Delay, Time Shifting

Kreatives Programmieren 1

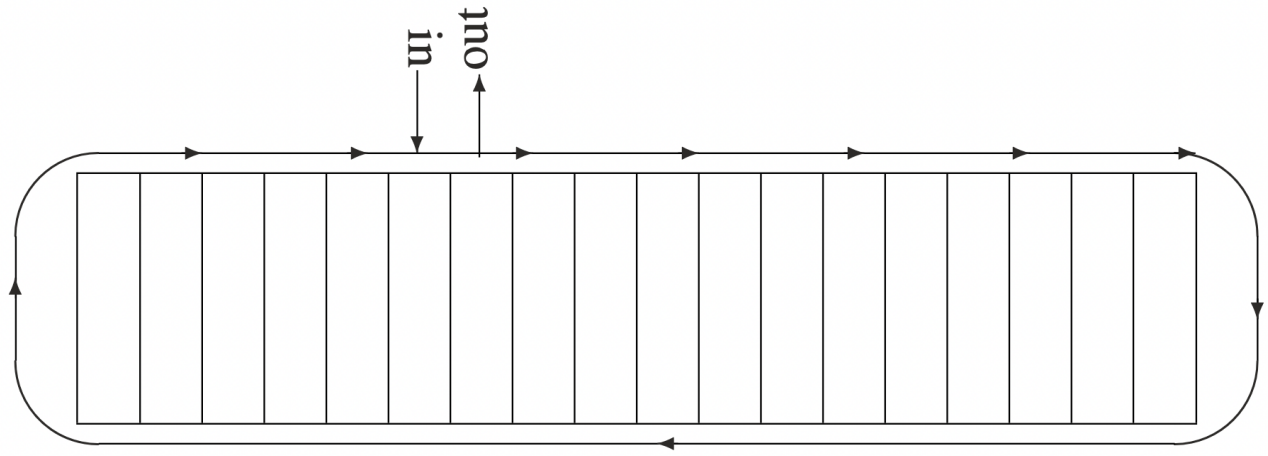
Luís Antunes Pena

Delay, Time Shifting

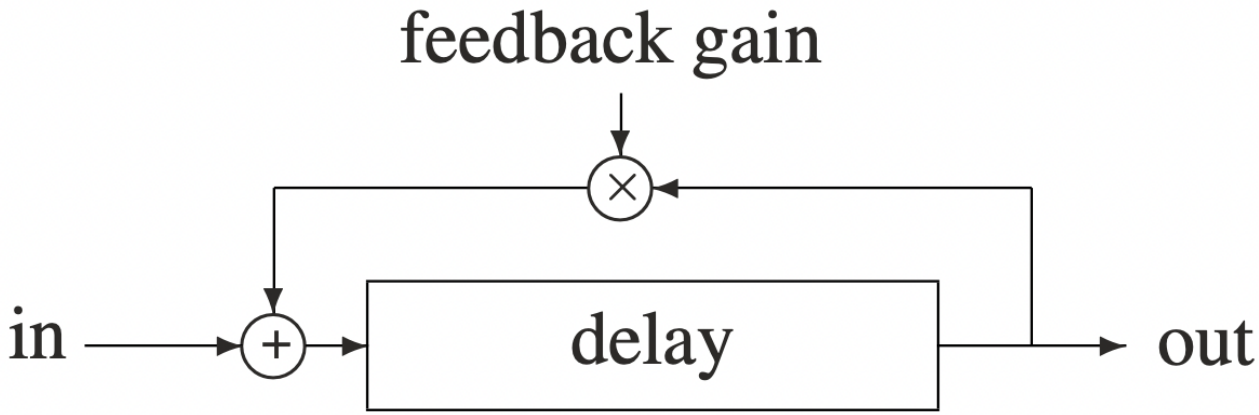
Consider two songs played at 5:00 and 5:00:01 on the same day. The difference, whatever it is, clearly resides in neither of the two individual sounds, but rather in the interference between the two. This interference can be perceived in at least four different ways:

1. Canons
2. Echos (ca. 30 ms - 1 s)
3. Filtering ($<$ 30 ms)
4. Altered room quality: If the second copy is played more quietly than the first, and especially if we add many more delayed copies at reduced amplitudes, the result can mimic the echos that arise in a room or other acoustic space.

