Raphael & Stoddard Model Parameters

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1 Introduction

This document contains the parameters of four instances of the Raphael & Stoddard model. The first two are trained on Haydn piano sonata data, first using the seven scale degree chords and then using additionally the dominant seventh chord.

The third and fourth are trained on jazz standard midi files, again without then with the dominant seventh chord.

2 Haydn

2.1 Emission Distribution

Beat category: 0 (1st beat)

$D = 0$	0.36288	(chord root)
$D = 1$	0.30916	(chord 3rd)
$D = 2$	0.22071	(chord 5th)
$D = 3$	0.09815	(other scale note)
$D = 4$	0.00910	(non-scale note)

Beat category: 1 (3rd beat)

$D = 0$	0.33418	(chord root)
$D = 1$	0.26080	(chord 3rd)
$D = 2$	0.19181	(chord 5th)
$D = 3$	0.19778	(other scale note)
$D = 4$	0.01542	(non-scale note)

Beat category: 2 (2nd or 4th beat)

$D = 0$	0.19641	(chord root)
$D = 1$	0.20286	(chord 3rd)
$D = 2$	0.16686	(chord 5th)
$D = 3$	0.39815	(other scale note)
$D = 4$	0.03573	(non-scale note)

Beat category: 3 (off beat)

$D = 0$	0.16615	(chord root)
$D = 1$	0.19531	(chord 3rd)
$D = 2$	0.21370	(chord 5th)
$D = 3$	0.38990	(other scale note)
$D = 4$	0.03493	(non-scale note)

2.2 Key Transition Distribution

Previous mode: major

Key	Mode	
I	major	0.90289
VI	minor	0.03788
IV	major	0.02226
V	major	0.01888
II	minor	0.00782
III	minor	0.00493
bIII	major	0.00212
bVI	major	0.00188
IV	minor	0.00134
bV	major	0.00000
V	minor	0.00000
VII	minor	0.00000
bIII	minor	0.00000
II	major	0.00000
I	minor	0.00000
bVII	major	0.00000
bII	minor	0.00000
VI	major	0.00000
bVII	minor	0.00000
bII	major	0.00000
bVI	minor	0.00000
III	major	0.00000
VII	major	0.00000
bV	minor	0.00000

Previous mode: minor

Key	Mode	
I	minor	0.60519
bVII	major	0.11517
IV	minor	0.09082
bVI	major	0.06541
V	minor	0.04536
VII	major	0.02285
bII	minor	0.01882
V	major	0.01565
IV	major	0.01429
I	major	0.00630
VI	major	0.00014
bIII	major	0.00000
bVII	minor	0.00000
III	minor	0.00000
VI	minor	0.00000
bV	major	0.00000
II	minor	0.00000
bII	major	0.00000
VII	minor	0.00000
III	major	0.00000
bVI	minor	0.00000
II	major	0.00000
bIII	minor	0.00000
bV	minor	0.00000

2.3   Chord Transition Distribution

Previous chord: I

I	0.62011
VII	0.12544
V	0.10546
IV	0.07790
II	0.04895
VI	0.02215
III	0.00000

Previous chord: II

V	0.46517
I	0.33481
VII	0.10516
II	0.09486
IV	0.00000
VI	0.00000
III	0.00000

Previous chord: III

III	0.83150
I	0.16850
V	0.00000
II	0.00000
IV	0.00000
VI	0.00000
VII	0.00000

Previous chord: IV

I	0.75704
IV	0.16027
VII	0.07765
II	0.00504
V	0.00000
VI	0.00000
III	0.00000

Previous chord: V

I	0.75206
V	0.11487
II	0.07120
VI	0.03663
VII	0.02525
III	0.00000
IV	0.00000

Previous chord: VI

II	0.56294
IV	0.43706
V	0.00000
VI	0.00000
I	0.00000
III	0.00000
VII	0.00000

Previous chord: VII

I	0.89949
II	0.05872
VII	0.04179
IV	0.00000
V	0.00000
VI	0.00000
III	0.00000

2.4   Key Change Chord Distribution

I	0.31154
V	0.23810
II	0.15392
VII	0.12090
III	0.11074
IV	0.06480
VI	0.00000
V7	0.00000

3 Haydn7

3.1 Emission Distribution

Beat category: 0 (1st beat)

