Time maps, multiple convergence points, and computer analysis of Nancarrow

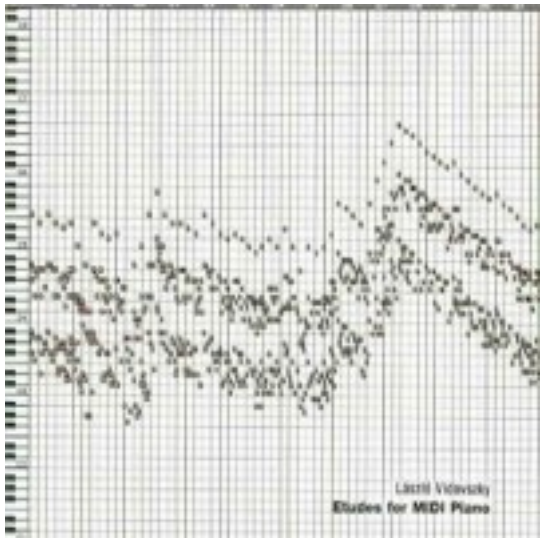
Nick Collins

Topics

- Algorithmic composition of tempo canon variants
- Time map representations and a prototype GUI for convergence point selection
- Computational treatment of Nancarrow source data

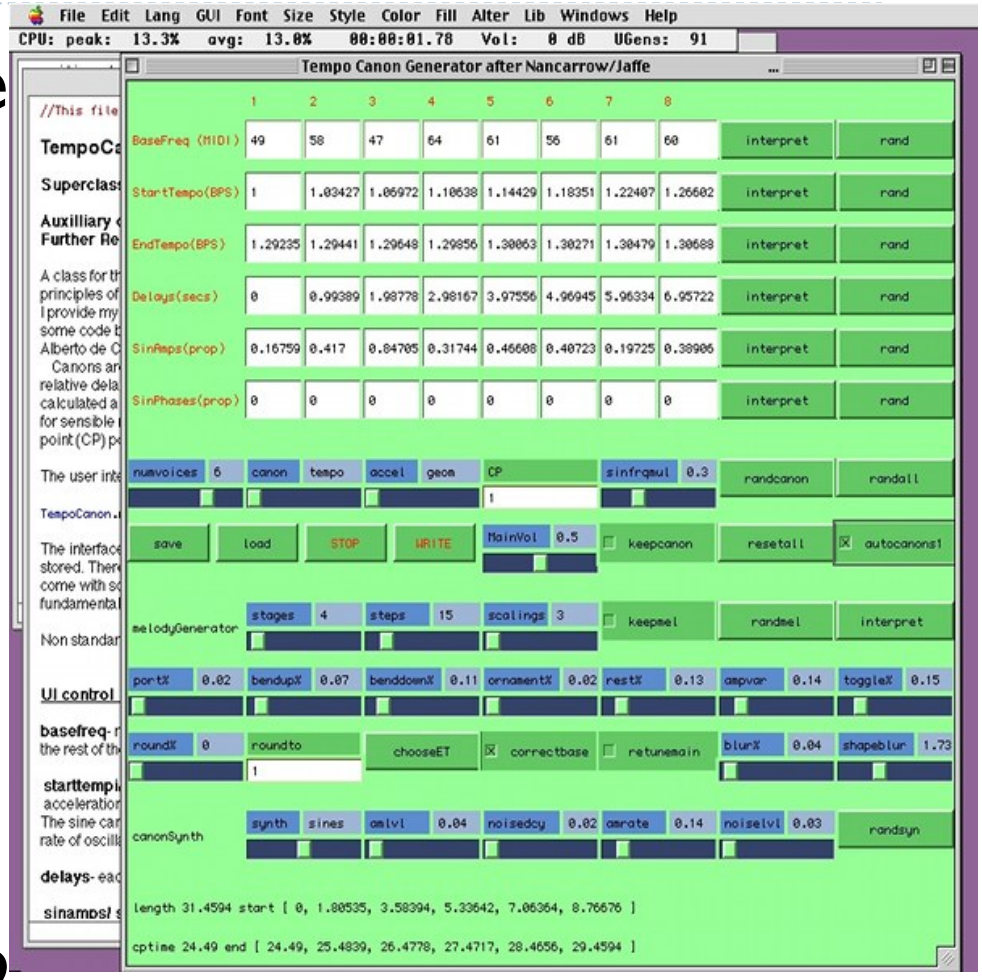
Computer music and Nancarrow

- Inspirational figure to many computer musicians
- Many pieces including Alistair Riddell's studies for computer-controlled piano, Laszlo Vidovsky's MIDI piano studies



Canonic Hill Loss

- 2003 project: generative system for mensural, acceleration (Nancarrow), sinusoidal (Jaffe) canons
- 2003 ICMC paper
- Project updated, 2011 Charity album, SuperCollider 3 version adapted from older SC2

