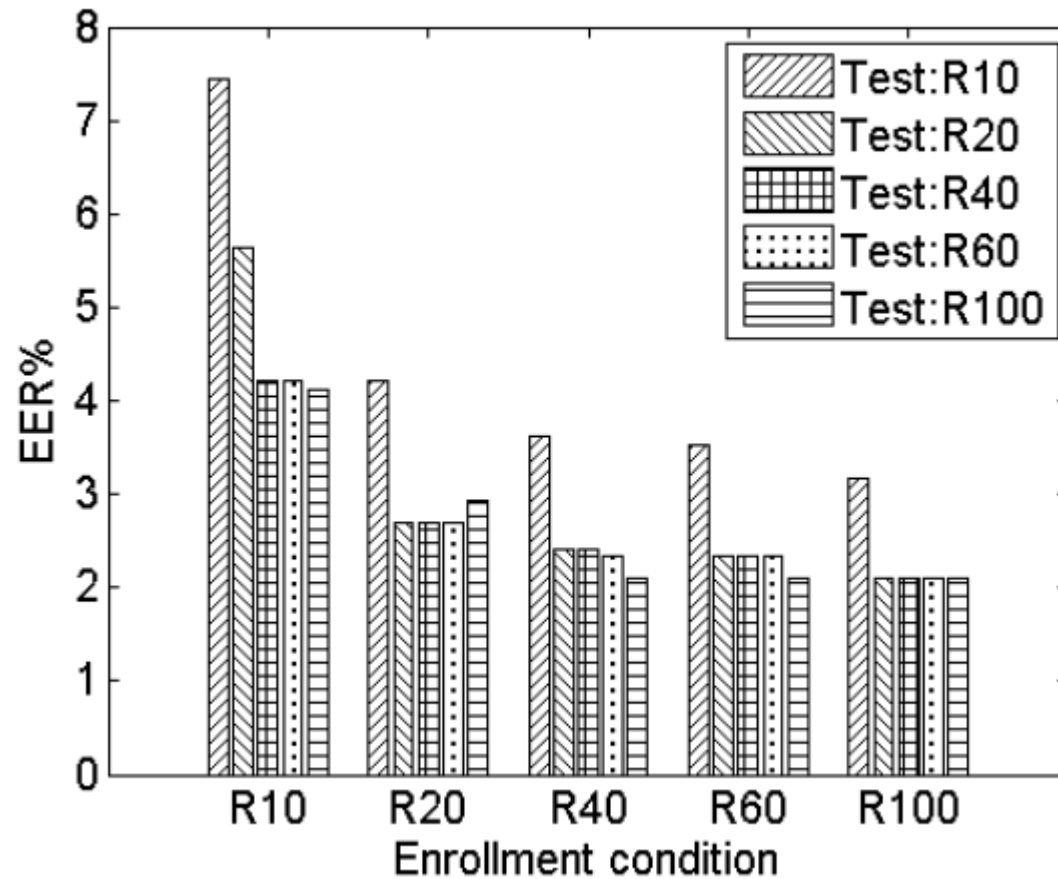
Sine Wave Truncated

2) GMM-UBM



Sine Wave Truncated

3) i-vector



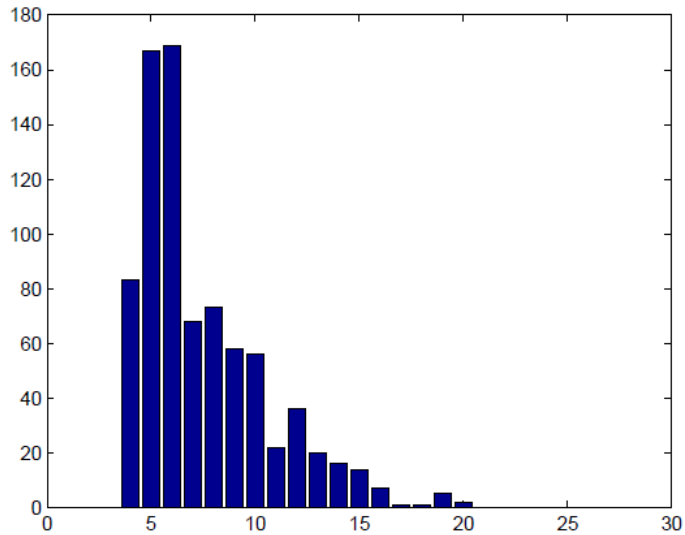
Sine Wave Truncated

4. Detection for Truncated Speech Segments

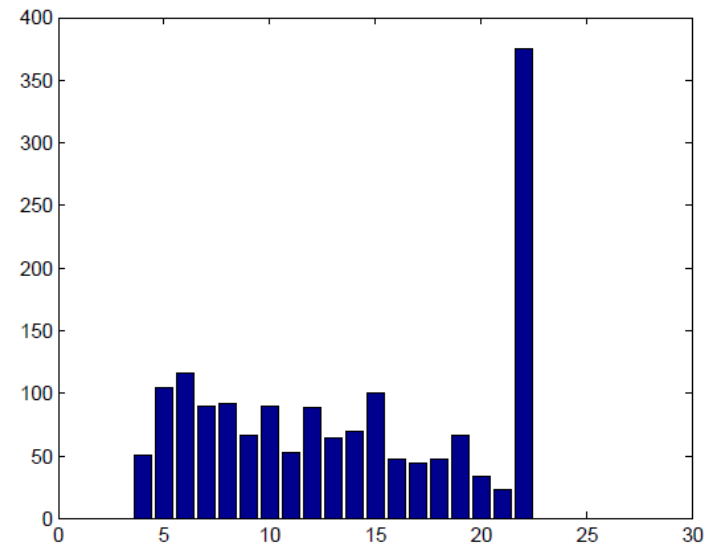
- 1) Treat 0.5 s as a segment
- 2) Separate into segments by the volume and count
- 3) Judge if it is the truncated segment

Sine Wave Truncated

4) Histograms of distribution



