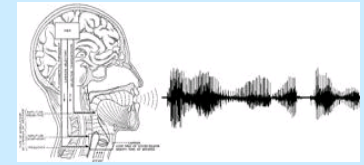




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SCL

Evaluation of Modified Phase Opponency (MPO) Processing of Noisy Speech

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Dr. Espy Wilson



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Outline

- Motivation
- MPO Development
- Comparison
- Algorithm Evaluation
- Preliminary Results
- Conclusion and Future Work
- Acknowledgments



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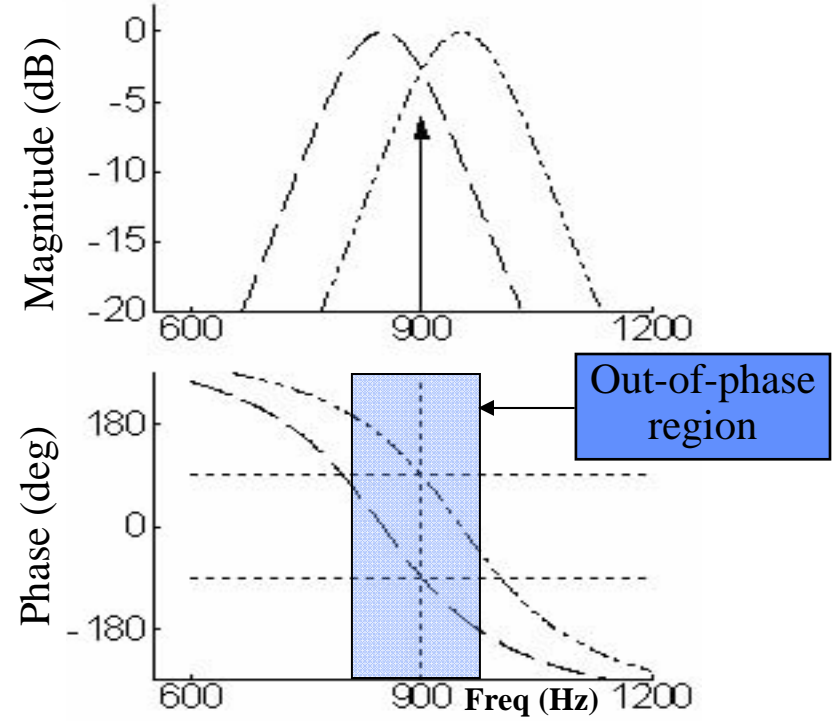
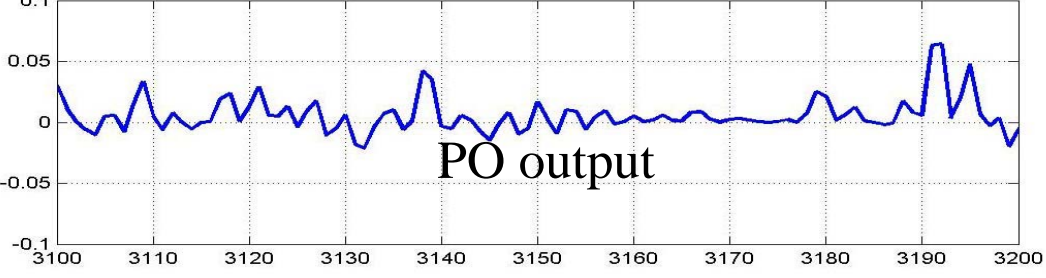
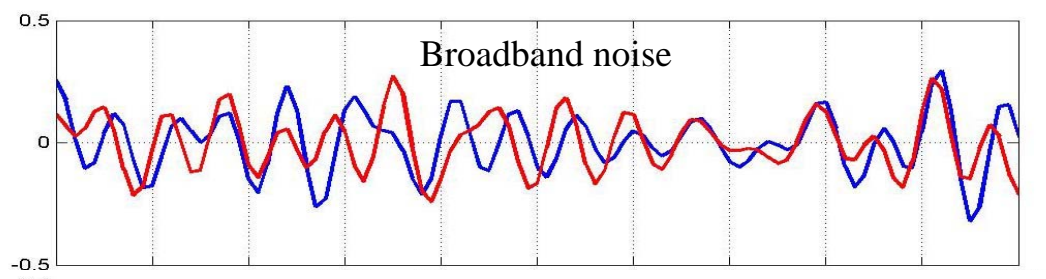
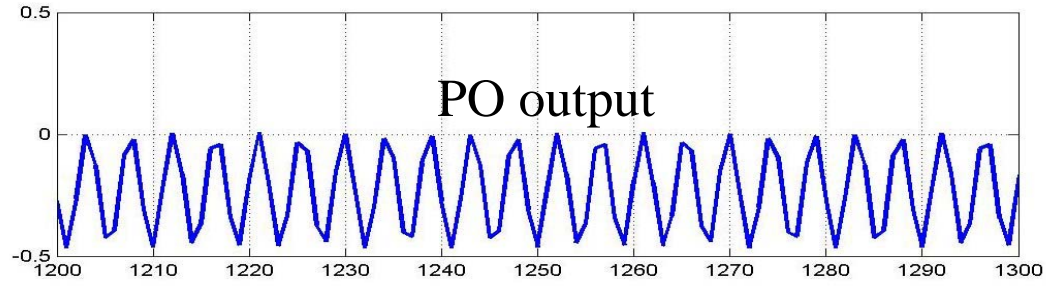
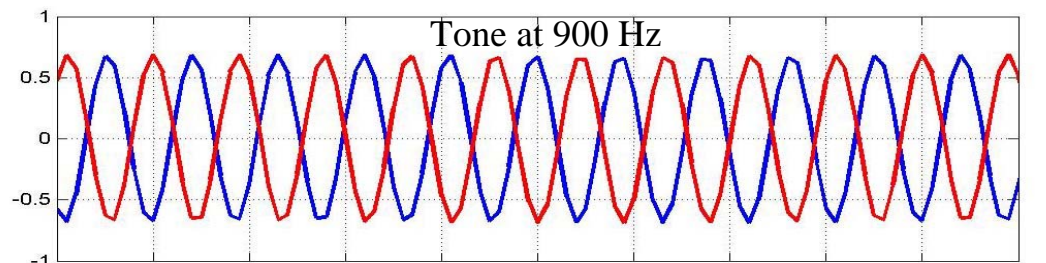
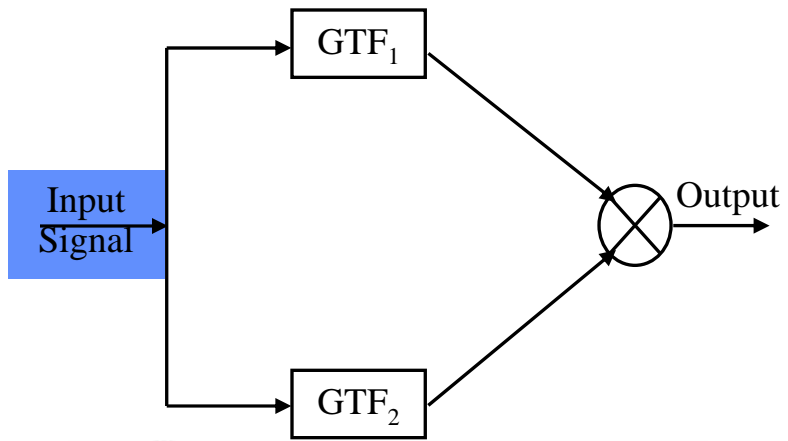
Motivation

