
Final team project

Data compression

ECE 6260 PRESENTATION | April 2019

By: Neha N Gowda and Thomas Benoit

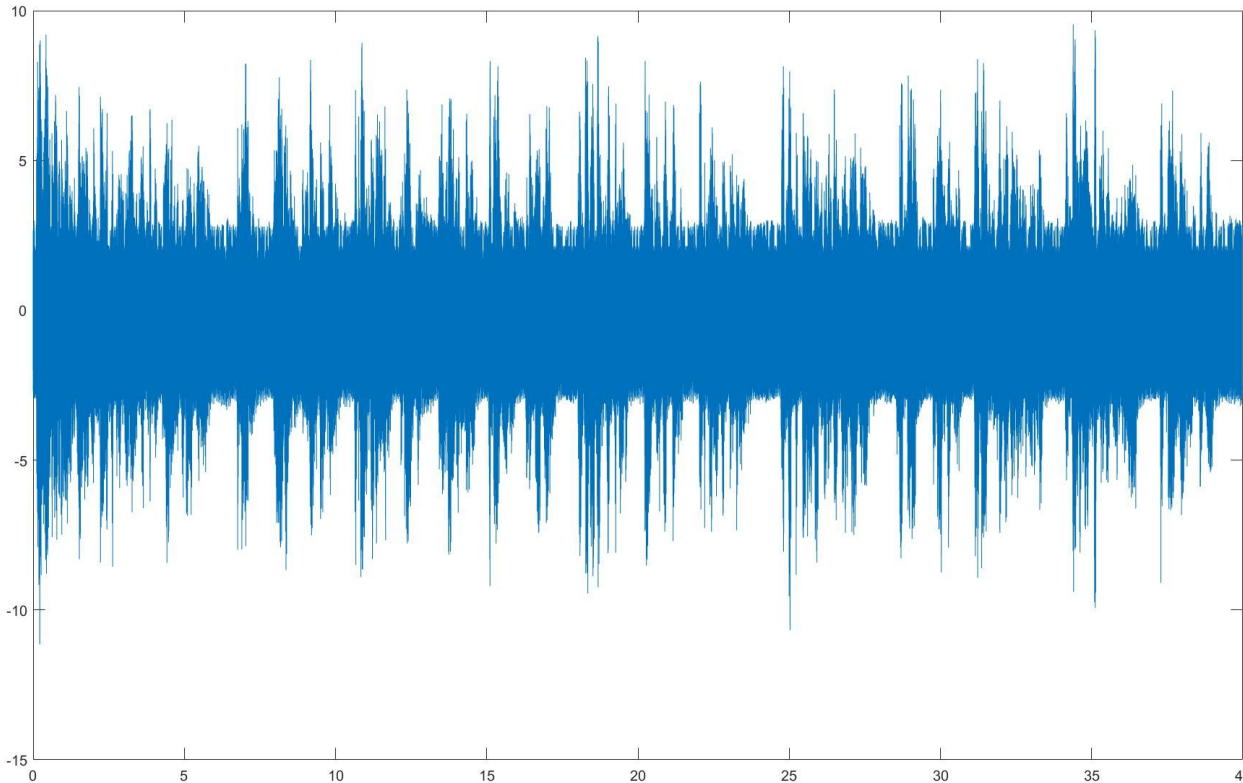
OUTLINE

1. Analysis
2. Implementation
3. Results

Analysis

Analysis

1



Is it a combination of different signals?

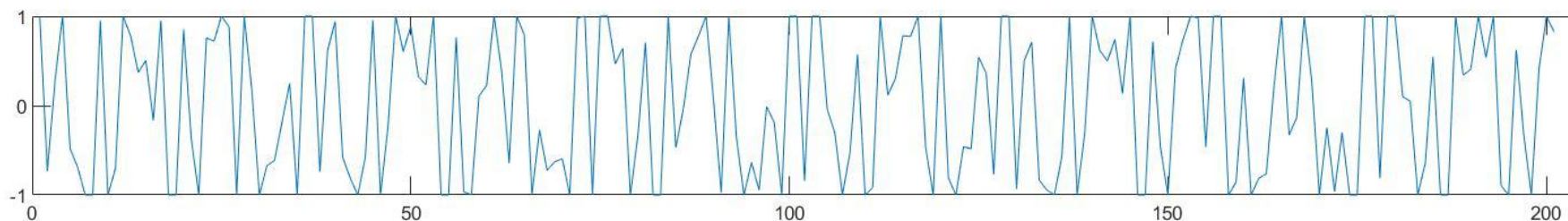
-> Let's analyze it both in *the time* and the *frequency* domains