D = 0	0.31118	(chord root)
D = 1	0.25836	(chord 3rd)
D = 2	0.31701	(chord 5th)
D = 3	0.10725	(other scale note)
D = 4	0.00620	(non-scale note)

Beat category: 1 (3rd beat)

D = 0	0.28398	(chord root)
D = 1	0.23825	(chord 3rd)
D = 2	0.31291	(chord 5th)
D = 3	0.15179	(other scale note)
D = 4	0.01307	(non-scale note)

Beat category: 2 (2nd or 4th beat)

D = 0	0.18115	(chord root)
D = 1	0.21385	(chord 3rd)
D = 2	0.25374	(chord 5th)
D = 3	0.31615	(other scale note)
D = 4	0.03512	(non-scale note)

Beat category: 3 (off beat)

D = 0	0.17280	(chord root)
D = 1	0.19209	(chord 3rd)
D = 2	0.26633	(chord 5th)
D = 3	0.33394	(other scale note)
D = 4	0.03484	(non-scale note)

3.2   Key Transition Distribution

Previous mode: major

Key	Mode	
I	major	0.86087
VI	minor	0.04679
IV	major	0.04430
V	major	0.03445
II	minor	0.00452
III	minor	0.00410
bVI	major	0.00195
IV	minor	0.00192
bIII	major	0.00109
bV	major	0.00000
bIII	minor	0.00000
bVII	minor	0.00000
bVII	major	0.00000
II	major	0.00000
I	minor	0.00000
V	minor	0.00000
VI	major	0.00000
VII	minor	0.00000
bII	major	0.00000
bV	minor	0.00000
bII	minor	0.00000
bVI	minor	0.00000
VII	major	0.00000
III	major	0.00000

Previous mode: minor

Key	Mode	
I	minor	0.57960
bVII	major	0.13833
IV	minor	0.09388
bVI	major	0.06118
V	minor	0.04034
VII	major	0.02240
bII	minor	0.01953
IV	major	0.01234
V	major	0.01076
bV	major	0.00515
VII	minor	0.00503
VI	major	0.00448
I	major	0.00394
bIII	major	0.00305
bVII	minor	0.00000
bIII	minor	0.00000
VI	minor	0.00000
III	minor	0.00000
II	minor	0.00000
bII	major	0.00000
bVI	minor	0.00000
II	major	0.00000
bV	minor	0.00000
III	major	0.00000

3.3 Chord Transition Distribution

Previous chord: I

V7	0.49156
I	0.48031
VI	0.02813
II	0.00000
IV	0.00000
III	0.00000
V	0.00000
VII	0.00000

Previous chord: II

V7	1.00000
I	0.00000
VII	0.00000
V	0.00000
II	0.00000
III	0.00000
VI	0.00000
IV	0.00000

Previous chord: III

VI	0.24924
V7	0.14022
I	0.11769
IV	0.10259
II	0.09971
III	0.09855
VII	0.09667
V	0.09534

Previous chord: IV

IV	0.93422
I	0.06578
V7	0.00000
VI	0.00000
II	0.00000
III	0.00000
VII	0.00000
V	0.00000

Previous chord: V

II	0.15344
V7	0.13449
I	0.13001
VI	0.12808
IV	0.11405
III	0.11376
VII	0.11339
V	0.11278

Previous chord: VI

II	0.40396
VI	0.33302
V7	0.20420
IV	0.05882
I	0.00000
III	0.00000
V	0.00000
VII	0.00000

Previous chord: VII

II	0.14990
V7	0.13703
VII	0.12910
I	0.11992
V	0.11888
III	0.11633
VI	0.11538
IV	0.11345

Previous chord: V7

I	0.69149
V7	0.27584
VI	0.01796
II	0.01472
IV	0.00000
V	0.00000
III	0.00000
VII	0.00000

3.4   Key Change Chord Distribution

V7	0.66285
I	0.31445
IV	0.01791
VI	0.00337
II	0.00142
III	0.00000
V	0.00000
VII	0.00000

4 Jazz

4.1 Emission Distribution

Beat category: 0 (1st beat)