- Everyday environments can be quite noisy and, as a result, pose a significant problem for many technologies
 - The performance of current state-of-the-art Automated Speech Recognition (ASR) systems drops drastically
 - People with hearing devices find it difficult to understand the speech of others, even when they are sitting close by
- One approach to address this issue of noise is to develop enhancement algorithms that “clean” the speech signal



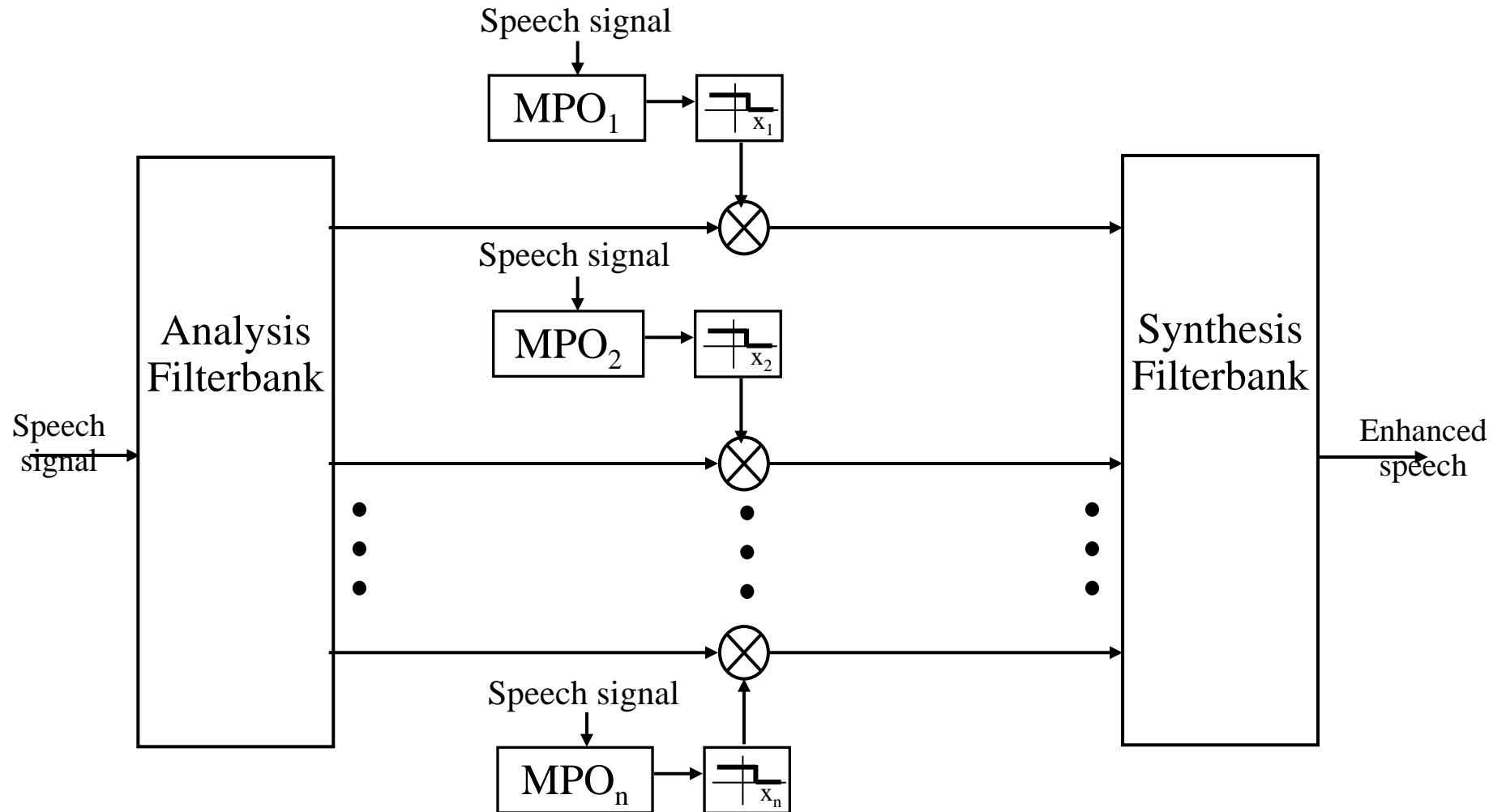
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Phase Opponency