Short-time LPC analysis

1

length of Frames analysed	Covering selected in %	Could hear a speech?
20ms	10%	badly
20 ms	25%	badly
20 ms	50%	slightly
20ms	60%	slightly
50ms	10%	slightly
50ms	20%	slightly
50ms	50%	slightly
75ms	25%	slightly
75ms	50%	slightly

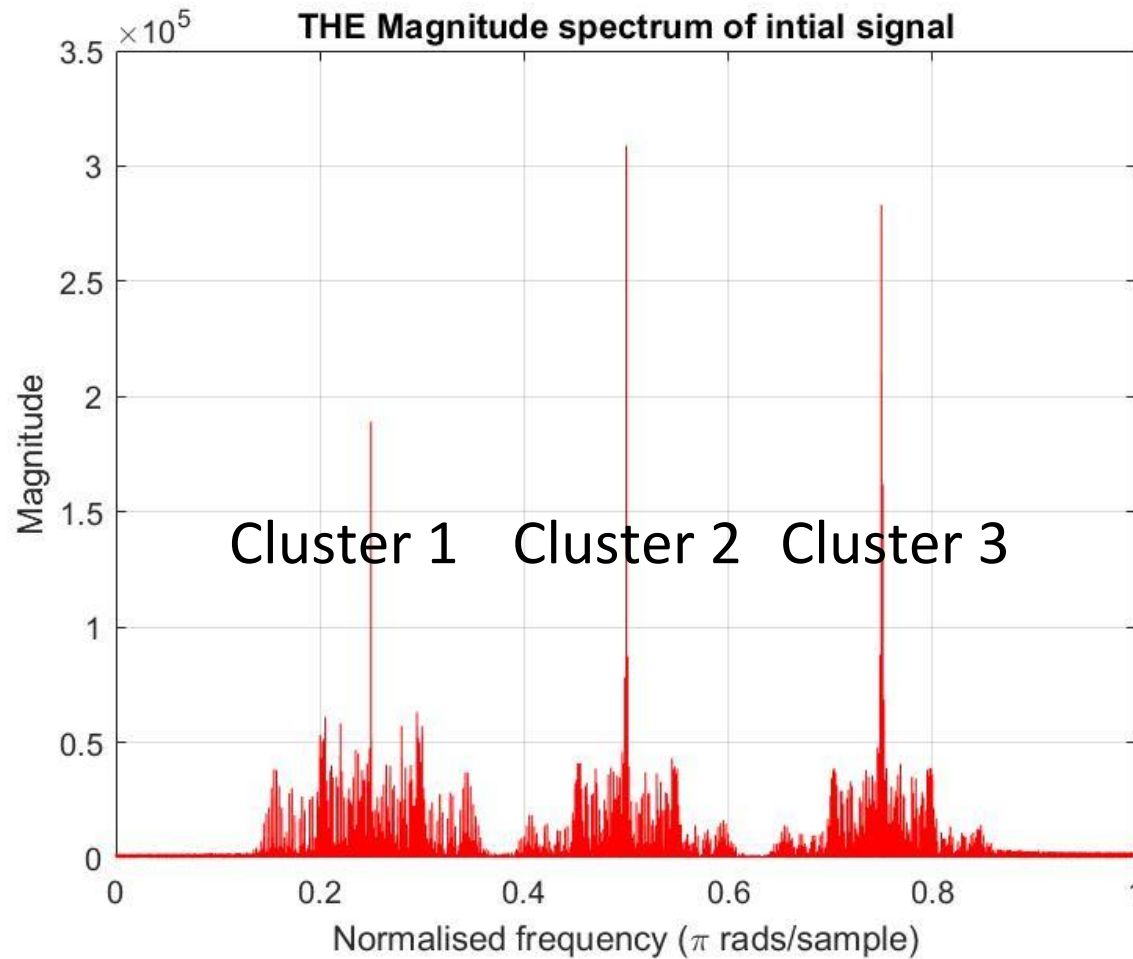
→ We hear and we notice speech traces in the synthesized signal !



