Basic Digital Audio Effects

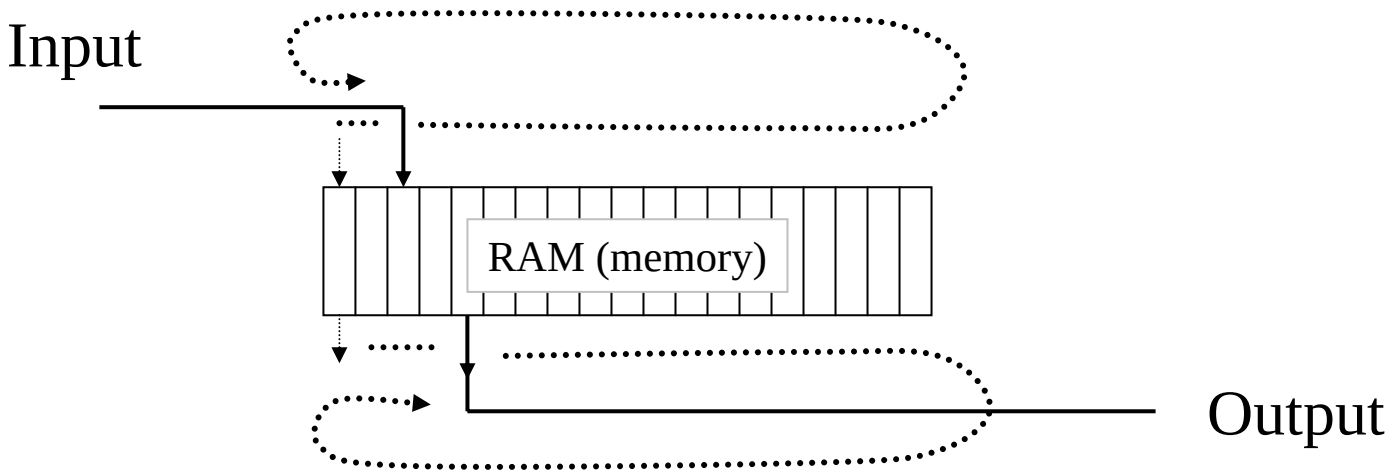
EE480

R.C. Maher

Fall 2004

Digital Delay

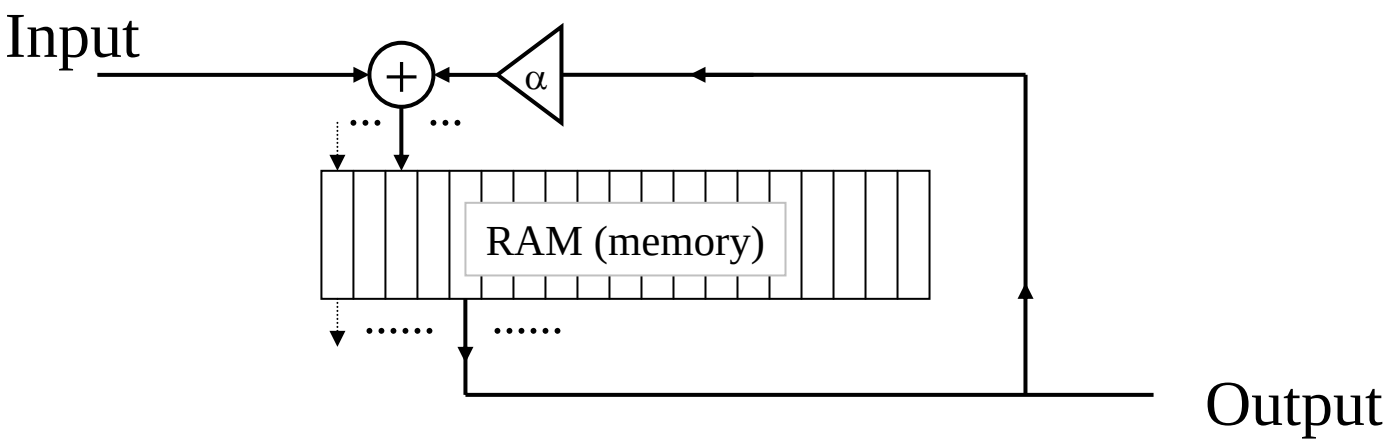
One sample after another is written into memory…



…and read out later. Delay is the number of samples between *write* pointer and *read* pointer.

