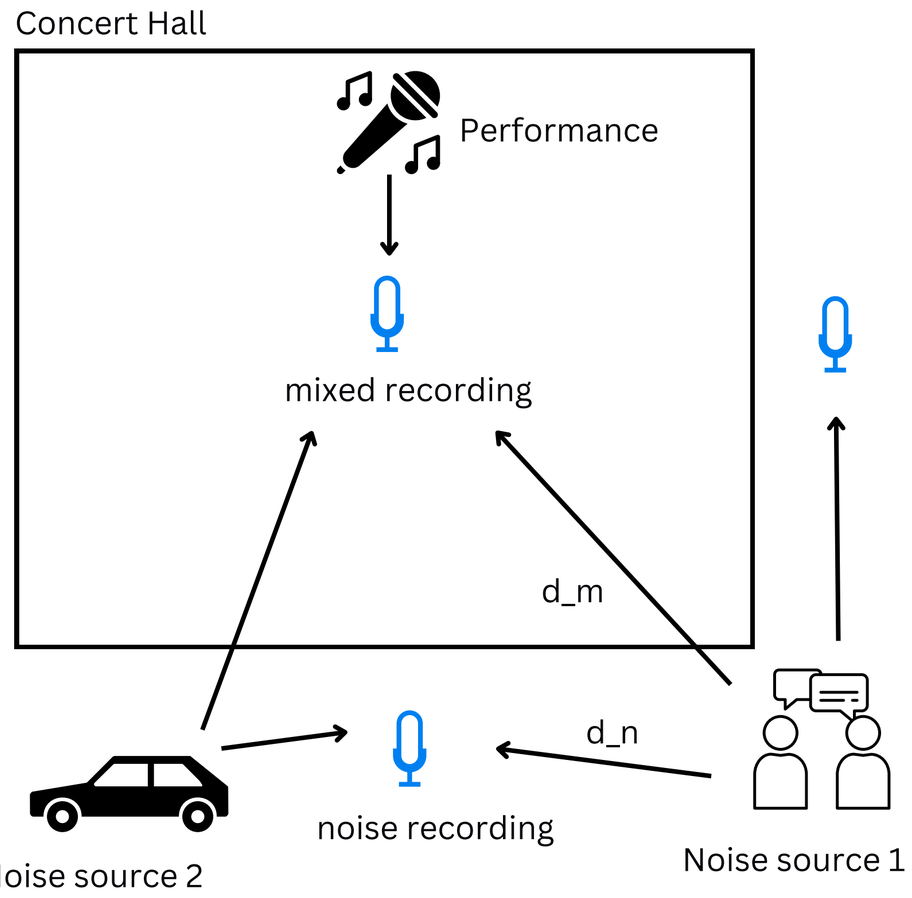
Cancellation algorithms applied to recorded audio data

Background

- The Endler Hall at Stellenbosch University is commonly used to record music performances.
- Noise from outside is often heard in recordings. Cancellation algorithms can be used to remove the noise in the recordings.
- This project investigates the effectiveness of cancellation algorithms, commonly used in Passive Radar, applied to recorded audio data.

Methodology

- Microphones are to be placed outside hall to record noise on its own.
- Time delay of noise occurring between noise recording and mixed recording.
- This is due to differences in distances of recordings from noise source.

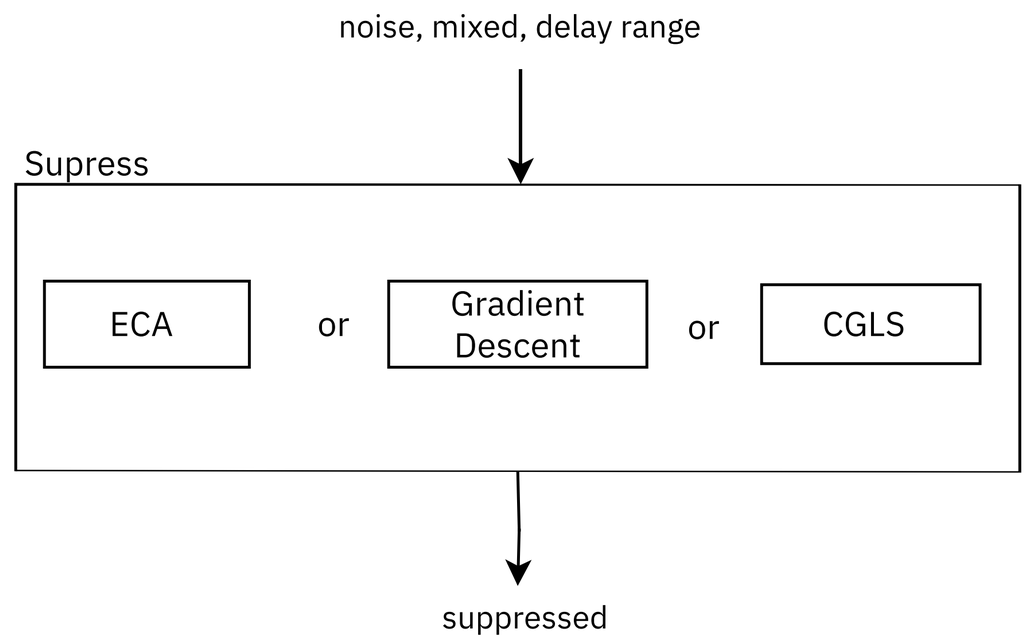


Setup at concert hall

The algorithms determine correct delays to use from a range of possible delays.

In this project, the mixed recording and noise recording are synthetically created. The recordings were 10 seconds long. 1000 possible delays considered.

The mixed recording is suppressed using one of the algorithms.



Results

Correlation of suppressed audio to pure performance audio

Method	Correlation	Execution Time (s)
ECA	0.9610	8.28
Grad Desc	0.9607	9.13
CGLS	0.9610	8.70

All algorithms were effective: increasing **correlation 0.88 -> 0.96**. ECA was the fastest.

Conclusions

- Execution time is long, considering only 10 second audio was used and 1000 possible delays considered.
- Realistically, more possible delays need to be considered which increases execution time quadratically.
- Therefore, more complex algorithm such as ECA-C should be implemented.

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GitHub repository containing:

- Audio files
- Project Report
- Code