↑
*Frame=50ms
And Covering
=10%*

Magnitude spectrum

1

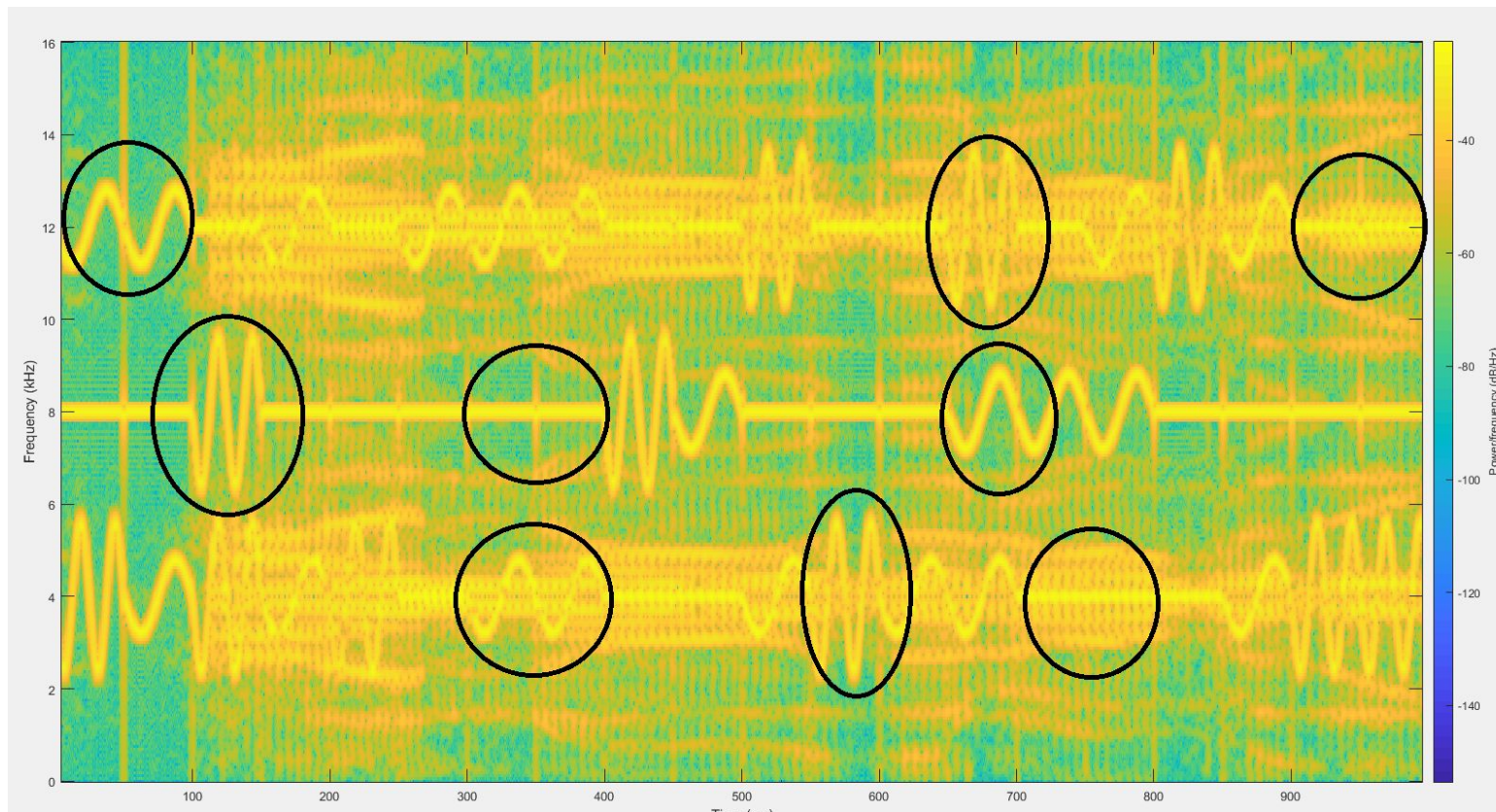


Three clusters of (3) chirps