Circular Buffer



Delay with Feedback



Delay as a Polyrhythmic Maschine

Comb Filter

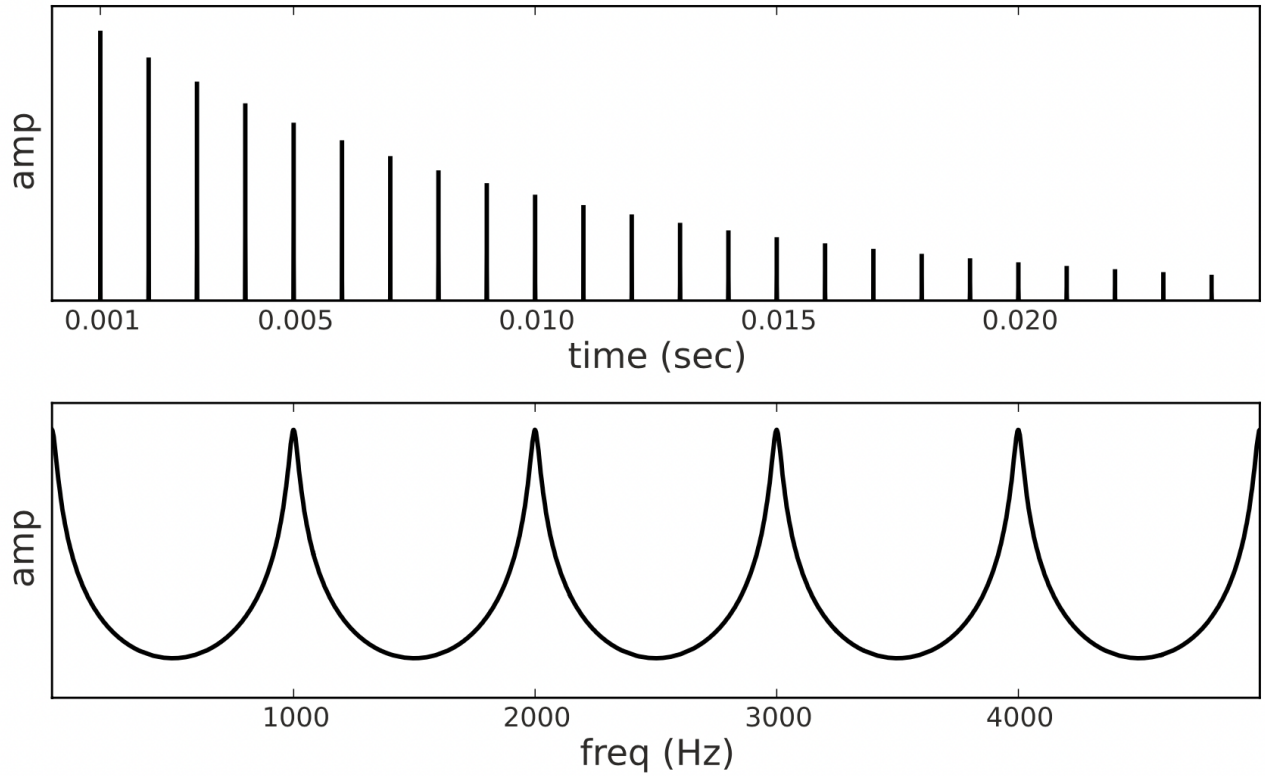


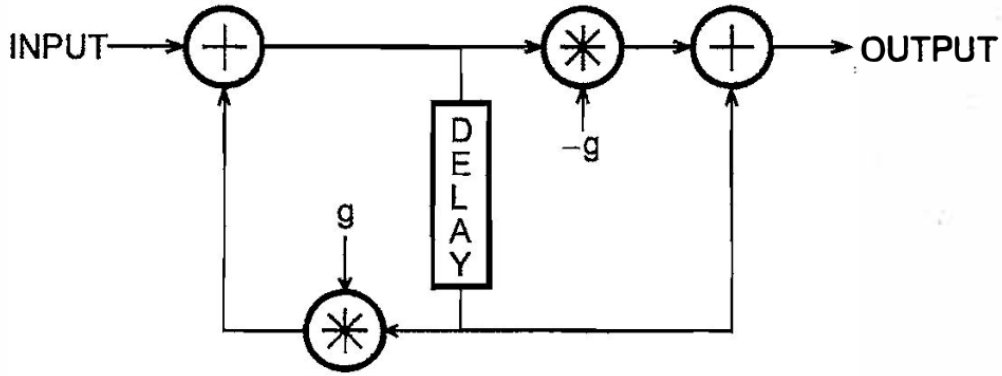
Figure: Comb filter impulse (top) and amplitude response (bottom) for D = 0.001s and g = 0.9. The amplitude response peaks are spaced by 1,000 Hz

