# The impact of time-frequency resolution on the performance of an acoustical zooming system

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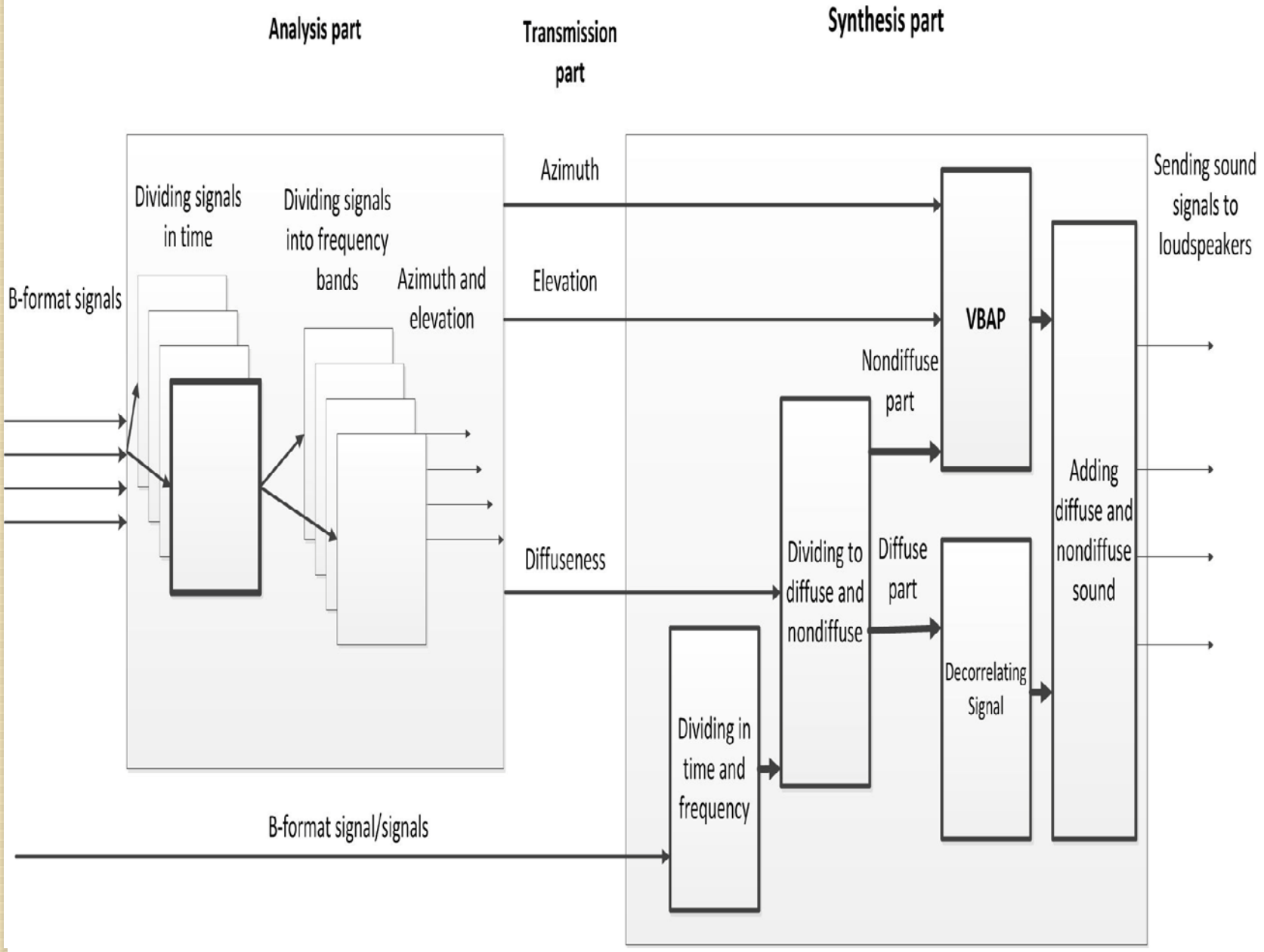
# Introduction