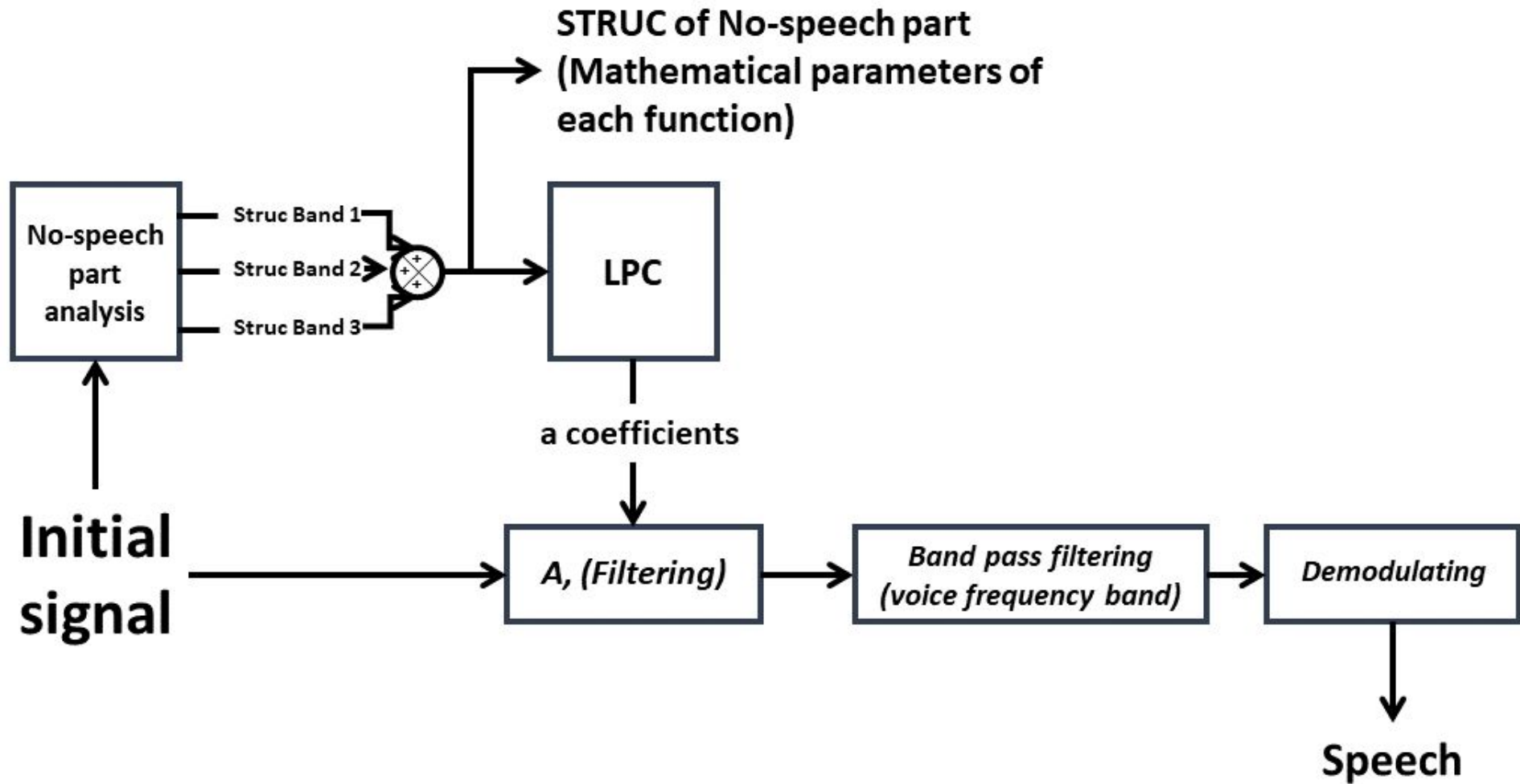
- Cluster 1 located in *4,000Hz*
- Cluster 2 in *8,000Hz*
- Cluster 3 in *12,000Hz*

