# Enhancing automotive cabins through real-time active noise cancellation

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Active noise cancellation (ANC) technologies are increasingly used in enclosed environments such as vehicle cabins to reduce low-frequency noise and improve overall acoustic comfort. This study aims to demonstrate real-time feedforward ANC systems optimized for cabin compartments to reduce engine and road noises. The system is composed of several spatial microphones, loudspeakers integrated into a cabin audio system including special headrest speakers, using filtered-x least mean-square (FxLMS) algorithm to minimize unwanted noise. The design accounts for differing operational conditions, such as engine RPM, type of road, passenger load. We propose a system of both approaches virtual and In-Car measurements. Expected results are up to 10dB reduction at dominant frequencies in the 50-300 Hz range, assuming computing delay is negligible. The algorithm adapts through engine RPM and road conditions changes. The study outlines the potential for scalable automotive ANC in the future, contributing to improved acoustic environment and reduced fatigue.