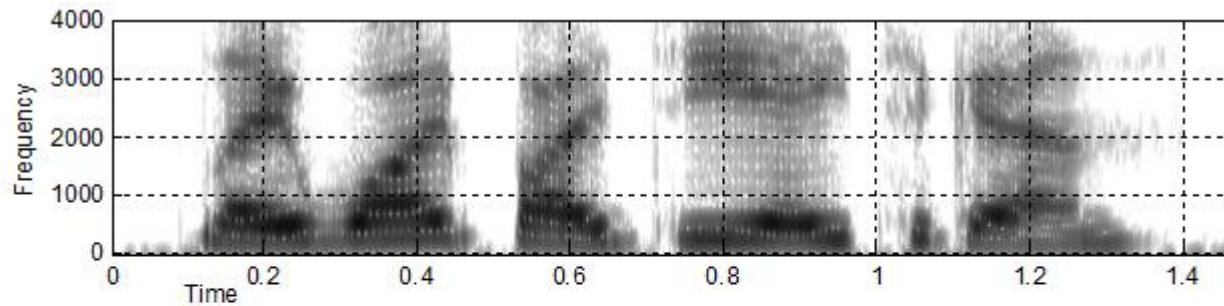
MPO Architecture



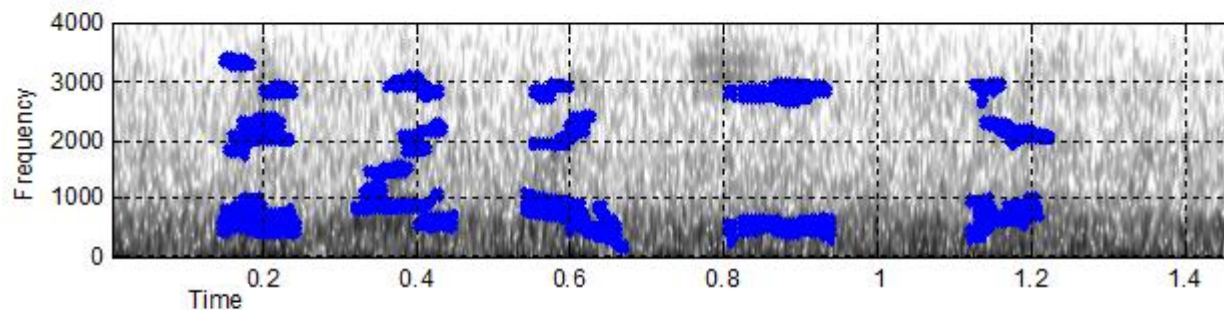


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MPO Profile



Clean Signal



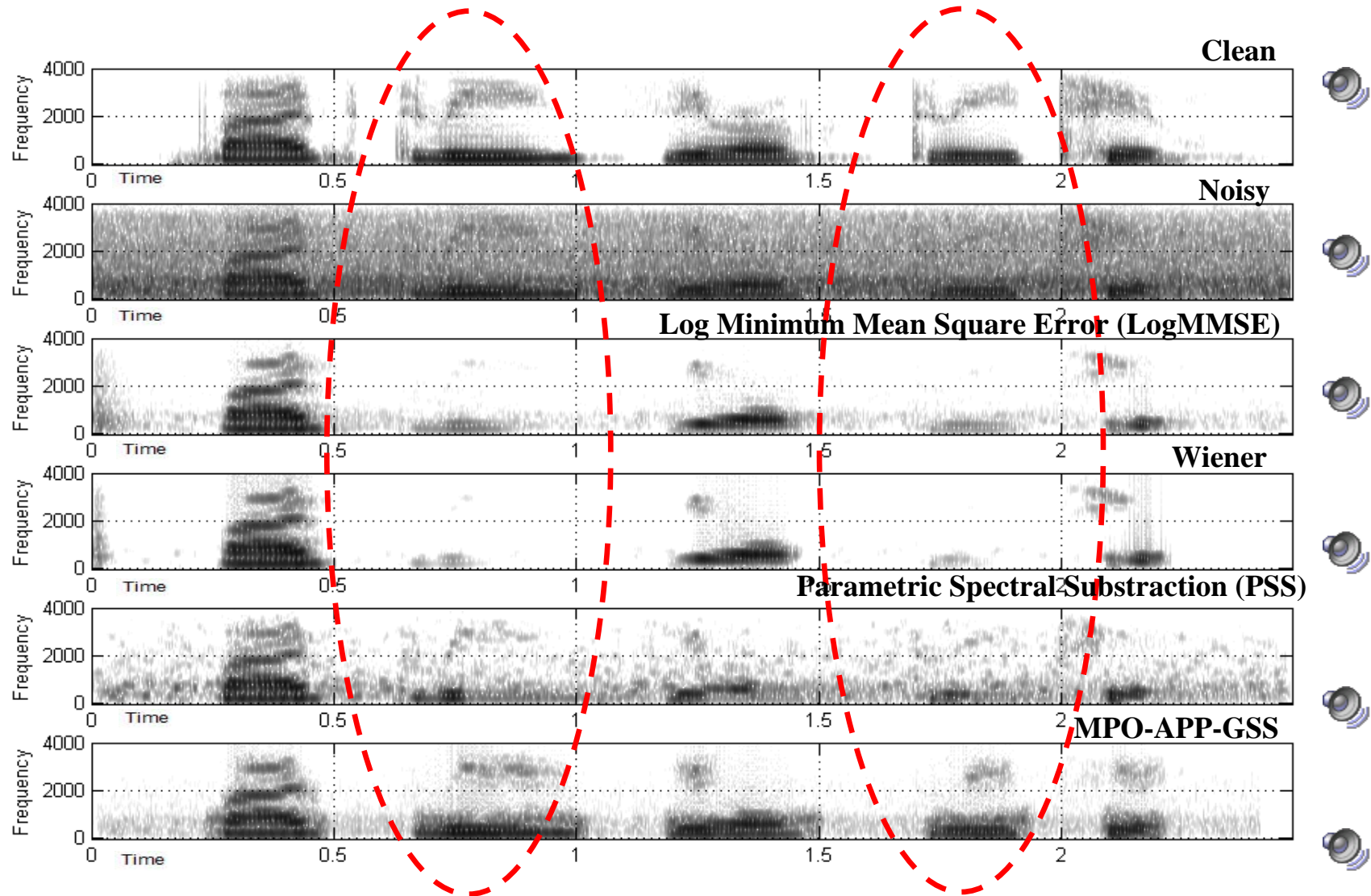
MPO profile

- Corrupted with speech shaped noise at -6dB Signal-to-Noise ratio (SNR)
- Modified Phase Opponency - Aperiodic Periodic Pitch Detector - Generalized Spectral Substraction (MPO-APP-GSS)



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MPO-APP-GSS vs Others (Car Noise @ 5dB SNR)





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Evaluation of MPO-APP-GSS

Quality Test

Intelligibility Test

pref_test_gui

Please choose your preference