- Directional Audio Coding (DirAC)
- Heisenberg's principle of uncertainty
- Acoustical zooming system
- Listening tests
- Results
- Conclusion

# Directional Audio Coding

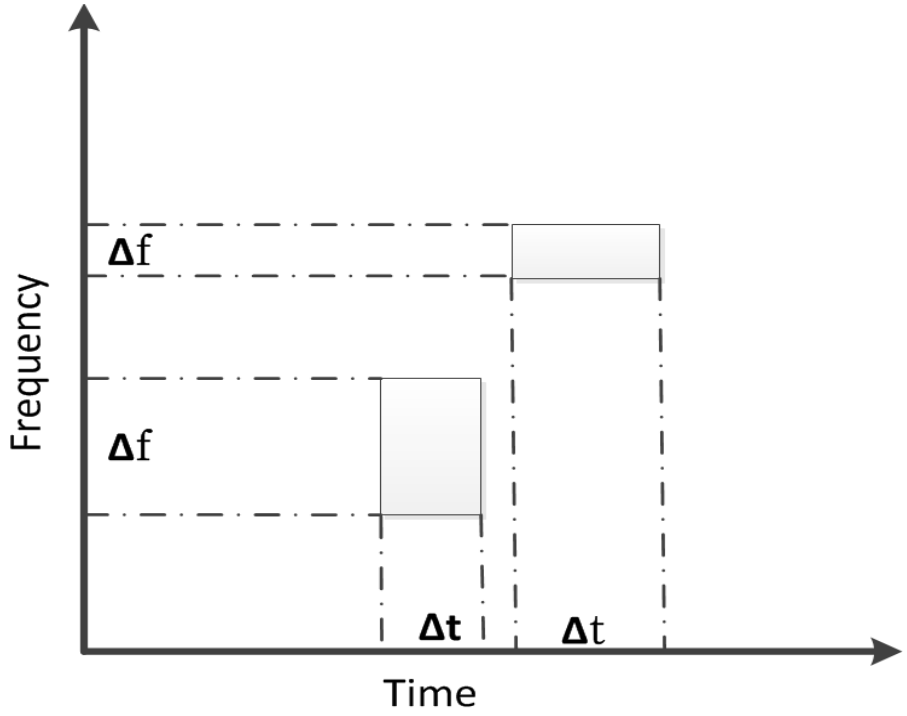
- a method for multichannel audio reproduction of spatial sound.
- DirAC can be divided into three parts:

1. analysis
2. transmission
3. synthesis


Analysis part
Transmission part
Synthesis part
Dividing signals in time
Dividing signals into frequency bands
Azimuth and elevation
B-format signals
Azimuth
Elevation
Diffuseness
VBAP
Nondiffuse part
Dividing to diffuse and nondiffuse
Diffuse part
Decorrelating Signal
Adding diffuse and nondiffuse sound
Sending sound signals to loudspeakers
Dividing in time and frequency
B-format signal/signals