Comb Filter

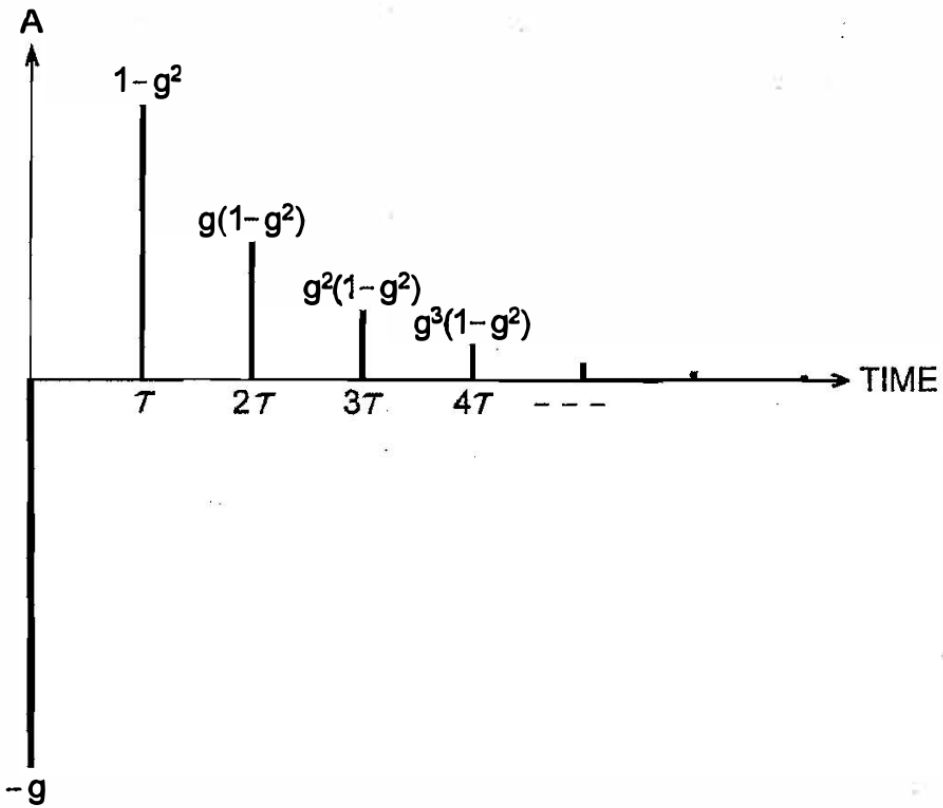
The name comb filter comes from the shape of this unit's amplitude response whose shape displays a series of regular peaks. These are spaced by the filter fundamental frequency, which is equivalent to the inverse of its delay time, 1/D. The impulse response is a series of decaying impulses, whose amplitude falls exponentially. The height of the peaks is determined by the gain. A comb filter can be used for echo effects, or as a way of colouring the spectrum of an input sound. For the latter application, shorter delay times are required, so that the filter peaks are more closely spaced, and its fundamental frequency is in the audio range (>20 Hz). In general, comb filters will impart some colour to the input sound, unless the delay time is significantly large for the amplitude response peaks to be bunched together (which is the case in echo applications).

Allpass Filter

a)



b)



Reverb

Natural reverberation is produced by the reflections of sounds off surfaces. They disperse the sound, enriching it by overlapping the sound with its reflections. This process colors the sound to some extent, imparting a change in timbre. The importance ofreverberation is familiar to musicians who have played the same piece in two halls. The effect ofthe different reverberant characteristics of the two spaces may influence the performance in a variety ofways.

