

SYNOPSIS

Design and Simulation of an Audio Crossover Unit in MATLAB

Introduction:

Each and every audio driver unit (speaker) has a specific frequency range over which the the driver operates with optimum performance. Beyond this range the output audio quality falls drastically. In most scenarios, a single audio driver unit is not able to cover the entire frequency spectrum audible to human ears with uniform gain, so we often need multiple driver units to cover different frequency ranges. Now we need a device to separate the incoming audio signals into 3 portions, based on their frequency content. This device is known as the **Audio Crossover Unit**.

Brief Overview:

Speakers are broadly classified into 3 categories based on the frequency range in which the operate best:

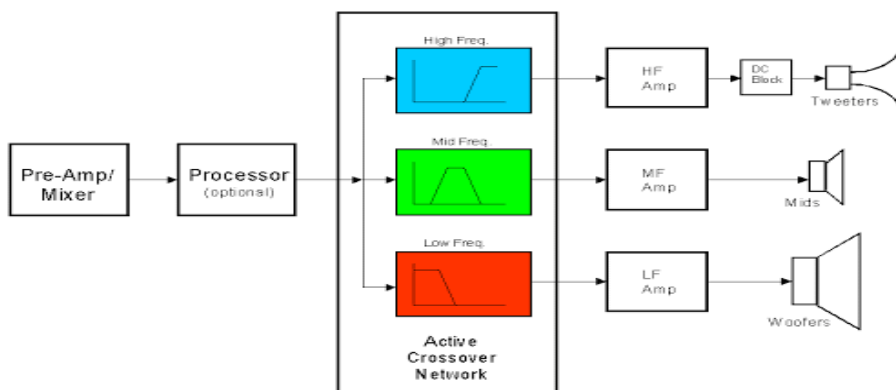
1. Woofers
2. Midrange drivers.
3. Tweeters.

Woofers – These speakers are best suited for the production of low frequency sounds. They are good at producing the **bass** quality of audio.

Midrange Drivers - These speaker are good at producing sounds lying in the middle of the audio frequency spectrum.

Tweeter – These speakers are meant to produce sounds lying in the higher end of the audio frequency spectrum. They are best for producing the **treble** quality of audio.

A balanced audio experience refers to all the audio frequencies being produced equally. If in case, we have a system which emphasizes on the lower frequencies more as compared to the higher frequencies, then the system is able to produce bass very well but is weak in producing the higher tones. On the other hand, if we have the opposite case, then the system will have excellent treble output but weak bass output. So, our main focus throughout the design process is to design a system which does not exaggerate a particular frequency range, but produces the entire audio frequency range equally well. The crossover unit is responsible for this function. The block diagram of a basic crossover unit is given below:



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2017-21
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