

Markov Decision in Tonal Music Generation

by

David Benoit & Brian Chiang

What is Tonal Music?

Tonal music is music that revolves around a note acting as a tonal center, or key. For example, a musical excerpt in the key of C major usually begins with a C major harmony (the notes C, E, and G played together). The piece will generally pass through many different harmonies, but will ultimately create a tension which wants to resolve to the tonal center; in this case, C major. As such, the excerpt will usually end on the tonal center.

How Does this Program Generate Tonal Music?

This program uses Markov Decision Processes to generate counterpoint, which is the relationship between the different voices in an excerpt. The user supplies the chord progression, and the program runs a value iteration process to approximate the best counterpoint. A positive state value represents a penalty score.

Best state path after 1000 value iterations:

State:

Progression: (i bVI iv ii-dim V i)

Value: 0

Voicing:

(D#/Eb 5 #<procedure:null-beat>)

(D#/Eb 5 #<procedure:null-beat>)

(G 4 #<procedure:null-beat>)

(C 3 #<procedure:null-beat>)

State:

Progression: (i bVI iv ii-dim V i)

Value: 4995

Voicing:

(D#/Eb 5 #<procedure:null-beat>)

(C 5 #<procedure:null-beat>)

(G#/Ab 3 #<procedure:null-beat>)

(G#/Ab 3 #<procedure:null-beat>)

State:

Progression: (i bVI iv ii-dim V i)

Value: 4990

Voicing:

(G#/Ab 5 #<procedure:null-beat>)

(G#/Ab 4 #<procedure:null-beat>)

(C 4 #<procedure:null-beat>)

(F 3 #<procedure:null-beat>)

State:

Progression: (i bVI iv ii-dim V i)

Value: 4990

Voicing:

(G#/Ab 4 #<procedure:null-beat>)

(F 3 #<procedure:null-beat>)

(D 3 #<procedure:null-beat>)

(F 2 #<procedure:null-beat>)

State:

Progression: (i bVI iv ii-dim V i)

Value: 4995

Voicing:

(B 4 #<procedure:null-beat>)

(G 4 #<procedure:null-beat>)

(D 4 #<procedure:null-beat>)

(B 3 #<procedure:null-beat>)

State:

Progression: (i bVI iv ii-dim V i)

Value: 0

Voicing:

(C 6 #<procedure:null-beat>)

(G 3 #<procedure:null-beat>)

(D#/Eb 3 #<procedure:null-beat>)

(C 3 #<procedure:null-beat>)