Computationally Efficient Hammond Organ Synthesis

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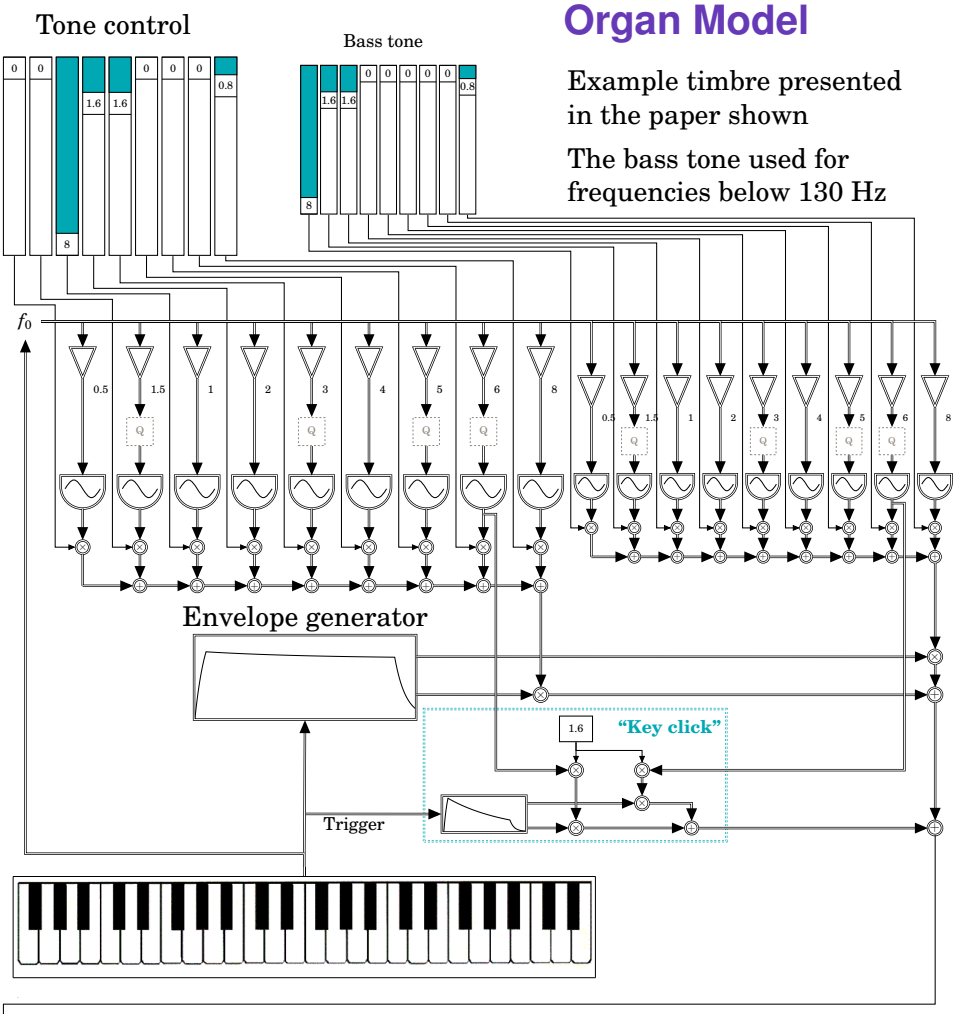
Organ Model



Example timbre presented in the paper shown

The bass tone used for frequencies below 130 Hz

Objective

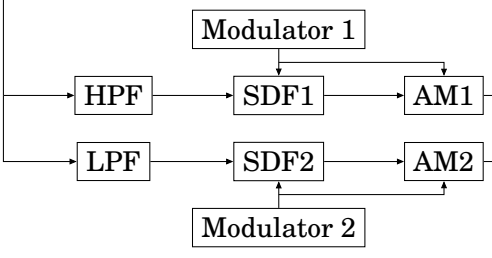
To create a digital model of the famous Hammond organ

Image source: http://www.cameratim.com/reviews/audio/hammond-123j3-organ/images/hammond-123j3-organ.jpeg

Techniques

- **Additive synthesis** (tone wheels)
- Overtones quantized (Q) to the closest in equal-tempered scale
- Fast attack and release, large sustain level
- **"Key click" effect** emulated with the **sixth harmonic**, decays fast

Leslie Cabinet Model



DEMO!

Leslie Cabinet

- Important part of the Hammond sound
- Rotating speaker units
- **Frequency and amplitude modulation**
- FM efficiently implemented with **spectral delay filters (SDFs)** [1,2]

References

[1] V. Välimäki, J. S. Abel, and J. O. Smith, "Spectral delay filters," *J. Audio Engineering Society*, July/Aug. 2009

[2] J. Pekonen, V. Välimäki, J. S. Abel, and J. O. Smith, "Spectral delay filters with feedback and time-varying coefficients," *Proc. DAFx-09*, Como, Sept. 2009

Companion page:
`www.acoustics.hut.fi/go/dafx11-hammond/`

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