# Heisenberg's principle of uncertainty

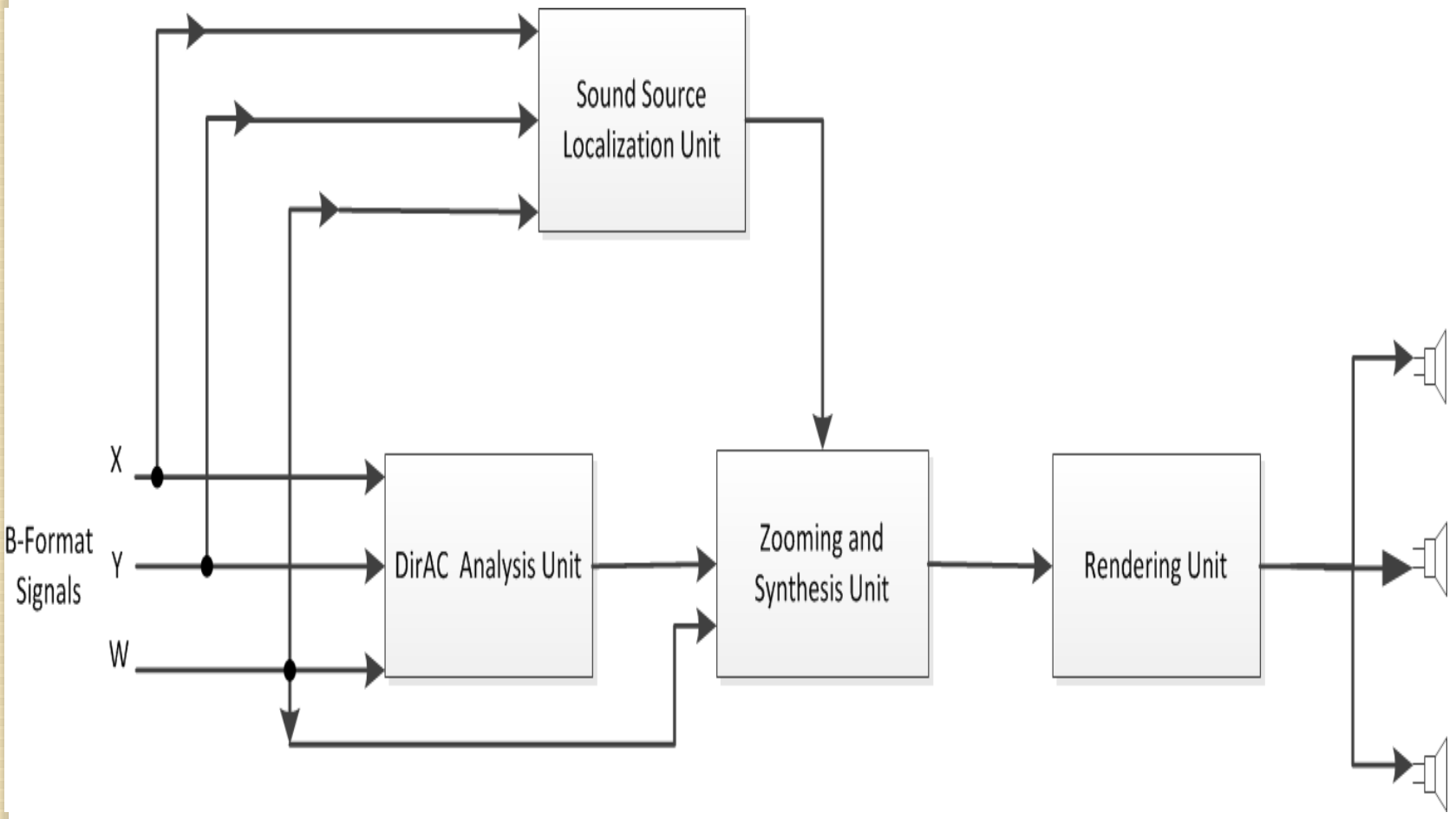
- describes the relation between the resolution in time and frequency.
- imposes a lower limit.



# Acoustical zooming system

- The system can zoom the sound of one speaker.
- modifies the parameters of the directional audio coding.
- consists of four blocks:

