



# Generative Grammars for Real-Time Composition

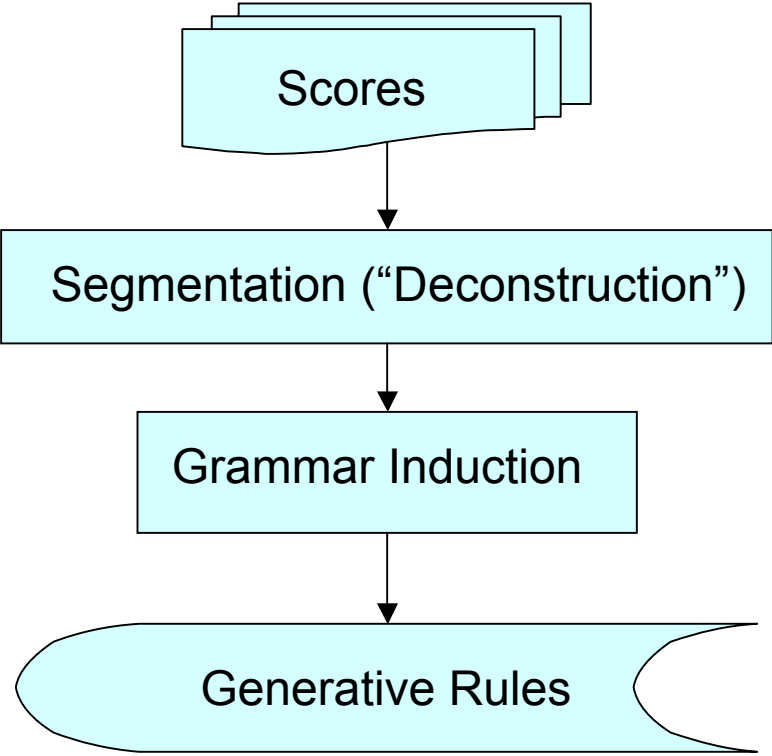
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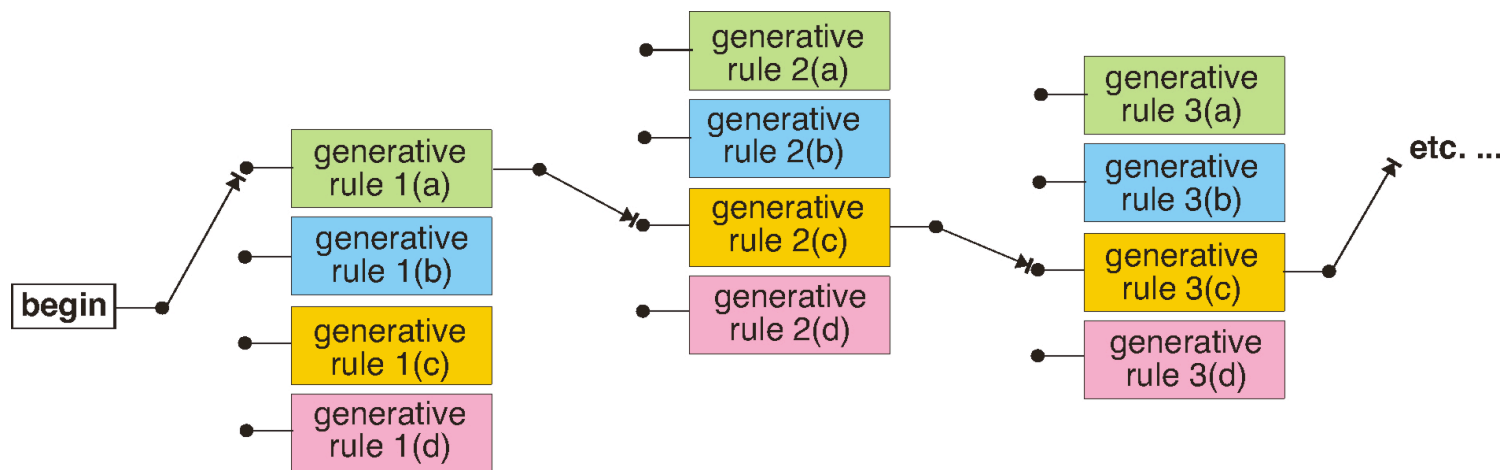
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The generative system composes sequences of short sections of music using the grammars. Each section is generated by a rule selected from  $n$  sets of grammatical rules, each corresponding to a different musical style.

