FINAL REVIEW OF THE DOPPLER EFFECT

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1. PROBLEM DISCRIPTION

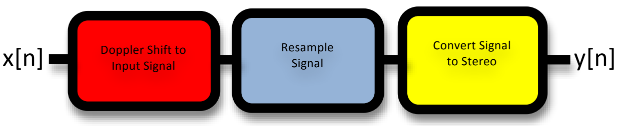
The Doppler effect plug-in may be a lucrative niche market that has never been thoroughly explored. The Doppler effect is a real world phenomena than can be implemented musically, the same way a pitch shifter or chorus/flangers have in the past. I propose A Doppler Effect 'effect' that can be sold and used as a plug-in on various instruments such as electric guitars, synthesizers or even percussive instruments such as congas or shakers. This will be a revolutionary and one of the only dedicated spatial audio plug-ins to the Doppler Effect made in the world. The lack of Doppler plug-ins on the market indicates that there will be little competition and possibly a valuable niche market. A Doppler effect plug in will give customers a creative tool and a unique opportunity to spatially and melodically manipulate their sounds in an unconventional and new way.

2. SPECIFICATION

I propose to develop a Doppler Effect 'effect' plug-in to be sold to audio engineers, producers and musicians who are interested in using the phenomena in a musical application as an effect. The Doppler effect plug-in algorithm will be developed so that it can be used on various digital audio workstations and be available on various plug-in mediums such as .dpm, vst and au. The plug-in will use the pitch shifting phenomena in a music application by taking the input signal and shift the pitch downwards. It was also create a spatial effect by applying an increase in level and then a rapid decrease in level as the sound recedes away from the observer. If the listener is observing these sounds in headphones they will perceive the sound (e.g an electric guitar) as if the sound had approached them, then rapidly moved away from the listener. The increase, then rapid decrease in velocity is to create the spatial perception of the sound getting progressively closer to the observer than rapidly moving away from them. As the sound recedes from the observer a significant downwards shift in pitch is then applied to the sound, emulating the Doppler effect.

3. IMPLEMENTATION

The proposed effect will take an input signal and shift the pitch of the signal downwards, relative to the parameter settings on the interface of the plug-in. The following schematic shows the signal flow from the input signal x[n] to the output signal y[n].



It works by taking the input signal and shifting the pitch of the signal over time. It then resample's the signal and then converts the output signal to a stereo output regardless if the input is mono or stereo. Whilst doing this it also changes the velocity of the signal relative to the parameter setting. The parameter settings consist of three inputs.

1. The velocity of the sound.
2. Initial horizontal distance between the sound source and the receiver.
3. The vertical distance between the sound source and the receiver.

These parameters determine the output signal and how the plug-ins behaves. For example if the velocity of the sound is 80 km/h then the time between the initial sound and the receding sound will a lot quick than any other lower values. The horizontal distance will also effect how the listener perceives the effect. For example if the observer is one hundred meters away from the sound source then the time it takes for the approach sound to increase in velocity would be a lot longer than any less values.

4. EVALUATION

The following images are graphs that have been plotted out of Matlab. Figure 1 shows the unprocessed input signal. It is a police siren taken from Apples, Logic Pro sound library. If we examine figure 2 the output signal we can see a significant changes from the input signal. These images prove that this is a non-linear system. This non-linear system takes the input signal, applies a downwards shift, resample's the signal and then applies it to the output signal which is converted to a stereo file.

Figure 1: Input Signal x [n]

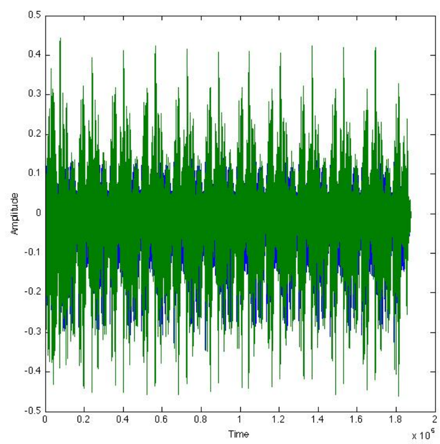
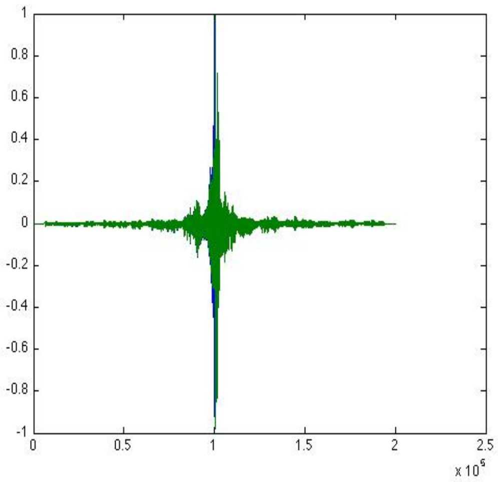


Figure 2: Output Signal y [n]



As we can see by the output signal, this Doppler Effect ‘effect’ non-liner system not only controls the downwards shift that is cause by the phenomena by it also controls the magnitude depending on the input speed and distance from the sound source. This is because the significant increase in velocity when a sound source is approaching you and then its rapid decrease in velocity as it recedes the observer.

5. CONCLUSION

Introducing a Doppler Effect plug-in on the market will be a new way to give producer, engineers and musicians a creative tool to implement and manipulate various sounds in their production. By using the code that I have developed in Matlab, a consumer can take their recorded or produced sounds and spatial manipulate them. Whilst wearing headphones, a listener of the effect in a production may perceive the musical instrument to approach them and recede away from them. If the listener is not wearing headphones they still may experience the phenomena more a melodic shift in pitch rather than a spatial effect. Whatever its application, this Doppler effect ‘effect’ thoroughly researched effective plug-in that the market needs.

6. REFERENCES

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