# Performance Comparison of different Noise Cancellation Algorithm's with respect to Engine Noise

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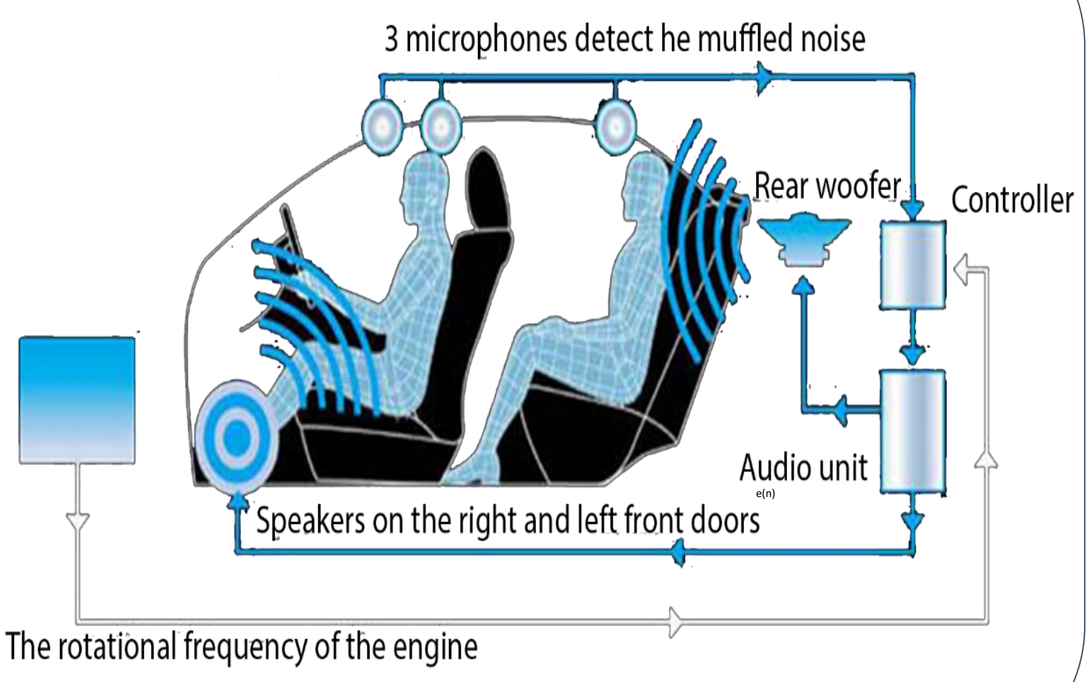
## *Introduction*

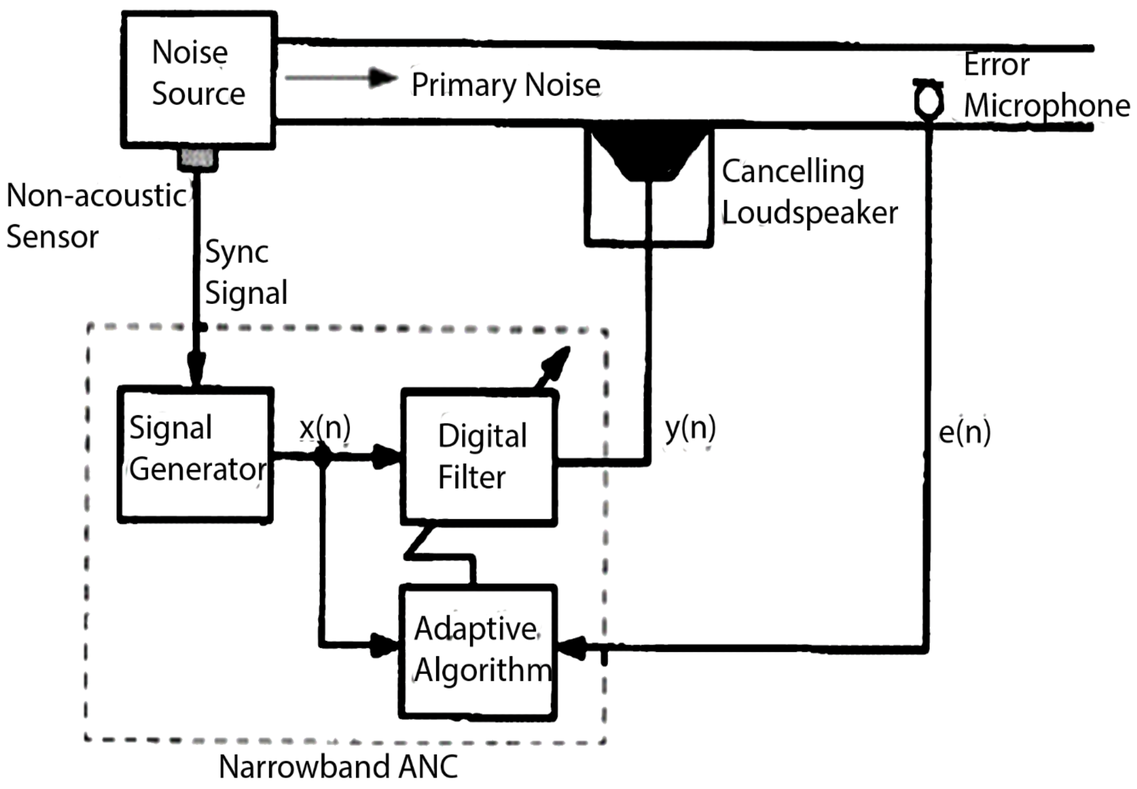
Acoustic Noise problems are becoming more and more as many industrial equipment's such as engines, transformers, compressors are in use. The traditional approach to avoid this acoustic noise problem is by using passive techniques such as enclosures, barriers to attenuate the noise. But later, it was found that these passive techniques are less effective to low frequencies particularly. Therefore, a solution was found to deal with this Situation - Active Noise Control.