The image displays a musical score for piano, consisting of three systems of music. Each system includes a treble and bass staff. The first system is labeled 'beethoven' and 'schumann'. The second system is labeled 'beethoven', 'schumann', and 'beethoven'. The third system is labeled 'schumann' and 'beethoven'. The music is written in common time (C) and features various rhythmic patterns and chordal structures.

beethoven schumann

beethoven schumann beethoven

schumann beethoven

## Synthesis: (re)combinatorial composition

Style-replication based on David Cope:

*The genius of great composers, I believe, lies not in inventing previously unimagined music but in their ability to effectively reorder and refine what already exists.*

On this assumption, that composing or improvising is just a re-ordering of existing material, we develop a simple improviser that transfers a part of the musical task to the computer.

# Combinatorial composition

- Can work on notes, chords, bars.
- Find an acceptable continuation of music.
- Uses harmony, melody, phrase structure.
- Possibly spectral information. (to be developed)

(see web page)

# Style blending

- Mixing slices: 'the patchwork opus'?
- Projection vs. simple mixing?

# Phrase structure + transitions

S => incip bar bar bar bar bar cadence2bar

incip => '((equal-slot 'composer eeg-composer)  
(equal-slot 'bartype 'incip))

bar=> '((equal-slot 'composer eeg-composer)  
(equal-slot 'pitchclass prev-pitchclass)  
(equal-slot 'type 'bar)  
(close-slot 'pitchleading prevpitchleading))

# Similarities & copies

Similarities:  $SS \rightarrow S S'$

$S' \rightarrow$  '(generate-pitch-class-abstract generated-S)

result:

$S ==$  '((incip (close-slot 'pitchclass '(0 5 8)))  
          (bar (close-slot 'pitchclass '(...)))  
          etc...)

Copies:  $SS \rightarrow Shc Sfc$

$Shc \rightarrow$  '(incip bar bar bar bar bar halfcad)

$Sfc \rightarrow$  '(copy-generated)

$S$  is now '((bar (equal-slot 'id 102)) (bar ....) [...] (full-cadence))

# One-dimensional control



Musical score for two pieces. The top system features a tempo marking of quarter note = 100. The first piece, by Schumann, is in 2/4 time and consists of a single melodic line in the treble clef. The second piece, by Tom Turpin, is in 2/4 time and consists of a single melodic line in the bass clef. Both pieces are in the key of D major.



Musical score for a piece by Scott Joplin. The score is in 2/4 time and consists of two staves: a treble clef staff and a bass clef staff. The piece is in the key of D major and features a complex, syncopated melody in the treble clef and a supporting bass line in the bass clef.

# Multi-dimensional control

System always orders possibilities to harmonic, melodic and rhythmic distance.

This ordering calculates euclidean distance from different axis; those axis can be weighted by input controls.

$$R = \sqrt{(w_1 * h)^2 + (w_2 * m)^2 + (w_3 * r)^2}$$

# Multi-dimensional control

The image displays a musical score for piano, divided into three distinct sections. The first section, labeled "Joplin", is in common time (C) and features a tempo marking of quarter note = 200. The second section, labeled "Turpin", continues in common time. The third section, labeled "Schumann", is also in common time. The score is written for piano with a grand staff (treble and bass clefs). The Joplin section shows a rhythmic pattern of chords in the right hand and single notes in the left hand. The Turpin section features a more complex texture with dense chords in the right hand and a melodic line in the left hand. The Schumann section is characterized by a flowing, arpeggiated texture in the right hand and a simple harmonic accompaniment in the left hand.