Karaoke Filter Design

By: Max Krauss and David Lee

A band elimination filter with adjustable bandwidth and cutoff frequencies can be used to create a karaoke version of any song by removing vocal frequencies. This can be achieved by designing a digital signal processing filter that is tuned to remove specific frequency ranges using techniques such as FIR or IIR filters. The bandwidth can be adjusted to attenuate a range of frequencies, and the filtered song will hopefully contain only instrumental frequencies.

In modern music, vocals are mixed to spread throughout the frequencies of the song. This makes it more difficult to remove the vocal frequencies without affecting the instrumental portions of the song. Our filter design allows the user to input the desired frequencies to be removed, so in order to create a karaoke version of the song, the user must have knowledge of the vocal frequencies of the song. This is because all songs have unique vocal frequencies, meaning one song can have vocals that range from 80Hz to 110Hz, and another may range from 1000Hz - 80000Hz. Our final filter implementation demonstrates the filtering of a Johnny Cash song called “Hurt”. The filtered song has some remnants of vocals but they are much quieter than the original.