Reverb

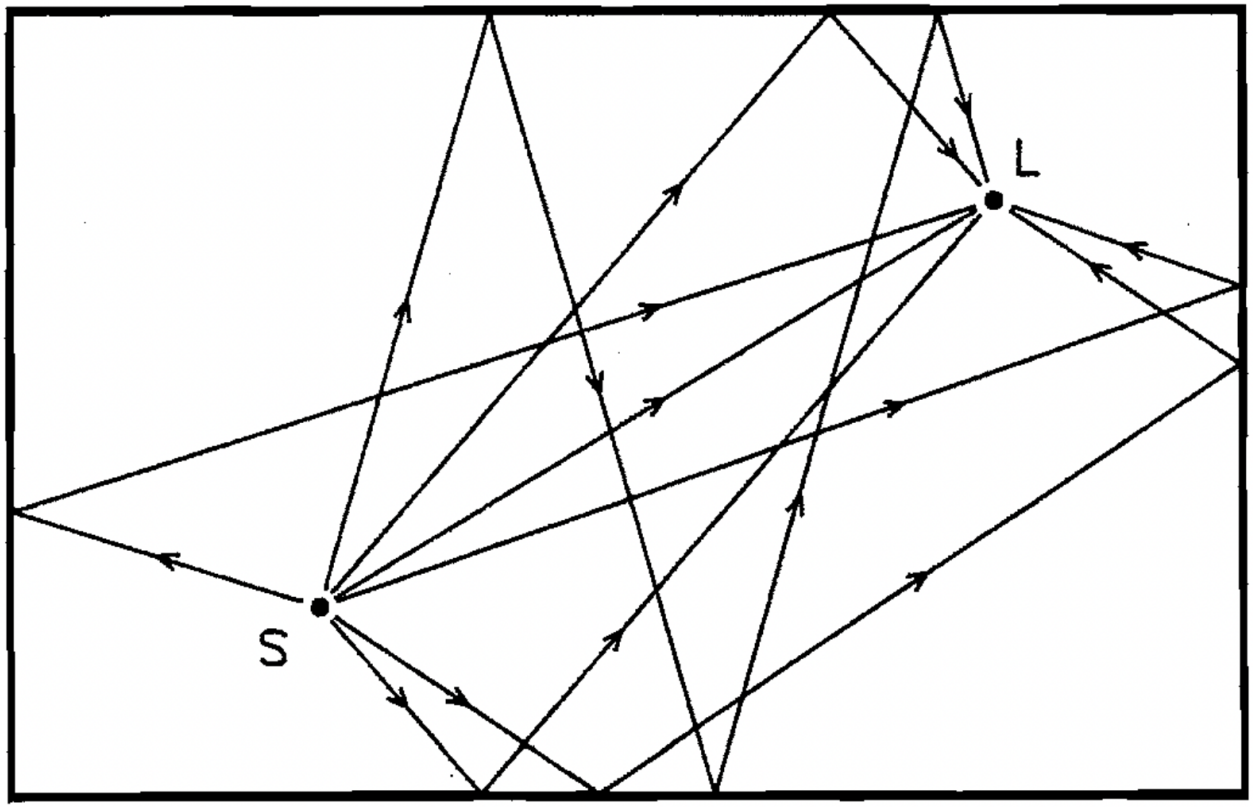


Figure: SOme of the paths of sound travel between a source (S) and listener (L) in an ideal room.