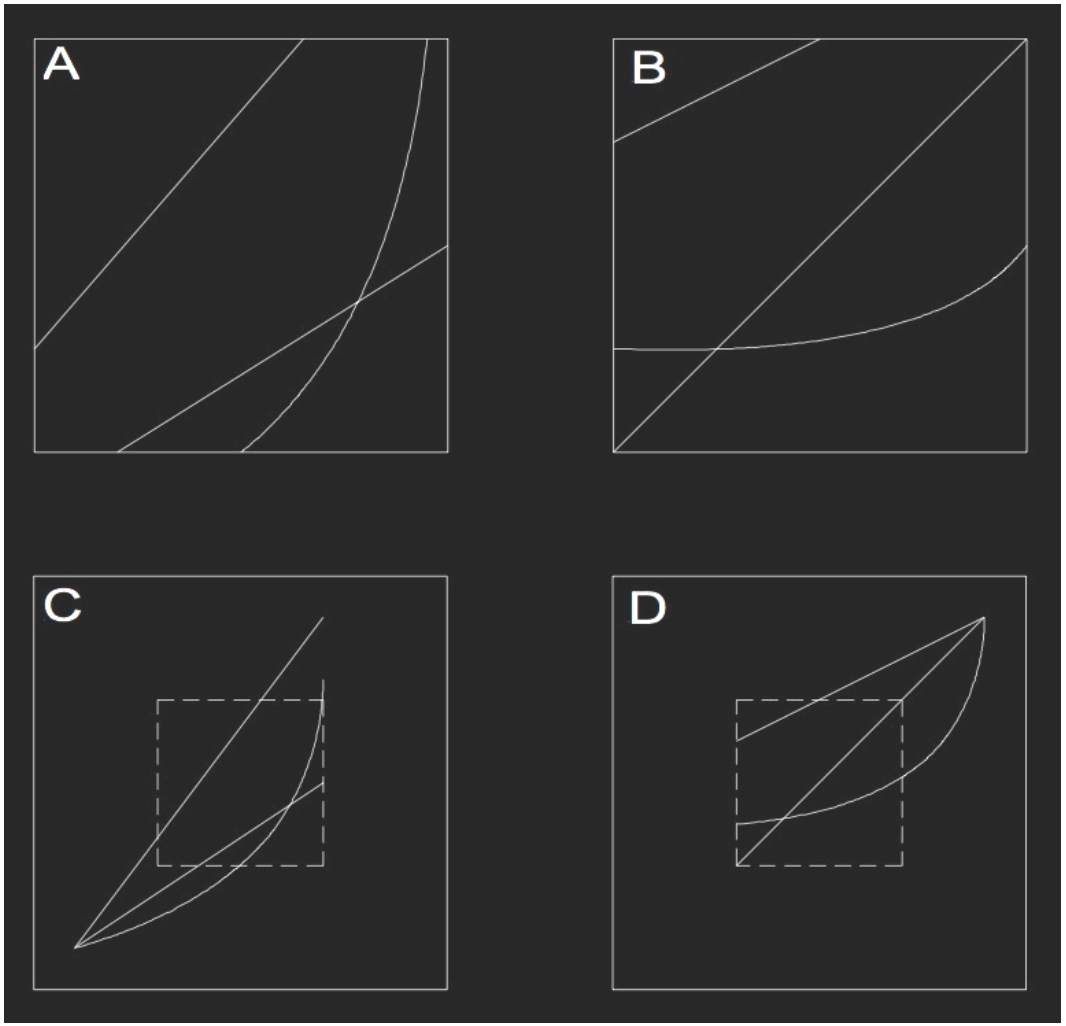


Demo

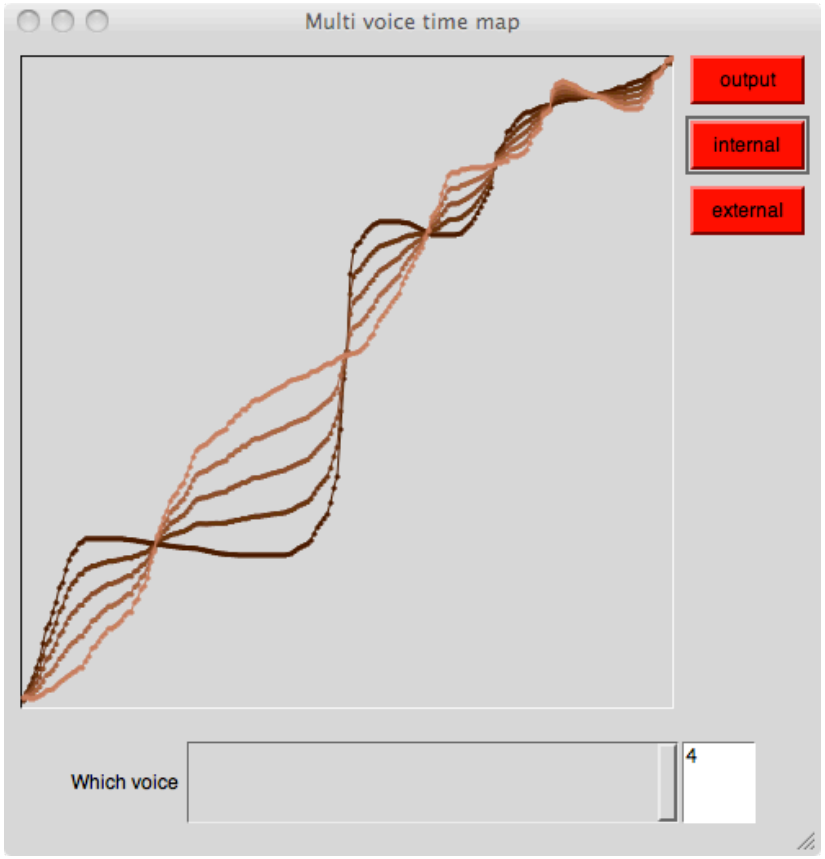
But…

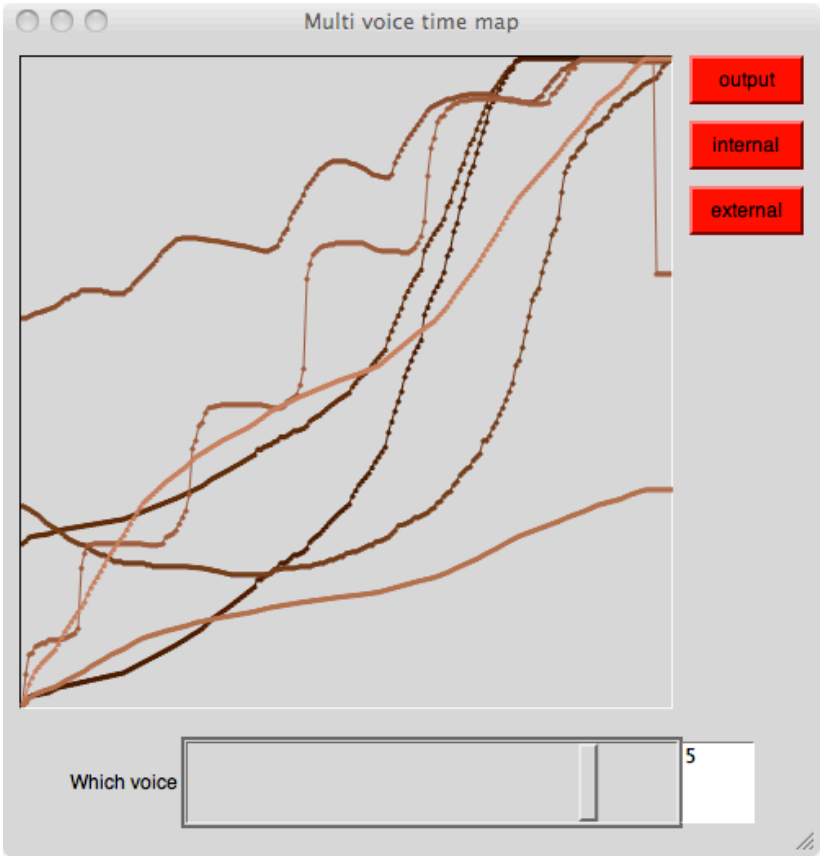
Would like visual feedback on