DESC9115 LAB REPORT 1
VIBRATO
DIGITAL AUDIO SYSTEMS
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For the purpose of this report I tried to go into a deeper understanding of the mathematical equation of the vibrato, the DAFX book mentions the principle of the vibrato effect is the variation of the time delay, and by varying periodically the time delay, it will produce a periodical pitch variation.

In the mathematical equation of the Vibrato, the attention must be focused in the phase, since is the most important design consideration. First, the sinusoidal oscillator is taken as a constant amplitude A times sin. The phase function is required to be properly designed to obtain the correct implementation of vibrato.

$$y(t)= A \sin (\underline{\emptyset(t)})$$
design the phase function

There fore, a starting point would be a constant amplification of the slope of 2 of "fo", giving a constant value of frequency if that was the finish result for a phase function. Then to introduce vibrato we need to cause a little bit of modulation or fluctuation of that ramp, we can do that by adding a sinusoid to the ramp function, that sinusoid should have a relatively low frequency which normally would be called the vibrato rate. The variation makes more sense to be sinusoid than it is to be superimposed or added to that ramp function.
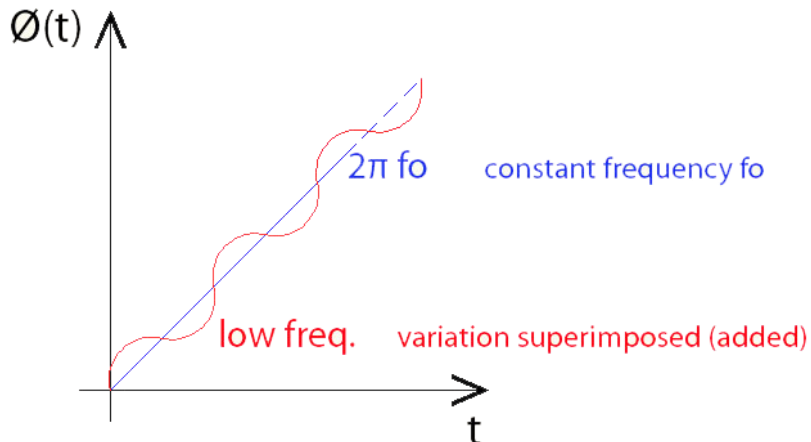
Then, the phase function $\emptyset(t)$ can become the ramp function 2π fo t plus the frequency deviation Δf which serves as a constant amplitude for our sinusoidal variation which has frequency fr for the rate $\sin(2\pi$ fr t).Once the phase function in hand we drop that in our sinusoidal equation;
$$y(t) = A \sin (2 \pi \text{ fo} + \Delta f \sin (2 \pi \text{ fr t})$$

The function I used in Mathlab was the all pass interpolation, which had to be corrected by suppressing the *"a"* `ya_alt=ya(n,1)` `ya_alt=ya(n,1)`. So first I linked the fs (frequency) to the one of the audio file selected so it automatically picks the one of the audio file desired; `[x,fs] = wavread ('Flute')`.
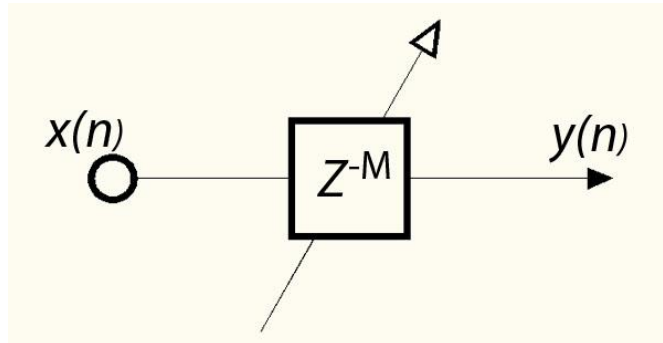

Fig1. Diagram of the "vibrato" effect.

To add a bit more complexity to the vibrato effect I added the "flanger" effect to it, which is implanted by just adding the original signal to the one with by vibrato and playing them together as the diagram below.
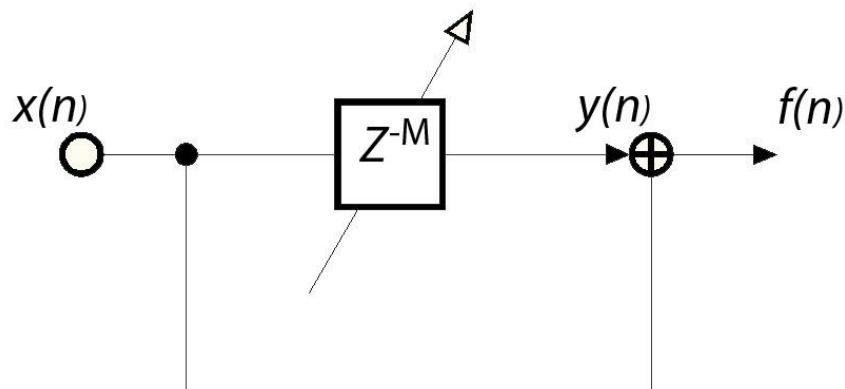

Fig 2. Diagram of the "flanger" effect.

This was accomplished by adding the f (for Flanger) variable, since the beginning ; `[y fs f]=vibrato(Modfreq,Width)` and explaining that `f=y+x;` How ever the function automatically plays the vibrato effect, if the user desires to listen to the flanger effect its required to express it to matlab through `sound(f,fs);`

References

Zolzer Udo, "*DAFX: Digital Audio Effects* John Wiley & Sons, Ltd., vol. 110, no. 3, pp. 1598–1608, Mar. 2001.
Doering Ed, "*Vibrato Effect*", viewed on web page; http://cnx.org/content/m15496/latest/ 2008.