Normal



Truncated

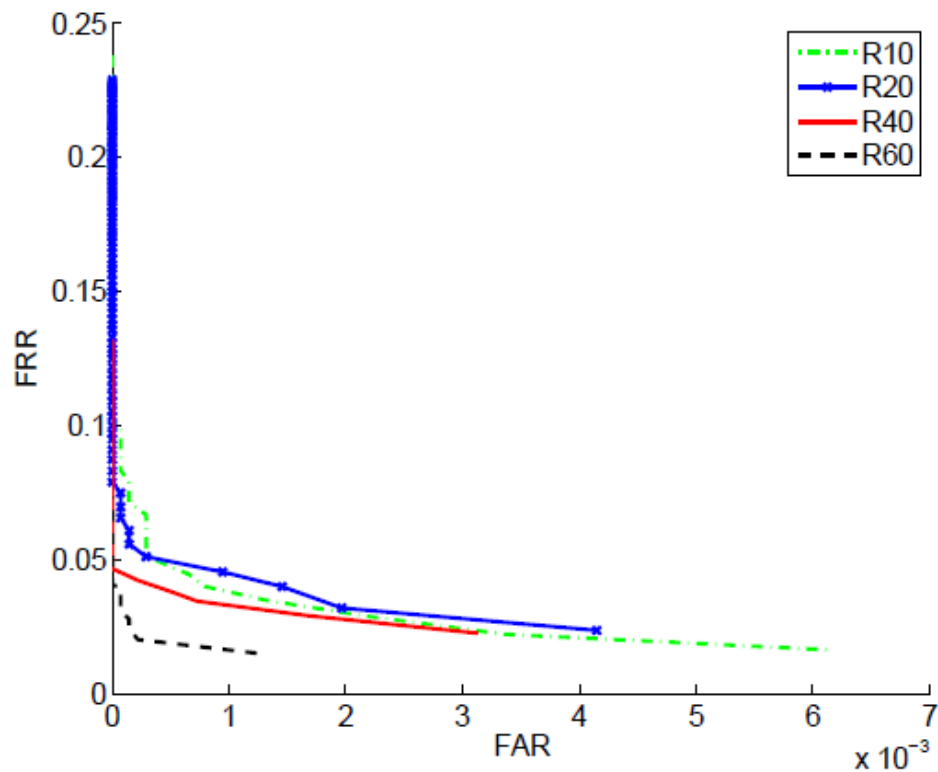
Sine Wave Truncated

5) Detection based on the histogram of distribution

- I. Find the maximum absolute value of the speech and separate into 20 intervals by the value
- II. Count the points located in the intervals of one 0.5s-segment
- III. If the point number of the last interval is larger than threshold, detect it as a truncated segment