Reverb

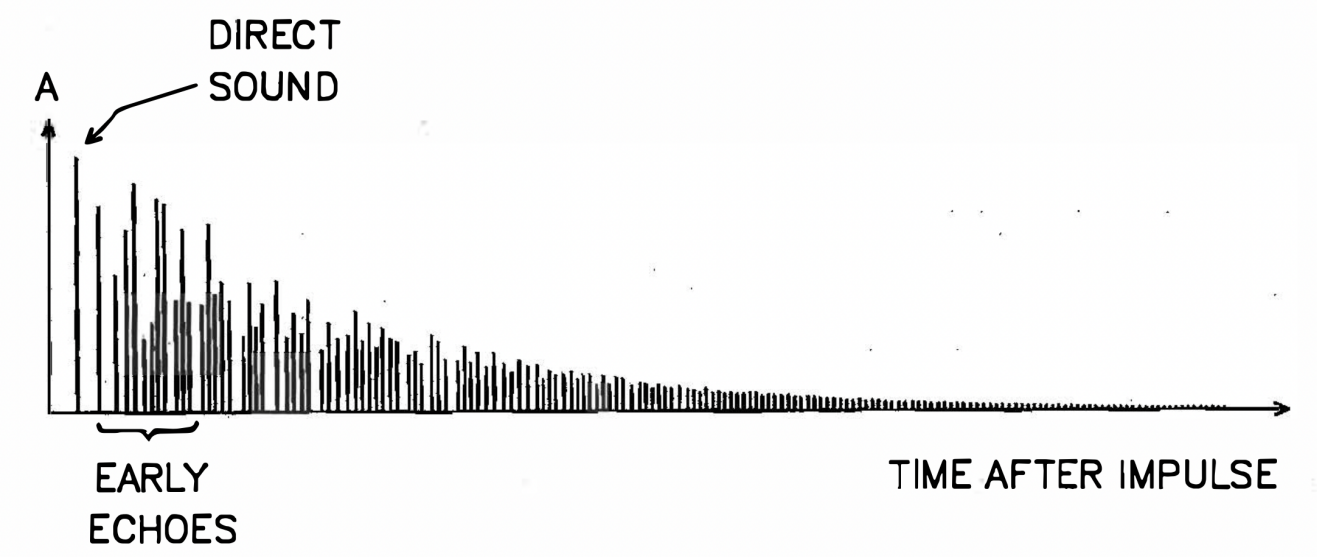
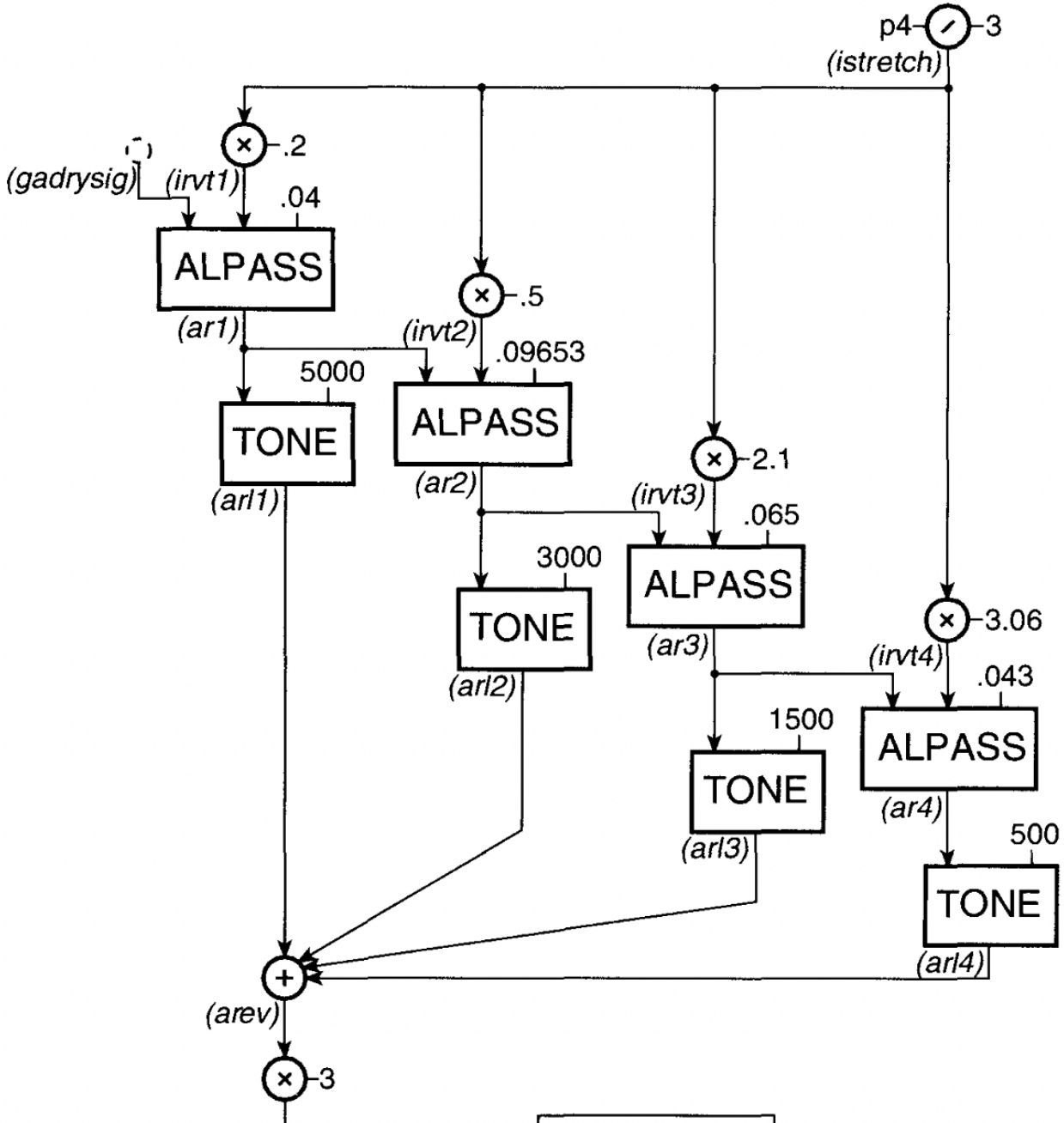
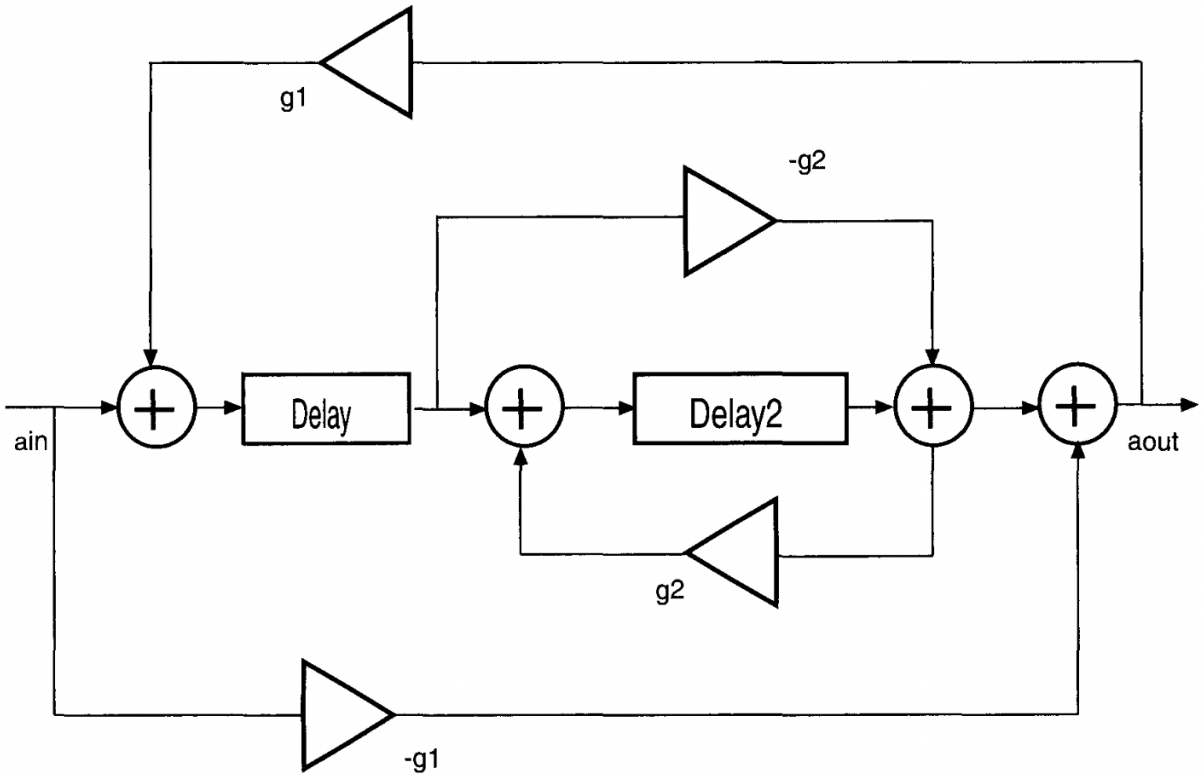