First Utterance	Second Utterance
<input type="radio"/> Prefer Weakly	<input type="radio"/> Prefer Weakly
<input type="radio"/> Prefer Moderately	<input type="radio"/> Prefer Moderately
<input type="radio"/> Prefer Strongly	<input type="radio"/> Prefer Strongly

pref_test_gui

Please make your Selection

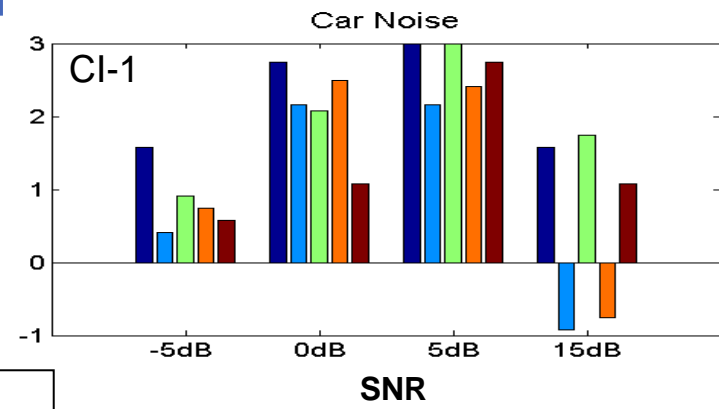
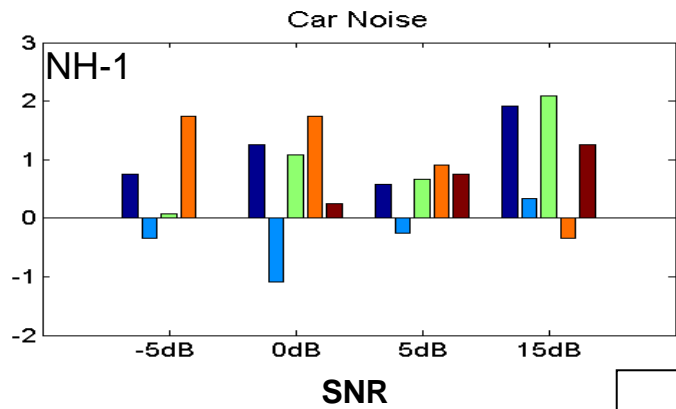
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<input type="radio"/> WHITE	<input type="radio"/> 2 (TWO)
<input type="radio"/> GREEN	<input type="radio"/> 3 (THREE)
	<input type="radio"/> 4 (FOUR)
	<input type="radio"/> 5 (FIVE)
	<input type="radio"/> 6 (SIX)
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Preliminary Results