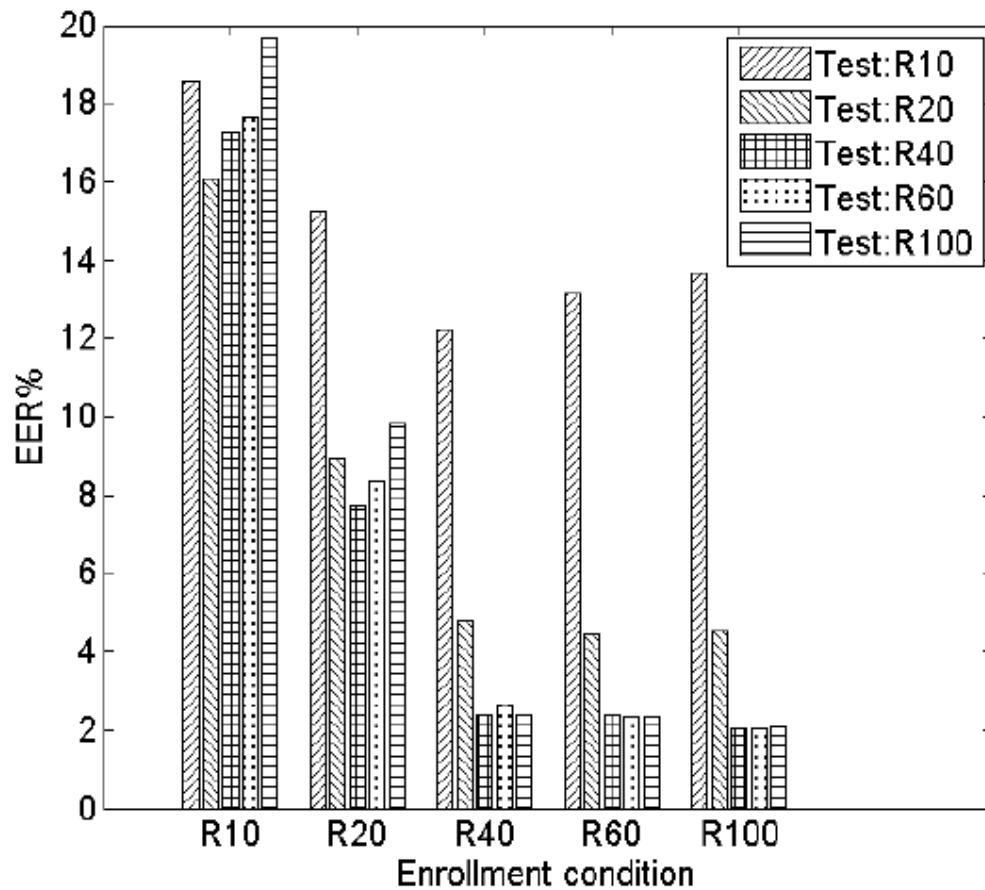
Sine Wave Truncated

6) DET of truncated segments detection



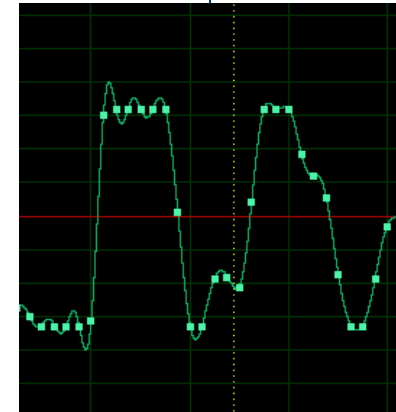
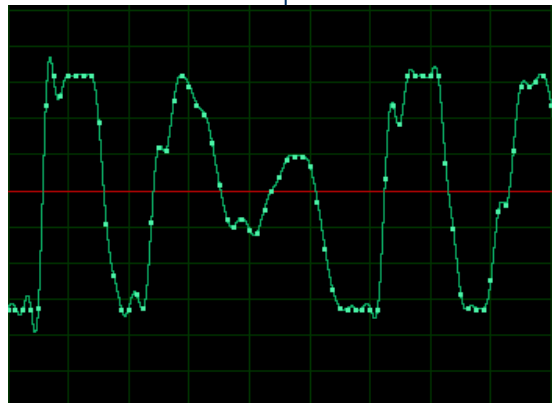
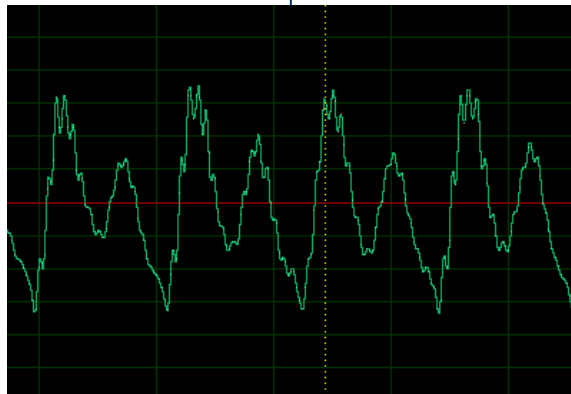
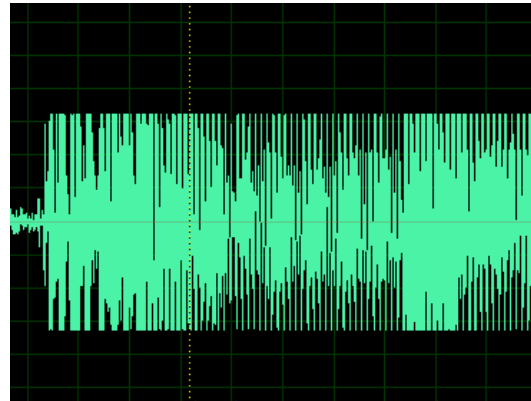
Sine Wave Truncated