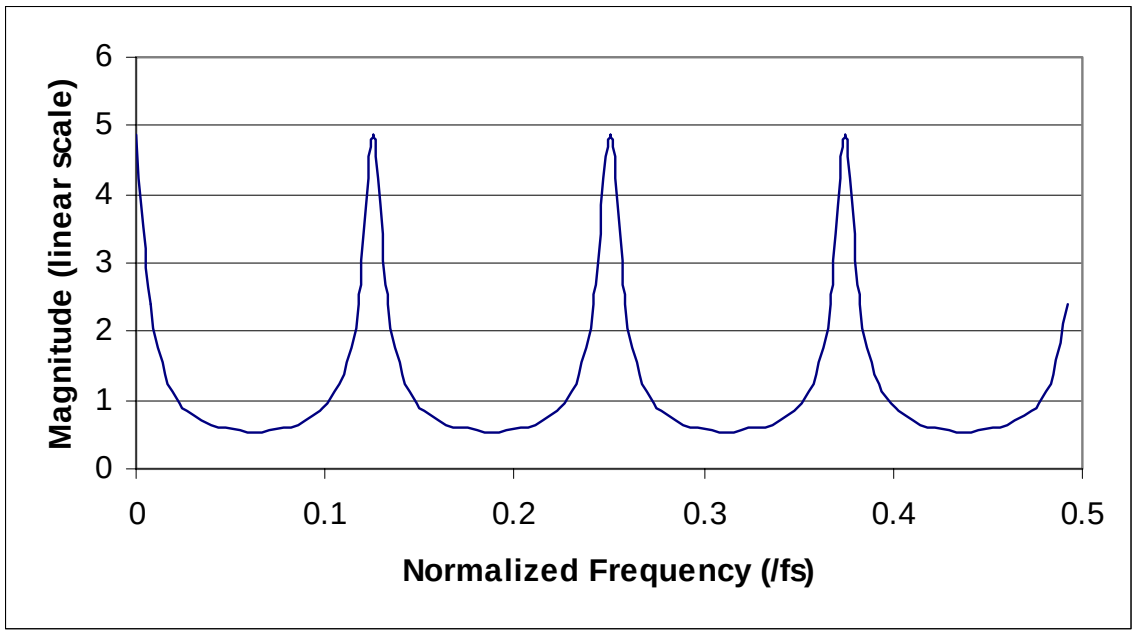
Recirculating Delay: Echo

Delayed output is attenuated and added back in with the input samples.



Recirculating Delay (cont.)

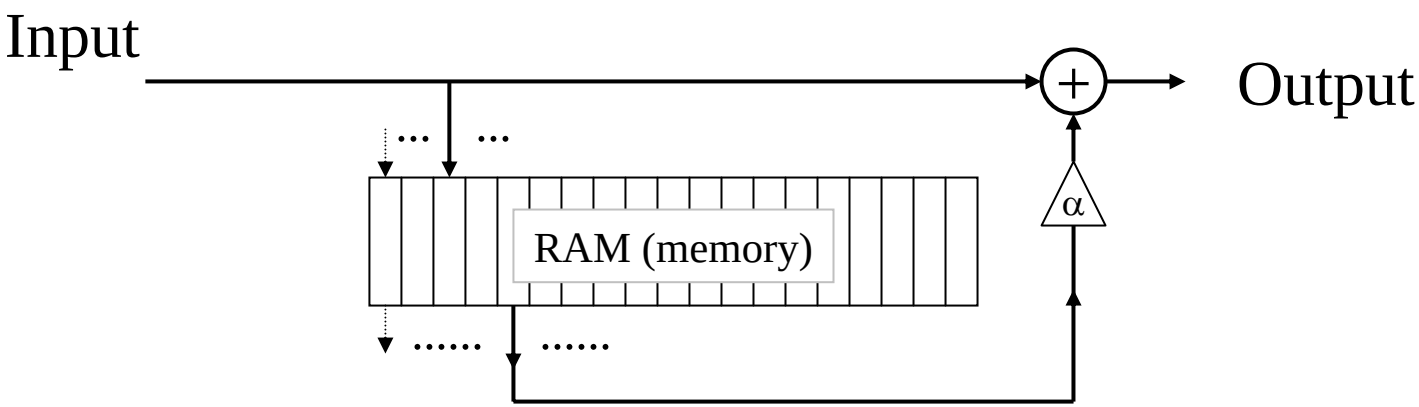
- Frequency response of system



- A “comb” filter. Frequency at peaks depends on delay length.