Quality Test

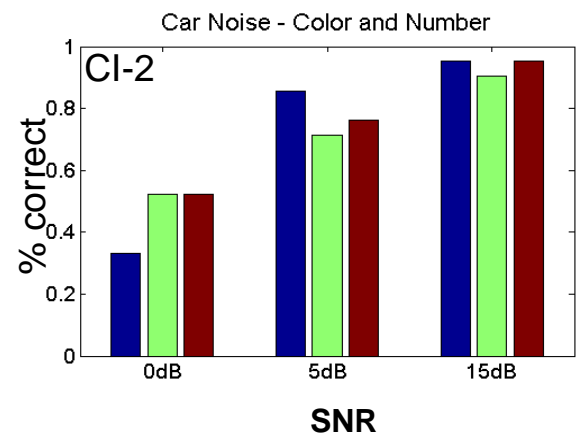
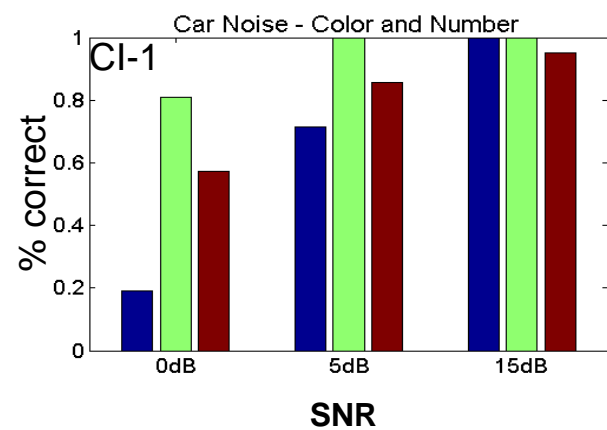
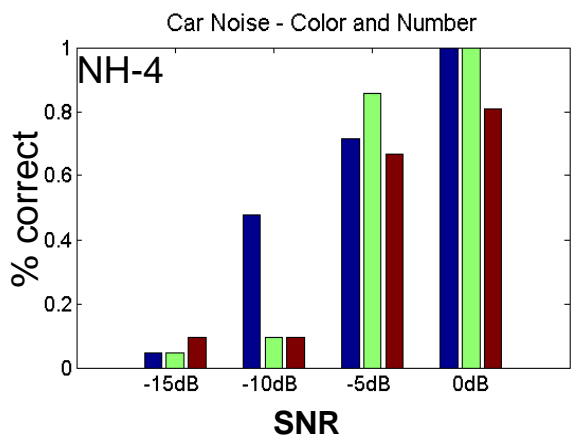


- Orig
- MMSELog
- PSS
- Wiener
- MPOAPP

3 – Strong preference
2 – Moderate preference
1 – Weak preference

- Orig
- MPO-APP-GSS
- MMSELog

Intelligibility Test





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Conclusion and Future Work

- The quality test results indicate that MPO-APP-GSS algorithm is preferred more by both normal hearing (NH) listeners and cochlear implant (CI) users.
- For the intelligibility test, the MPO-APP-GSS algorithm increases intelligibility at very low SNRs for NH listeners and is found to increase the intelligibility over unprocessed noisy speech for CI listeners.
- Future work will look at preference ratings and intelligibility performance among hearing-impaired listeners.



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