7) Performance of discarding the truncated segments



Sine Wave Truncated

5. Different Types of Truncated Speech



Sine Wave Truncated

6. Recovery of truncated speech

- 1) Line fit
- 2) DNN

Sine Wave Truncated

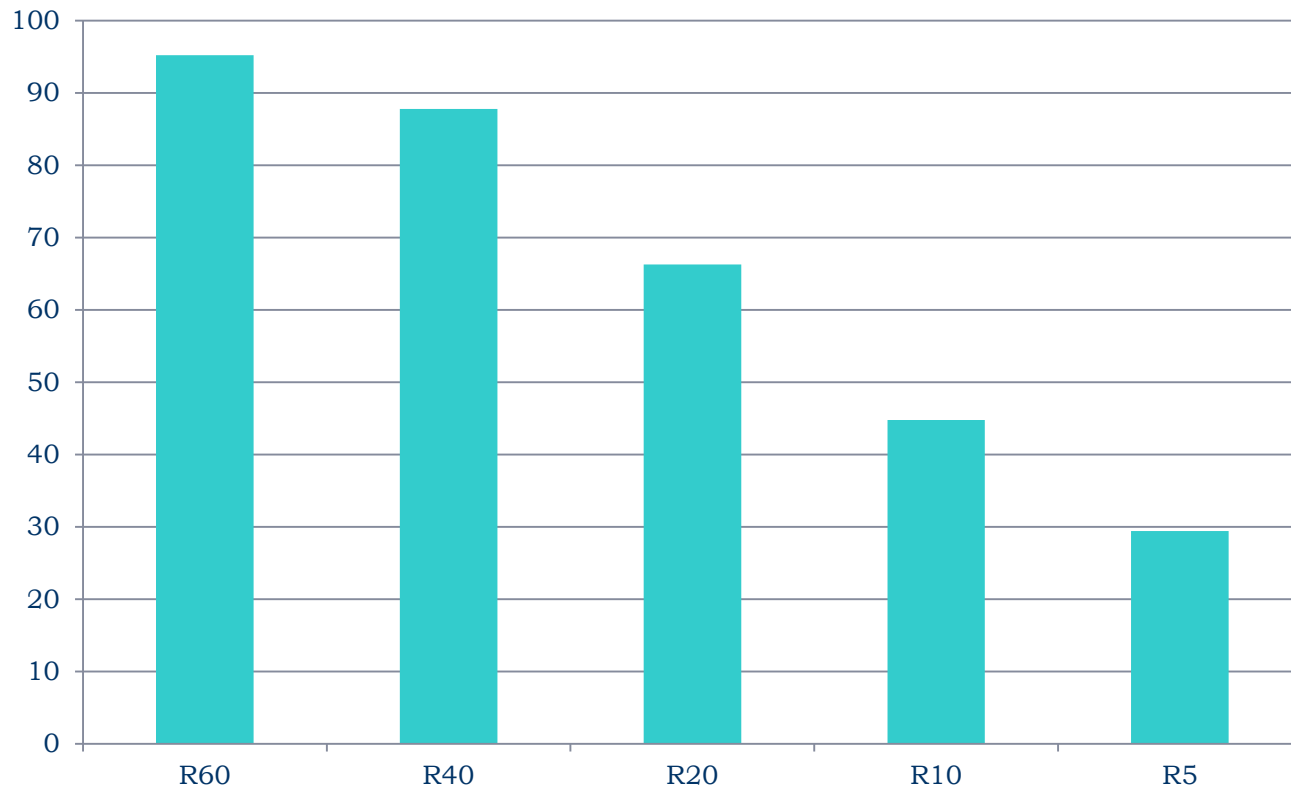
Discussion: Discriminant frames

Failed tasks:

- 1) Frames that has high scores
- 2) Frames that are the most similar ones
- 3) Frames with different energy

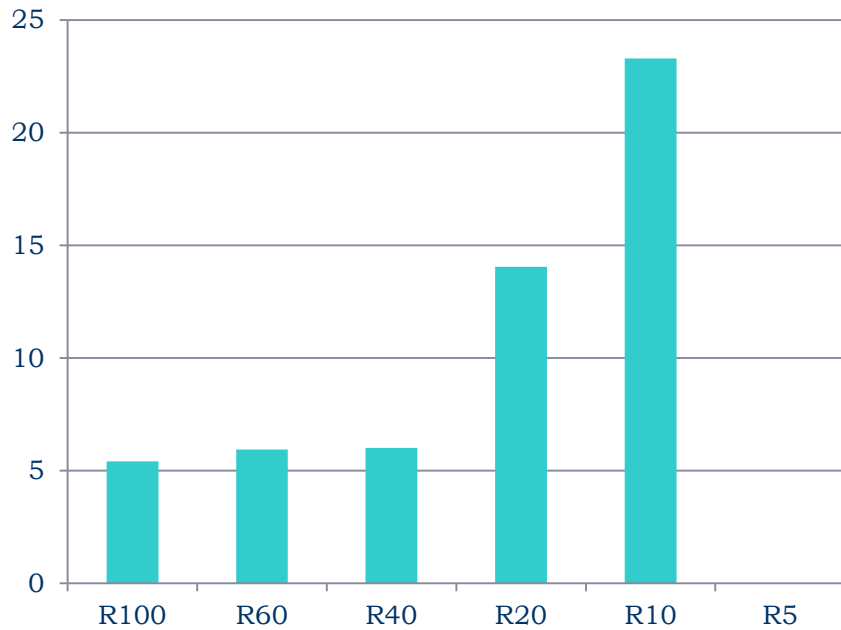
Sine Wave Truncated

Reserved Frames of Little Energy

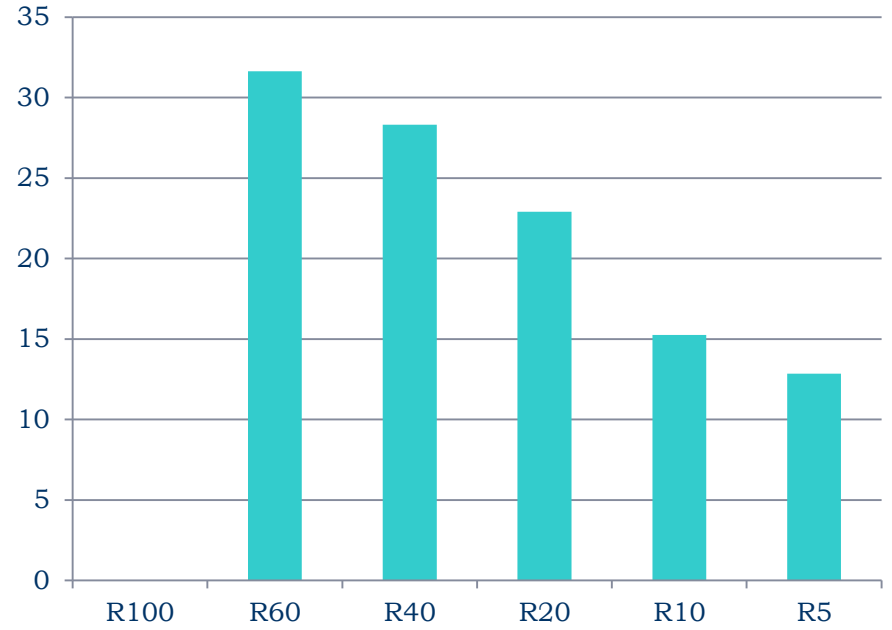


Sine Wave Truncated

Performance



Reserved Data



Discarding Data

Experiments and results

Thank you!