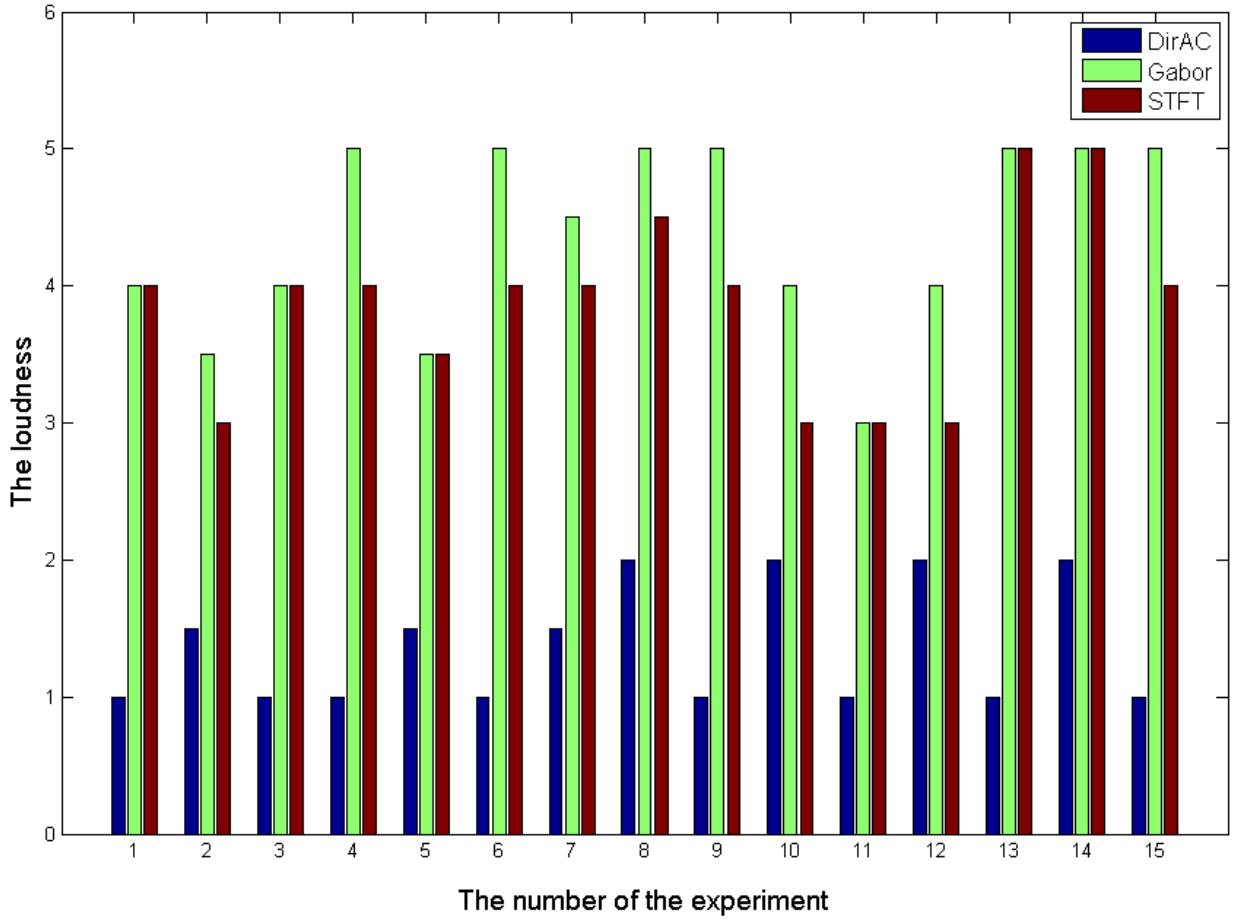
1. sound source localization unit.
2. DirAC analysis unit.
3. zooming and synthesis unit .
4. rendering unit.


Sound Source Localization Unit
B-Format Signals
X
Y
W
DirAC Analysis Unit
Zooming and Synthesis Unit
Rendering Unit