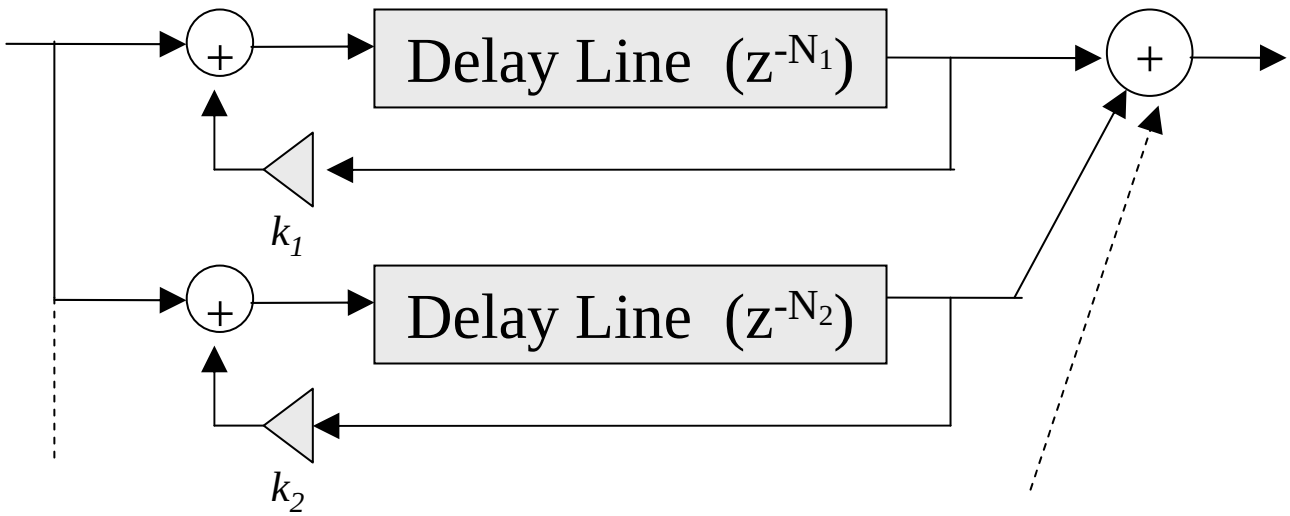
Time-Varying Delay: Flanger

Feed forward: delayed output is added back in with the input samples. Delay varies up and down as a function of time.



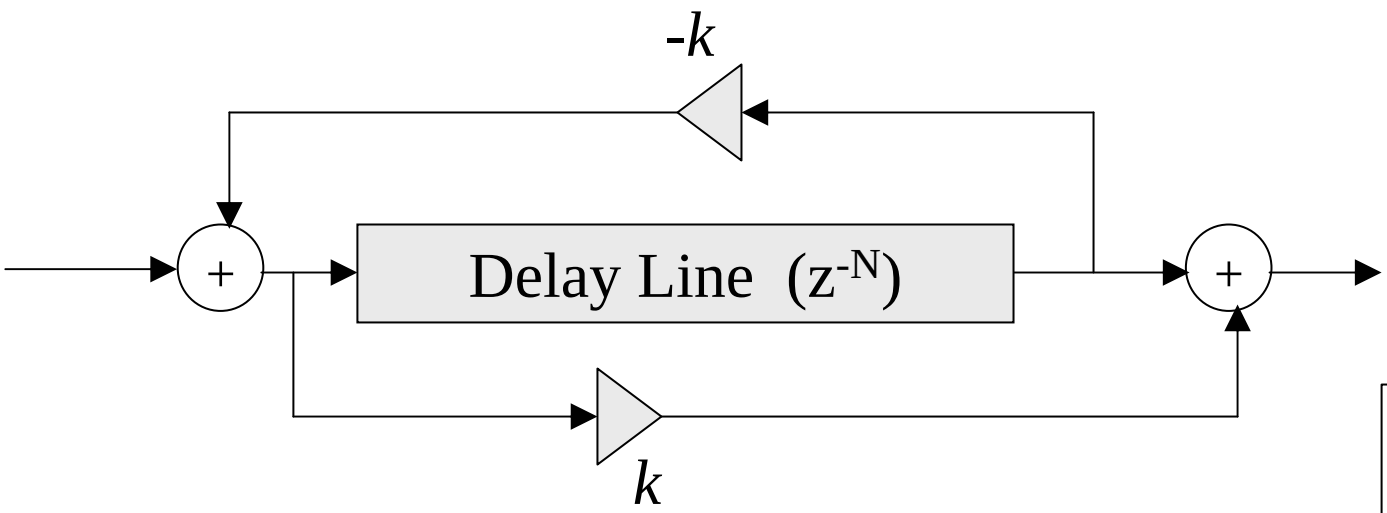
Reverb Simulation

- Plan: use parallel recirculating delay lines with incommensurate delays



Other Improvements

- Cascade of *all pass* recirculators



$$H(z) = \frac{k + z^{-N}}{1 + kz^{-N}}$$

N poles and zeroes equally spaced around circle (pole radius $k^{1/N}$, zero radius $k^{-1/N}$)