Spectrogram

1



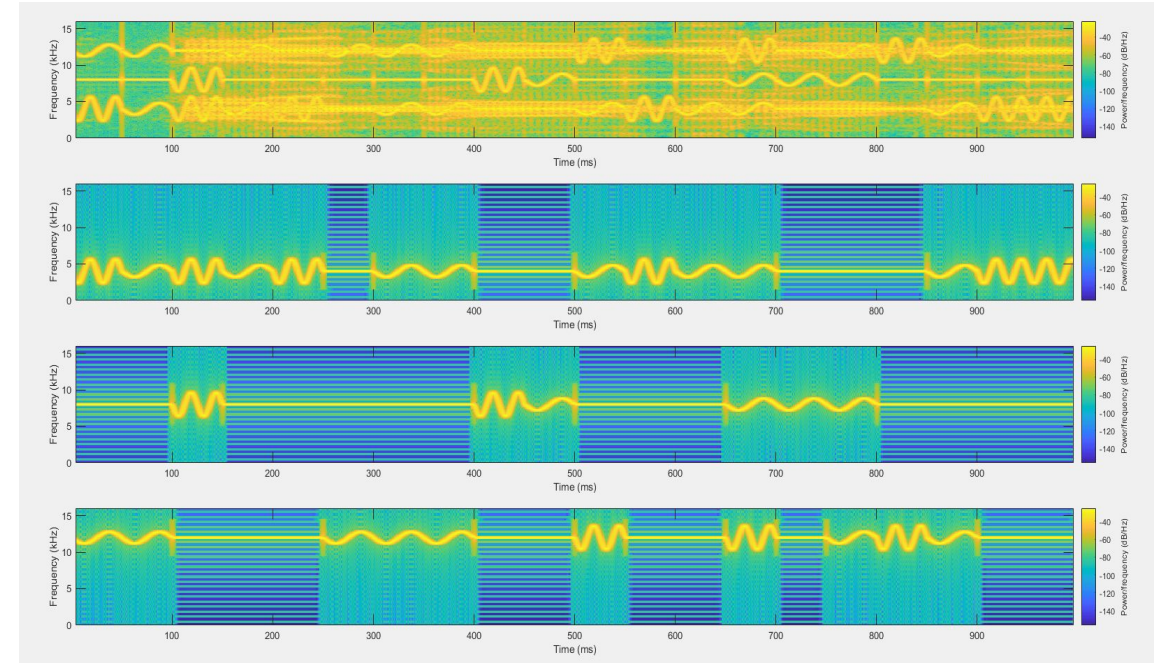
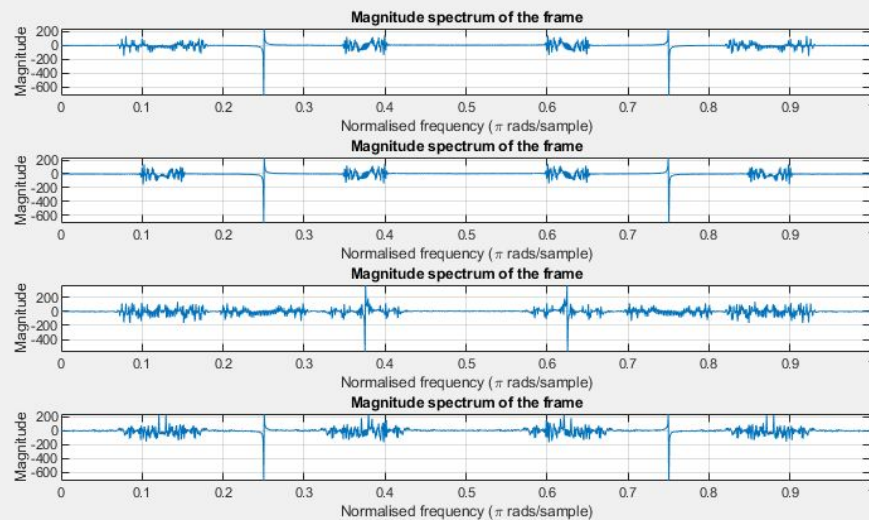
Implementation