Figure: SOme of the paths of sound travel between a source (S) and listener (L) in an ideal room.

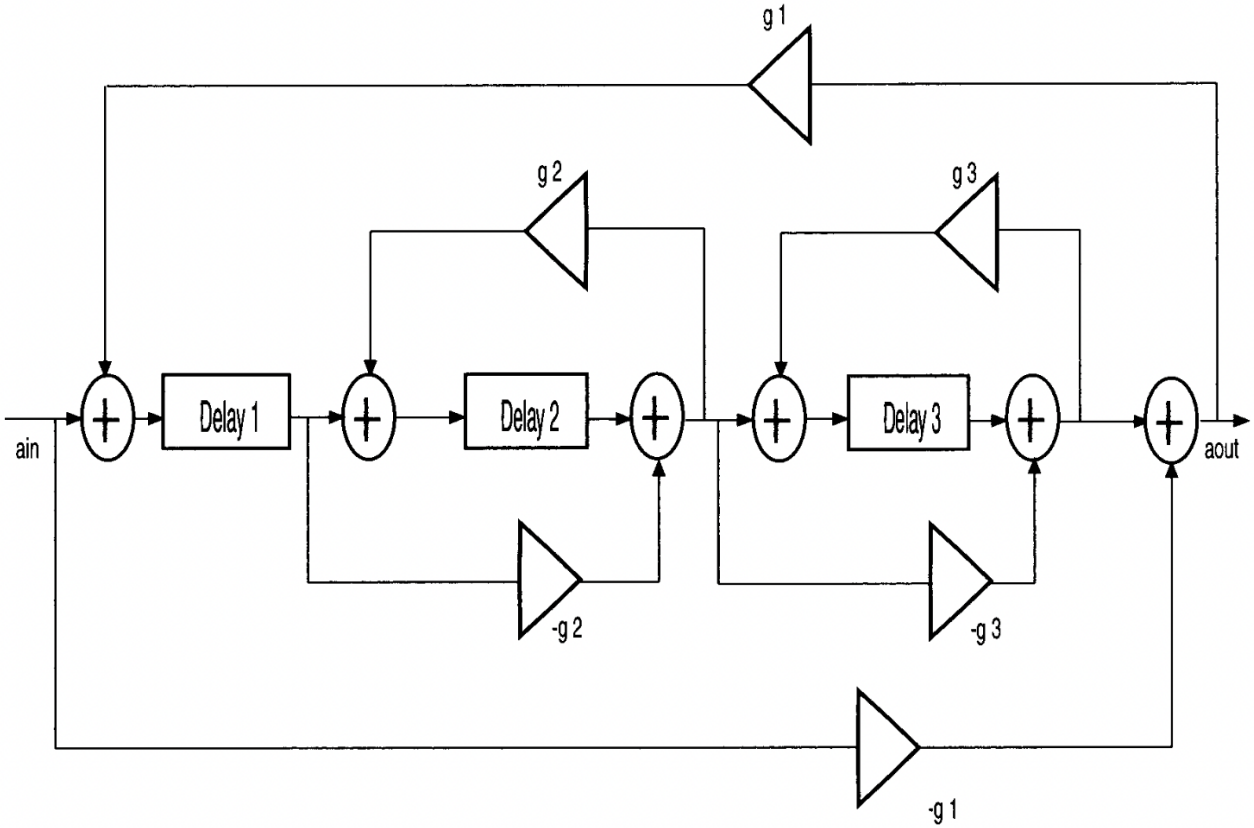
Experimental metalic reverb (Eric Lyon)