convergence points, arbitrary voice overlap structure, more flexible timing curves

Time maps



Overlaying multiple voices on a shared time map





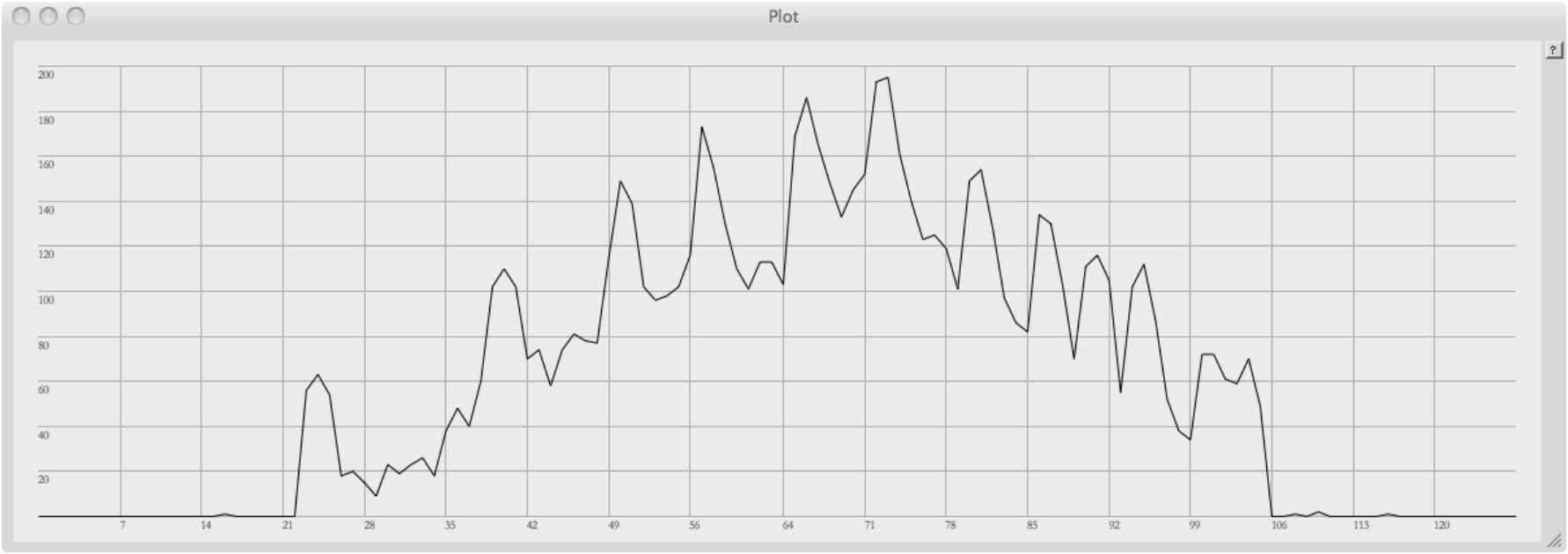
Demo

Canon melody line generation

- Originally used a custom recursive function
- Now, Markov models based on material from the Nancarrow studies

