Constrained Piano-Sonata-Like Music Composition Using MRF

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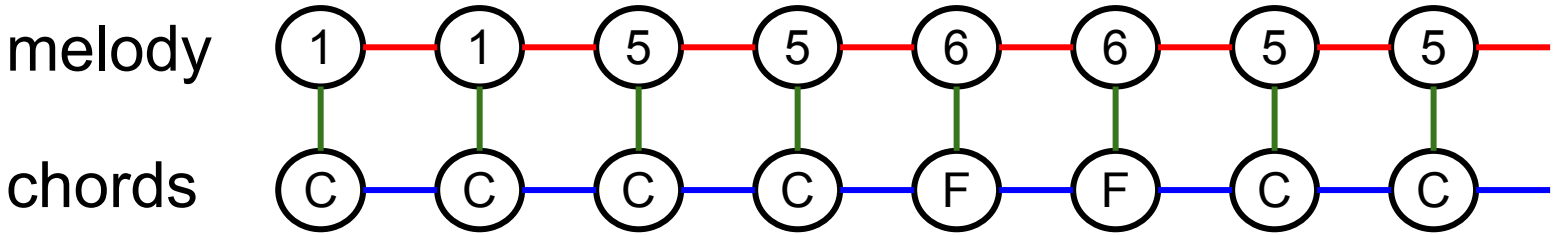
Goal: machine completes a musical period (樂段) given fixed notes (音符) and/or chords (和弦) at some beats (拍子).

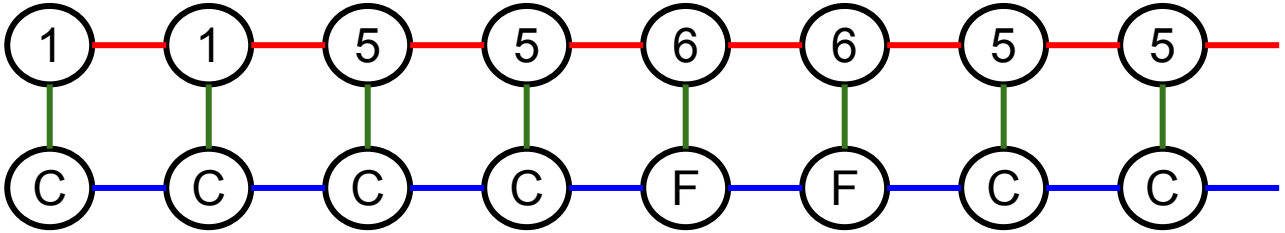
chords	C	G	F	G	F	Am	G	C
melody	| 1 1 |	5 5 |	6 6 |	5 5 |	4 4 |	3 3 |	2 2 |	1 - |

Represent the period using MRF:



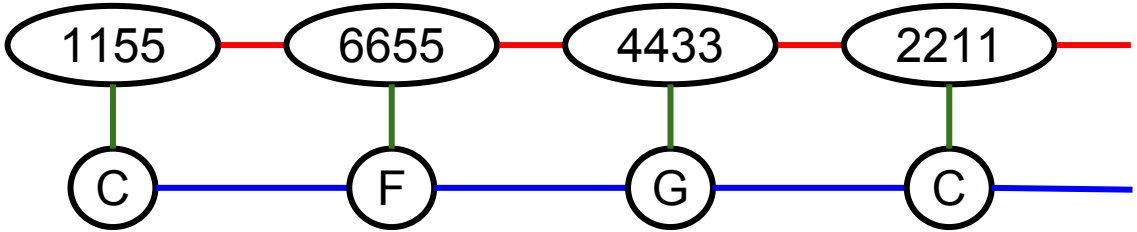
Transformed goal: to assign values (output) to variables in a 2-by-N grid MRF given some variables' values (input) fixed

Model



Problem: no correlation among non-neighboring notes

New model: groups of 4 notes are natural.

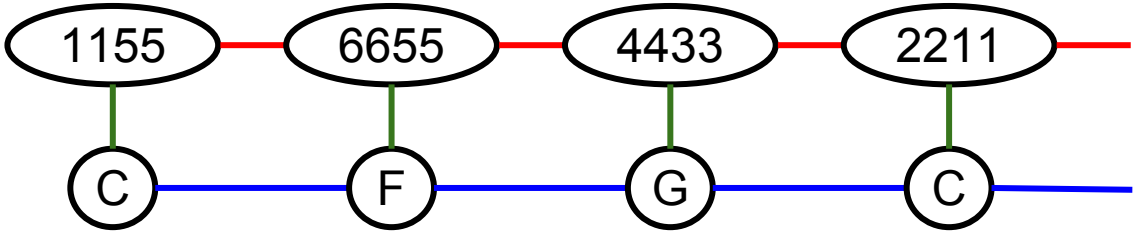


Problem: high complexity

Possible solutions:

- Extract features: first note, last note, shape, density.
- Factorize the potential function between notes.

Tasks



1. Convert music sheets to digital data.
    - Sourse: imslp.org/wiki/
2. Given data, determine the potential functions.
    - Notes to notes: to be determined
    - Notes to chord: neural network (input: notes, output: chord)
    - Chord to chord: fractional count
3. With some nodes filled, assign values to the rest.
    - Most probable assignment
    - Tractable

Issue: performance is evaluated by humans.

Data

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Target music: Piano sonata (奏鳴曲)

- Certain format
- Melodies and chords are easily extracted.

Required properties:

- Allegro (快板)
  - Note values (音長) do not vary widely.
- Ionian (Do Re Mi Fa Sol La Xi) and singular-key
  - #state of chord variables = 6. (I, IIm, IIIm, IV, V, VIm)
- Note values are based on power-of-2.
  - Notes can fit groups of 4.