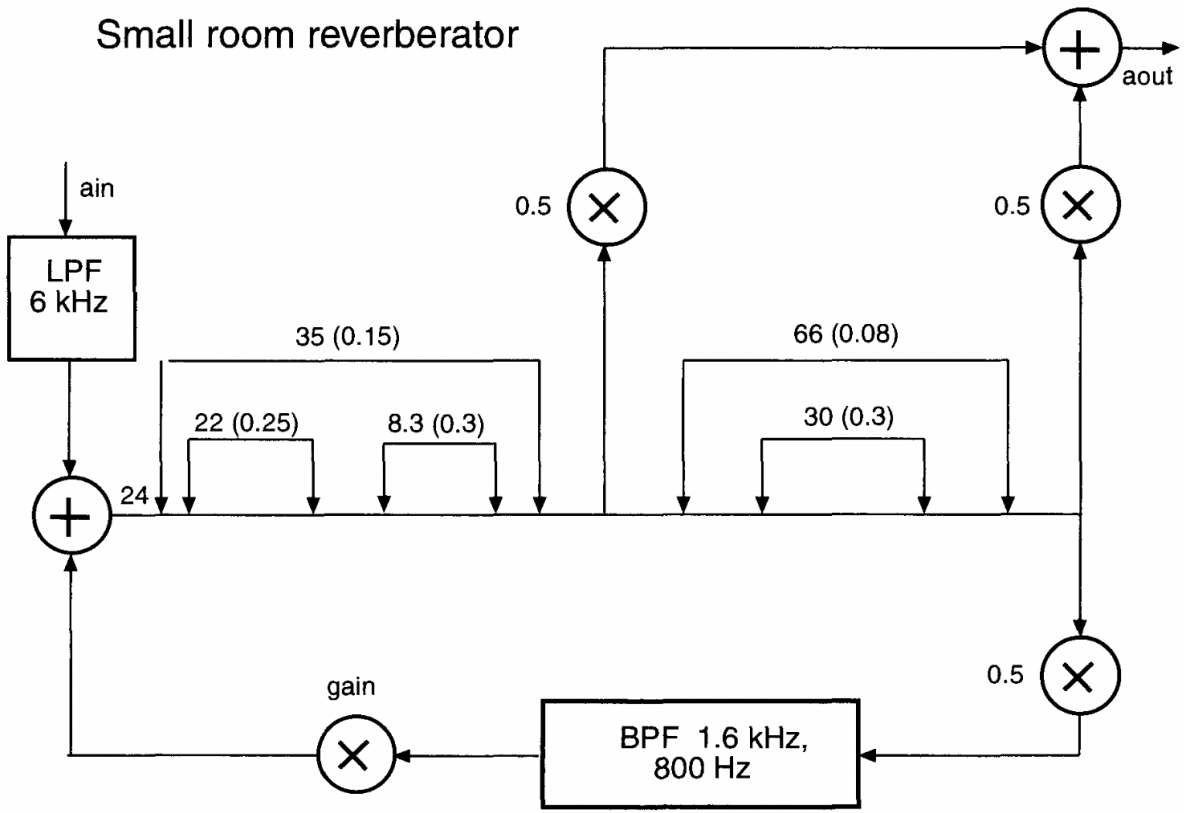
Gardner Reverb - Hans Mikelson



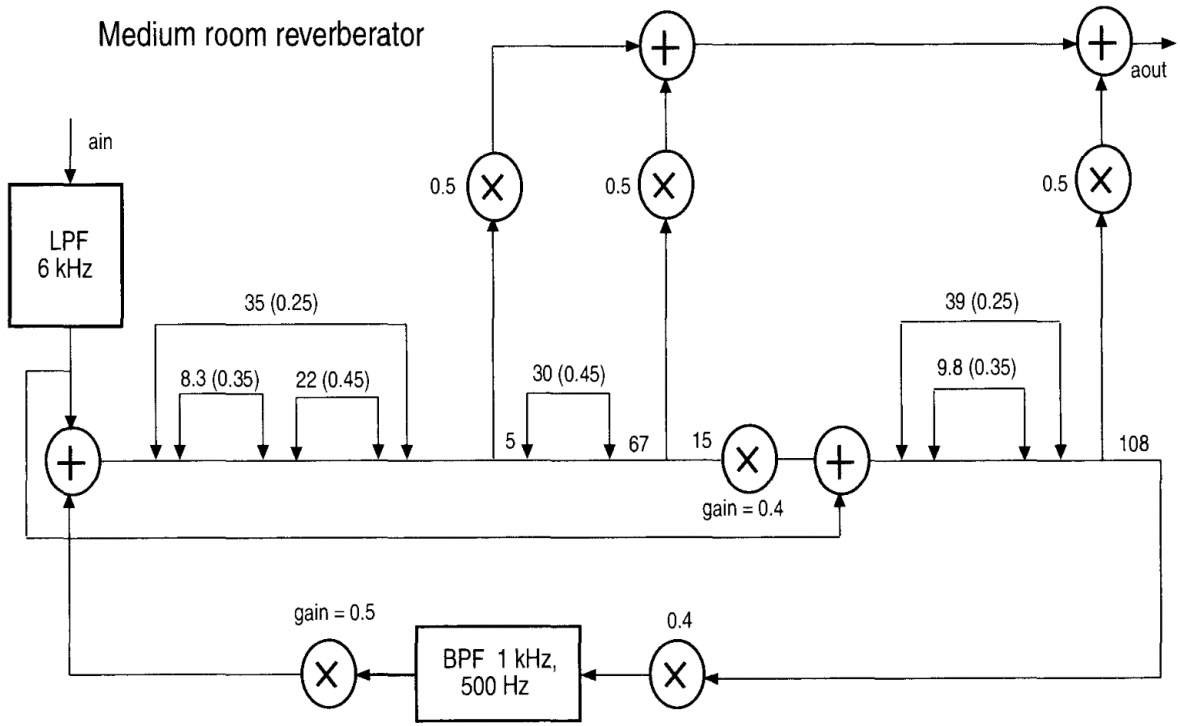
Gardner Reverb - Hans Mikelson



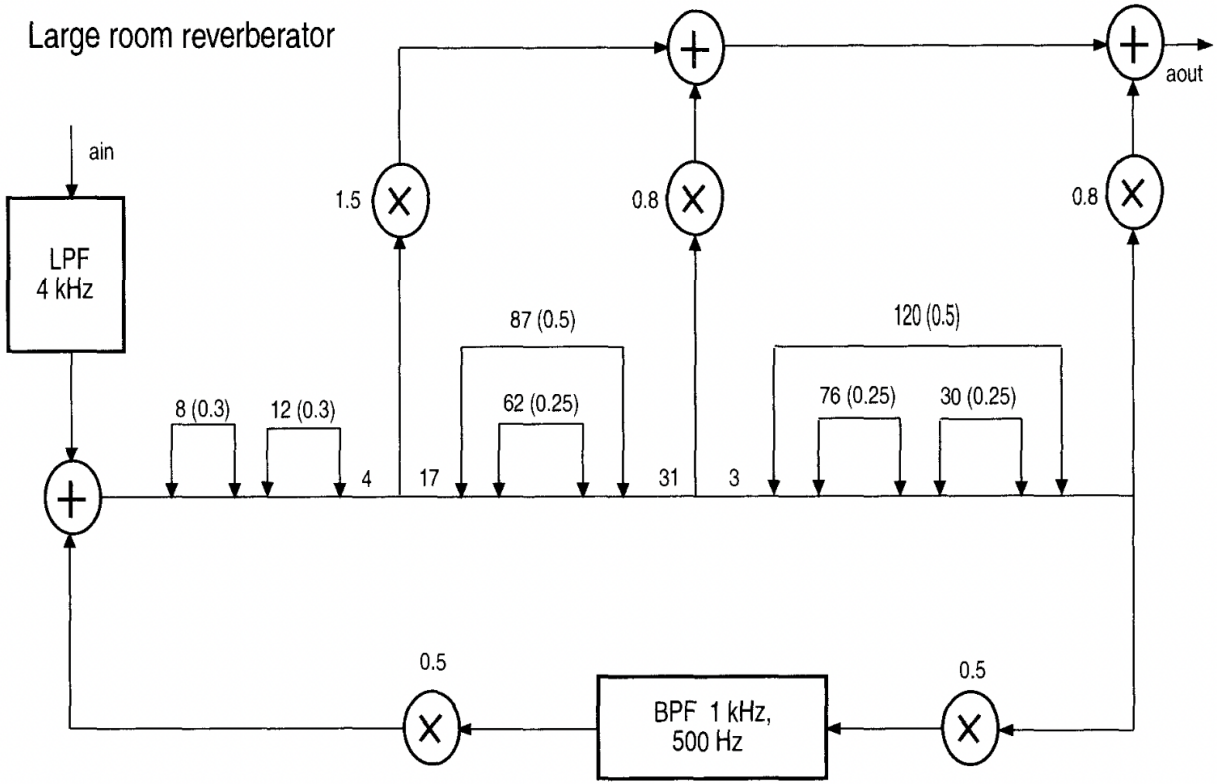
Gardner Reverb - Hans Mikelson



Gardner Reverb - Hans Mikelson



Gardner Reverb - Hans Mikelson



Flanger

Sound Modification Techniques Using Variable Delay Lines Certain effects can be imposed on sounds by using delay lines whose delay time can be varied on a sample-to-sample basis. Two of the most common uses of this technique are for flanging (phasing) and for producing a chorus effect. Flanging creates a "swishing" or rapidly varying high-frequency sound by adding a signal to an image of itself that is delayed by a short, variable amount of time (figure 10.15a). A typical use of this configuration is to apply a function of time to the delay
DODGE 303

Chorus effect

Karplus-Strong

Literatur

- Miller Pucket: The Theory and Technique of Electronic Music
- Csound A Sound and Music Computing System by Victor Lazzarini, Steven Yi, John ffitch, Joachim Heintz, Øyvind Brandtsegg, Iain McCurdy
- Charles Dodge, Thomas A. Jerse: Computer Music