0th order Markov model

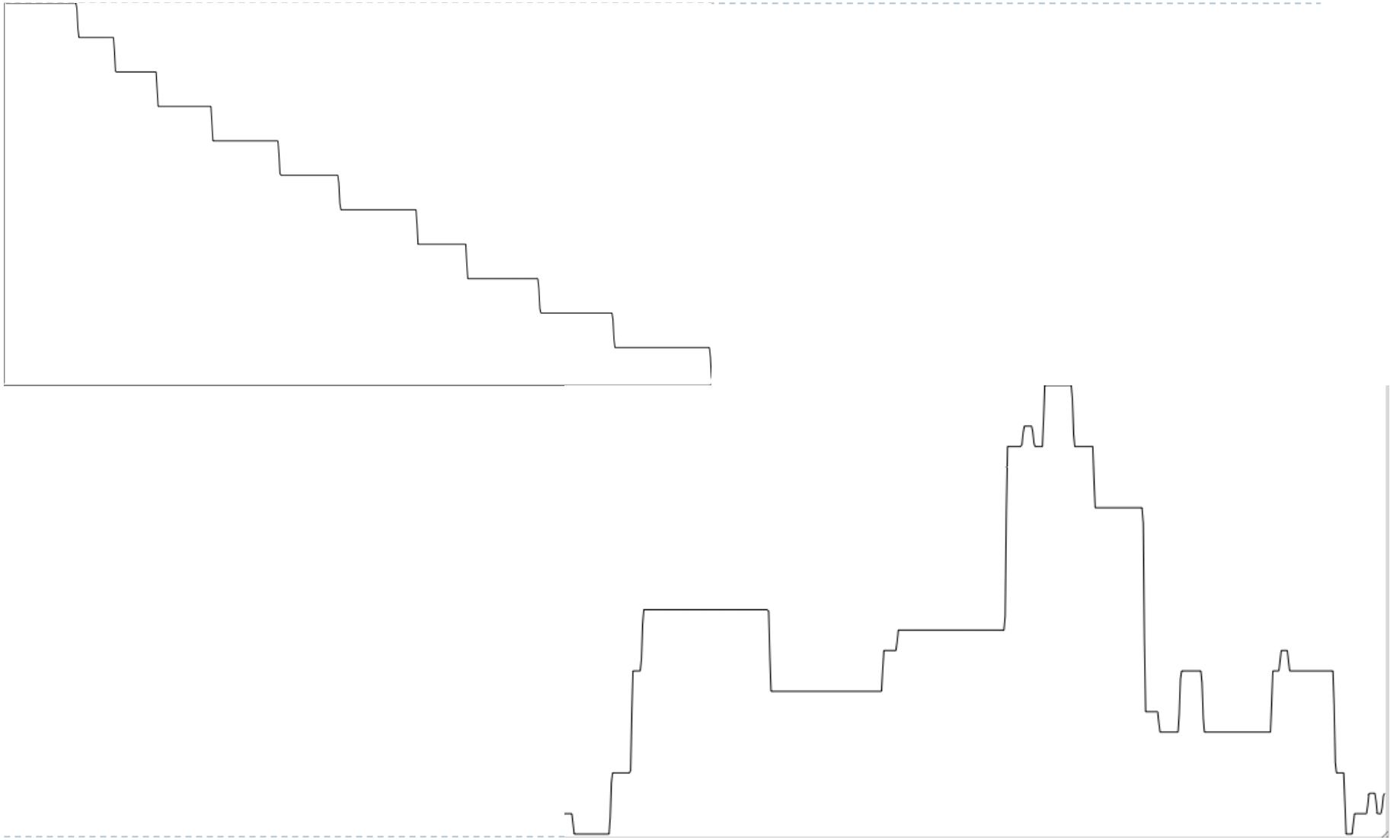
- Marginal distributions of pitch and IOIs (inter-onset-intervals)