Active Noise Control is a method for reducing unwanted sound by the addition of a second sound specifically designed to cancel the first by means of electroacoustic system which comprises of microphones, loudspeakers and a control unit to drive the loudspeaker.

As more powerful processing chips are in use, it is entirely algorithmic section which can influence the system performance. Therefore, the main motive of this project is to design an ANC system in car, by which noise generated by the car engine can be cancelled inside cabin, resulting in better travel experience.




## *Block Diagram*




## *Implementation*

### (i) Least Mean Square algorithm

Realizes adaptive filter in such a way that mean square of the error signal is minimum.

$$J(n) = E(e^2(n))$$

Weight update equation

Current Weights = Previous Weights + Step-Size * Error * Filtered input;

### (ii) Recursive Least Square algorithm

Realizes adaptive filter in such a way that weighted linear squares of the error signal is minimum.

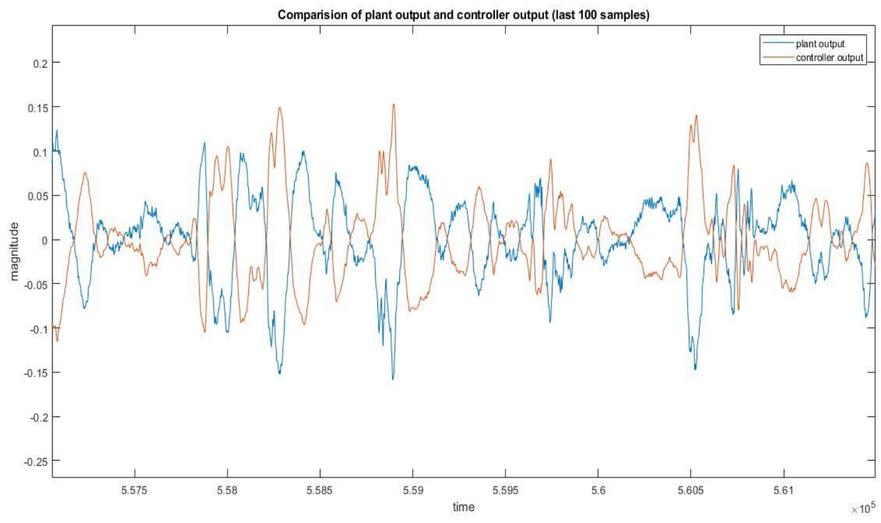
$$J(n) = \sum \lambda^{n-i} e^2(i)$$

Weight update equation

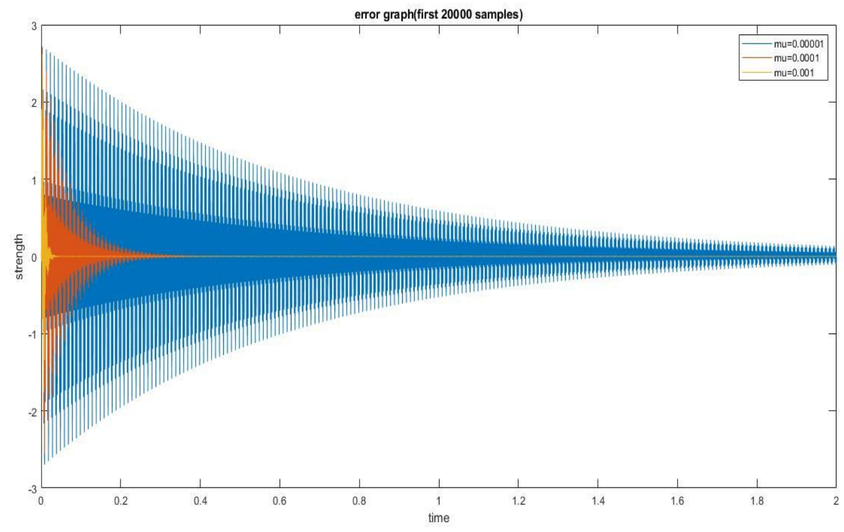
Current Weights= Previous Weights + Error * Gain vector

## *Results*

(i) Comparison of Noise signal and Anti-noise signal (generated within the code)




(ii) Comparison of Error graph with time with different step-sizes




## *Conclusions*

LMS and RLS algorithms were implemented at software level to generate anti-noise.

## *References*

1. Active noise control: A tutorial review by SEN M.KUO and DENNIS R. Morgan
2. Optimization of LMS algorithm for system identification by saurabh R. Prasad and bhalchandra B. Godbole
3. System identification using LMS, NLMS and RLS by sajjad ahmed ghauri and muhammad farhan sohail