Details on chirp extraction

2

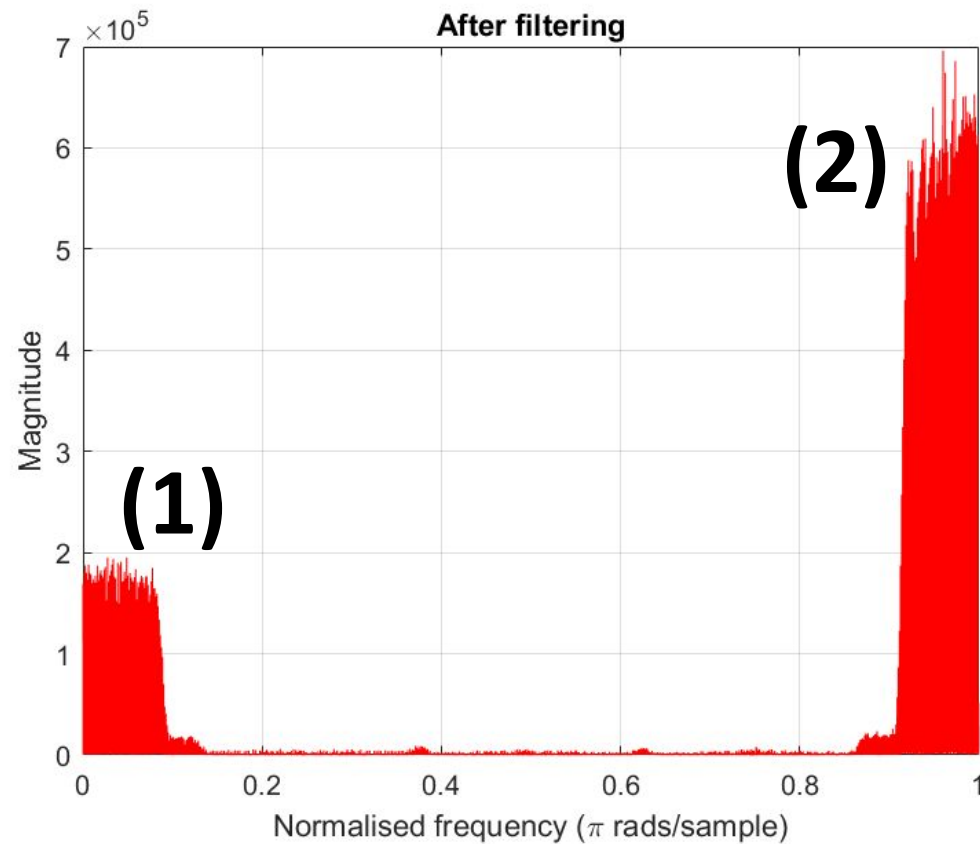
- ★ FFT of various frames each of 1600 samples was analysed
- ★ Observed 3 kinds of chirp in each band of frequency
- ★ These chirps did not appear continuously in all frames



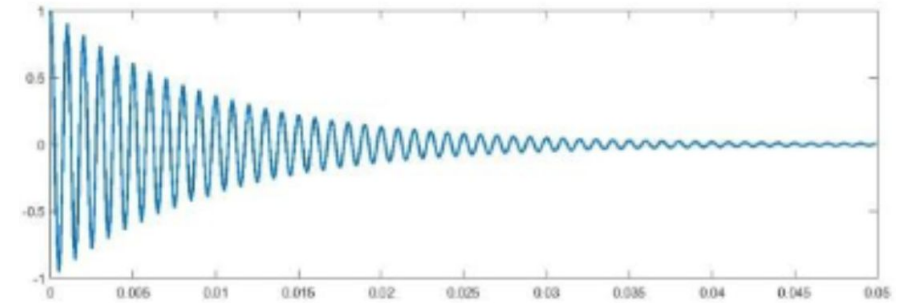
- ★ Studied the spectrogram and modelled the three different chirps
- ★ Used comparison of instantaneous frequencies and found where which chirp occurs

Why post processing ?

