



# Hamilton Institute

## Lazy Functional Generation of Musical Sounds

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Thursday, May 10<sup>th</sup>, 2007

### *Abstract*

Among many algorithms for the generation of spectrally complex signals, such as the sound of a plucked string or of a clarinet, some are based on 'physical' simulation, using wave-guide models. The flow of a physical entity (air pressure, string amplitude, etc.) is modelled through delay lines which transmit and filter discrete signals. These pipelines are assembled into circuits with feedback, resonances, spectral distortions, reverberation, and other effects, and a full-fledged musical instrument may be composed thereof.

We show how to construct such circuits using a high-level, purely functional and \*lazy\* language similar to Haskell, namely Clean. The laziness of the language implies the facility to code co-recursive extrapolative algorithms, where the construction of a piece of sequential data is deferred until the moment it is consumed. This makes it easy to code feedback loops in an extremely compact manner. A simple plucked string (Karplus-Strong model) can be coded in three lines.

We show some sound examples, including both instruments and special effects, as well as the lazy coding of a Shepard-Risset paradoxical sound loop whose perceived pitch seems to descend forever.

**Venue:** Seminar Room, Hamilton Institute, Rye Hall,  
NUI Maynooth

**Time:** 1.30 - 2.30pm (followed by tea/coffee)

Travel directions are available at [www.hamilton.ie](http://www.hamilton.ie)



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