Issue of stream separation

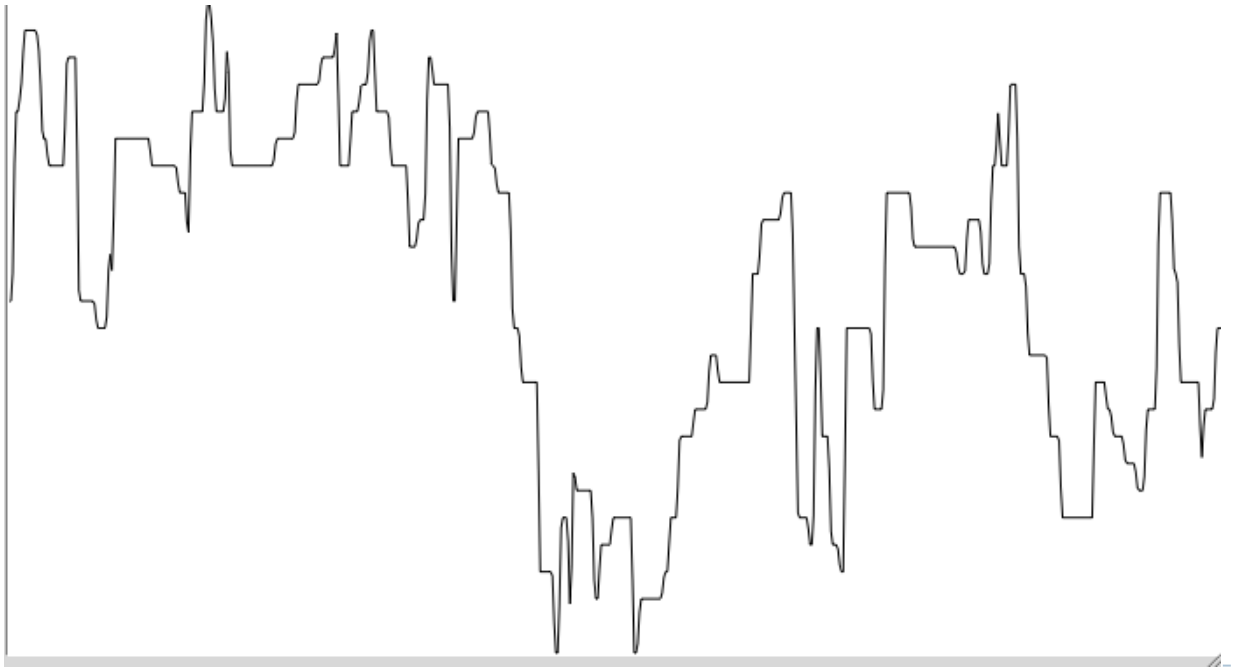
- More complicated modeling requires tracking distinct horizontal connections in the polyphonic texture (e.g., separating out canon voices)
- Built a simple multiagent algorithm to spot time and pitch proximity within certain fixed bounds
- No per-stream beat tracking model to follow metrical reference, but follows local duration fluctuations

Example: streams extracted from Study 37



Higher order model

- Variable order Markov Model (Prediction by Partial Match)
- Training input is all streamwise sequences in joint space of 230 (pitch interval, IOI) classes



Further ideas

- Recursive time maps; time map function composition
- Canon of canons; meta-canon where each voice is one tempo canon, and overall structural relations between each sub-canon follow pitch and time relationships akin to inter-voice relation
- Inter-voice interactions: each read of the canon line slightly adjusts it, simulate concurrency conflicts, shared state
- 3-D or higher dimension time maps; e.g., modulate between multiple melody sources on one dimension
- Score reading vibrato

Think you for lastening