2

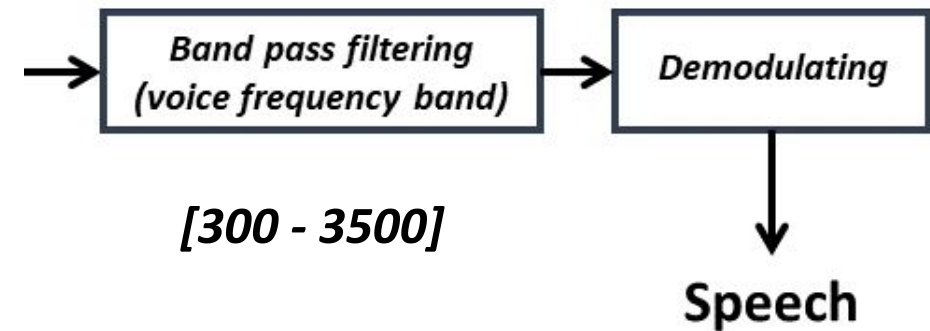


Two
Damped
sinusoids



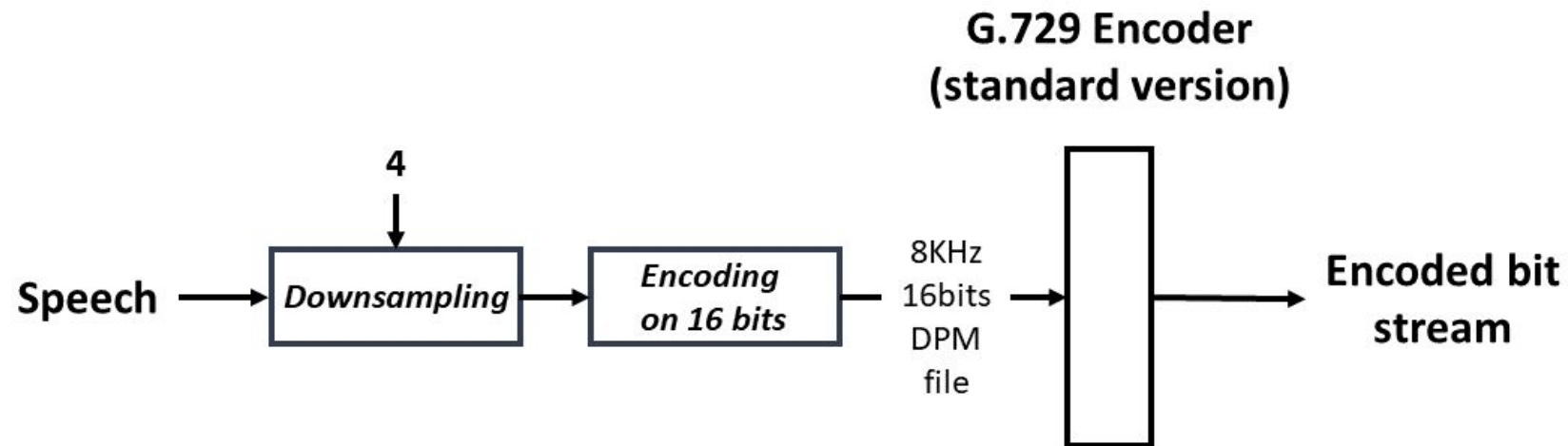
Removing
(2)