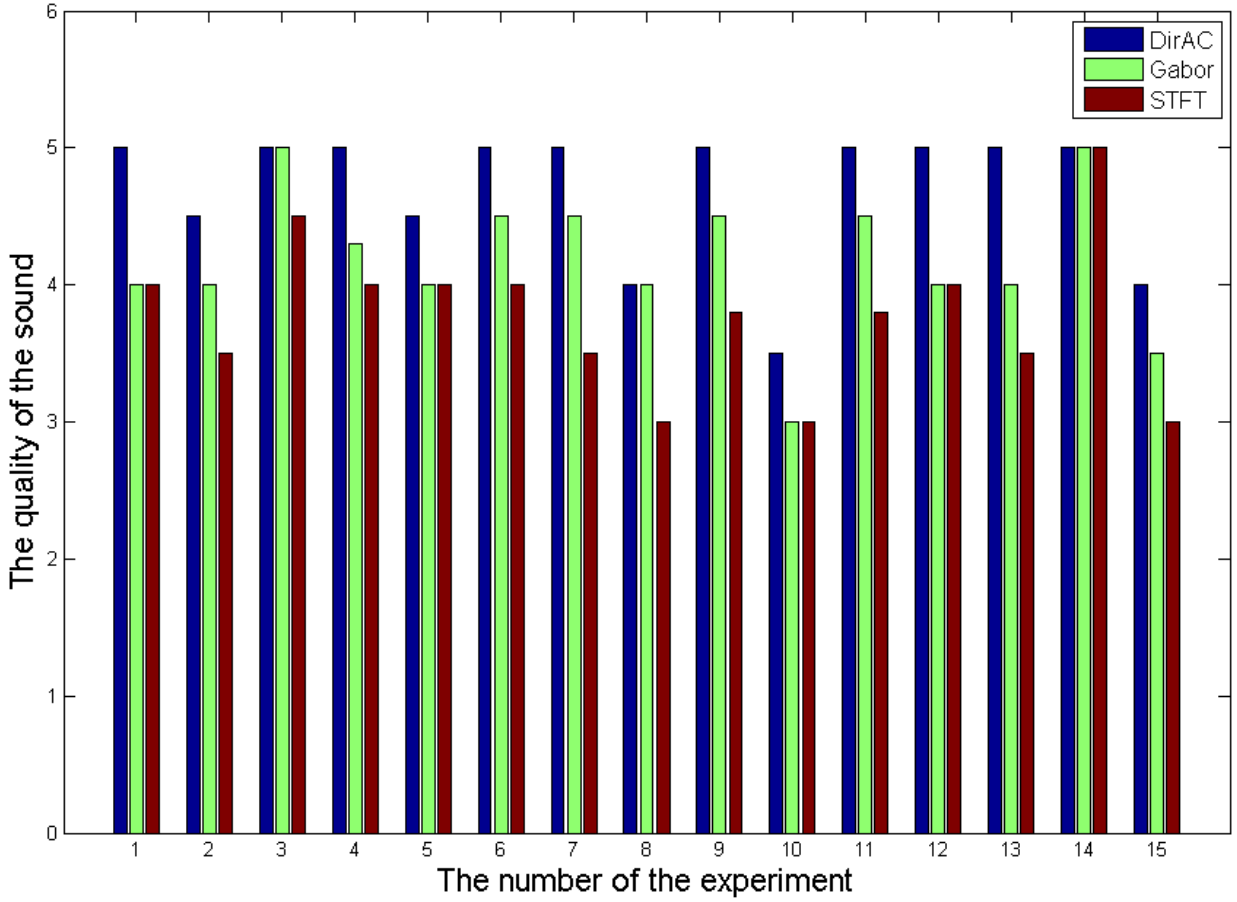
# Listening Tests

- compared the original sound the zoomed sound using both STFT and Gabor transform.
- the listeners included three women and seven men.
- five scales were available to describe the quality based on mean opinion score (MOS).
- another five scales to describe the loudness ratio of the speakers to each other.

# Results


DirAC
Gabor
STFT
The loudness
The number of the experiment
0
1
2
3
4
5
6
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15

# Results


DirAC
Gabor
STFT
The quality of the sound
The number of the experiment
0
1
2
3
4
5
6
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15

# Conclusions and *Future work*

- able to zoom the sound of one speaker.
- Gabor achieved better results.
- Future work will focus on

1. performing listening tests to measure the resolution of the system.
2. using Constant-Q in the system.

# Thank you for your attention