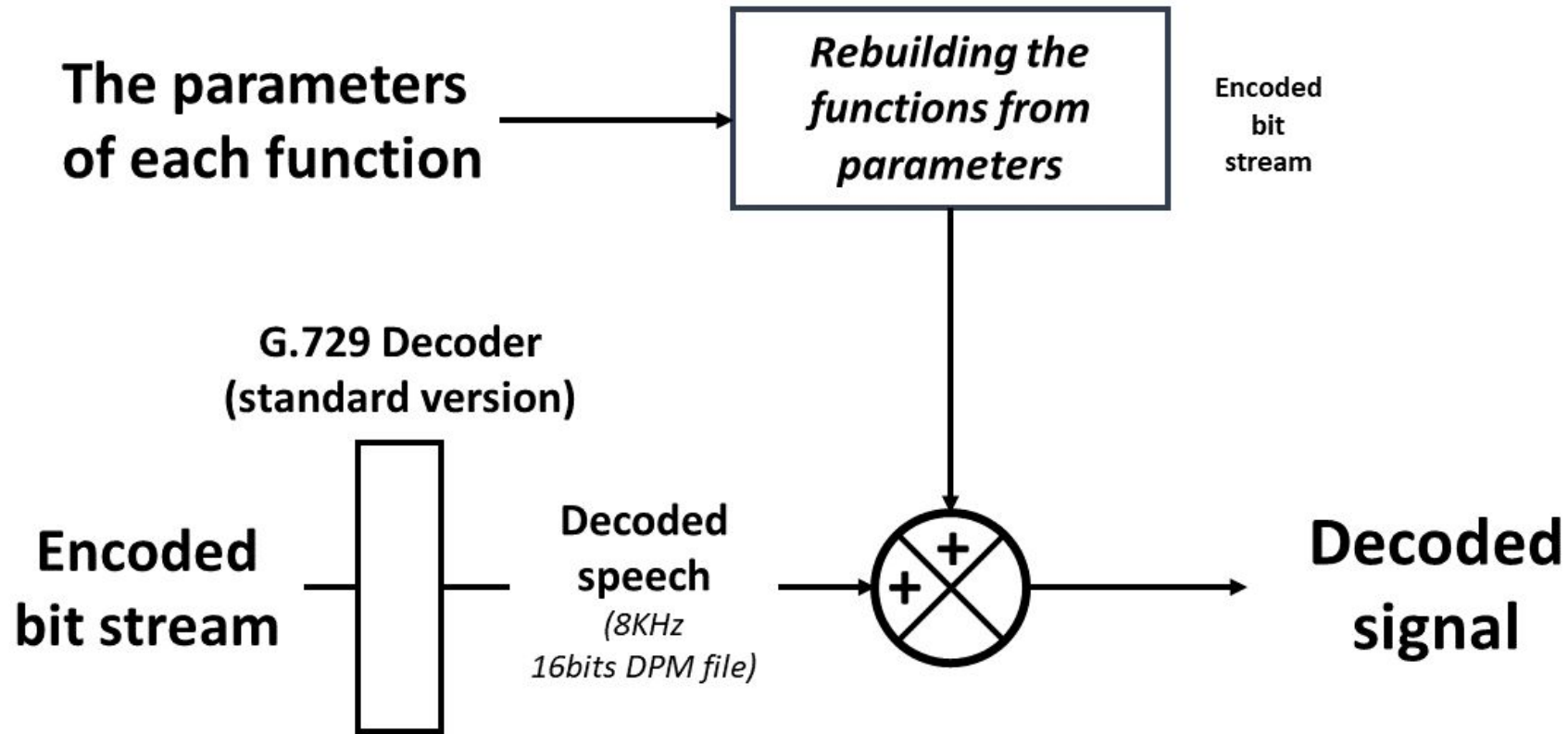
Demodulating the
speech out (1)



STRUC of No-speech part
(Mathematical
parameters of each
function)

Sending the parameters of
each function





Results

Measurements		Values	Comments
bits/s (fixe rate)		8 kbit/s	<i>The standard version of G.729 uses a fixed 8 kbit/s data rate.</i>
Signal to coding noise ratio	<i>8000 Hz sampled</i>	-2.3177	They were computed such that: $SQNR = 10 \cdot \log_{10} (P_{sig}/P_{sig-decoded})$ with sig: the initial signal and decoded: the decode one
	<i>32000 Hz sampled</i>	-0.7489	
Spectral distortion <i>(log spectral distance)</i>	<i>8000 Hz sampled</i>	0.1126	<i>The log spectral distance is computed from the truncated cepstral distance</i>
	<i>32000 Hz sampled</i>	0.9972	

- ★ Modelling the chirp signals and reconstructing them: autocorrelation and spectral distance measures. We did instantaneous frequency comparison, which otherwise might have given us better results.
- ★ We were not able to subtract the constructed chirp signals. Constructed chirp signal is the right one or not? We used LPC filtering of the signal. An unsolved mystery for us : “The CHIRP nightmare”!
- ★ We could compress the file better if we could get rid of all the chirp signals.

References

- [1] *LPCdemo.m* provided from the correction of HW4
- [2] the G.729 given in class: the github of *opentelecoms-org*:
<https://github.com/opentelecoms-org/codecs/tree/master/g729/ITU-samples-200701/Soft/g729>
- [3] MathWork file exchange Matlab

Questions?!