D = 0	0.31311	(chord root)
D = 1	0.19380	(chord 3rd)
D = 2	0.20926	(chord 5th)
D = 3	0.25480	(other scale note)
D = 4	0.02903	(non-scale note)

Beat category: 1 (3rd beat)

D = 0	0.28452	(chord root)
D = 1	0.16902	(chord 3rd)
D = 2	0.32592	(chord 5th)
D = 3	0.17221	(other scale note)
D = 4	0.04832	(non-scale note)

Beat category: 2 (2nd or 4th beat)

D = 0	0.20450	(chord root)
D = 1	0.21512	(chord 3rd)
D = 2	0.19698	(chord 5th)
D = 3	0.31851	(other scale note)
D = 4	0.06489	(non-scale note)

Beat category: 3 (off beat)

D = 0	0.17350	(chord root)
D = 1	0.18209	(chord 3rd)
D = 2	0.16609	(chord 5th)
D = 3	0.38402	(other scale note)
D = 4	0.09430	(non-scale note)

4.2 Key Transition Distribution

Previous mode: major

Key	Mode	
I	major	0.79638
III	minor	0.05193
bVII	major	0.03815
VI	minor	0.03044
IV	major	0.01865
II	minor	0.01714
III	major	0.01509
VII	minor	0.00973
V	major	0.00814
II	major	0.00567
VII	major	0.00530
V	minor	0.00166
bVI	major	0.00093
bII	major	0.00077
I	minor	0.00000
bV	minor	0.00000
bIII	major	0.00000
IV	minor	0.00000
VI	major	0.00000
bVI	minor	0.00000
bV	major	0.00000
bVII	minor	0.00000
bII	minor	0.00000
bIII	minor	0.00000

Previous mode: minor

Key	Mode	
I	minor	0.43470
bVII	major	0.18771
bVI	major	0.16887
IV	minor	0.07069
bIII	major	0.05819
bII	major	0.02680
V	minor	0.01699
bVII	minor	0.01290
I	major	0.00950
V	major	0.00623
bV	major	0.00401
VI	major	0.00241
VI	minor	0.00073
IV	major	0.00026
II	minor	0.00000
VII	major	0.00000
III	minor	0.00000
II	major	0.00000
bIII	minor	0.00000
bVI	minor	0.00000
bV	minor	0.00000
bII	minor	0.00000
III	major	0.00000
VII	minor	0.00000

4.3 Chord Transition Distribution

Previous chord: I

I	0.67497
II	0.15471
IV	0.09925
VII	0.06820
III	0.00271
VI	0.00016
V	0.00000

Previous chord: II

V	0.60142
II	0.30060
III	0.08519
IV	0.01277
VII	0.00001
VI	0.00001
I	0.00000

Previous chord: III

I	0.42999
III	0.38528
IV	0.11913
V	0.05809
VI	0.00748
VII	0.00004
II	0.00000

Previous chord: IV

VII	0.45148
IV	0.37075
III	0.11032
VI	0.05172
V	0.01571
II	0.00001
I	0.00000

Previous chord: V

I	0.67940
V	0.31406
IV	0.00412
III	0.00235
II	0.00004
VI	0.00002
VII	0.00001

Previous chord: VI

VI	0.84814
I	0.07380
IV	0.06911
V	0.00896
III	0.00000
VII	0.00000
II	0.00000

Previous chord: VII

VII	0.42720
VI	0.32106
III	0.17603
V	0.04105
IV	0.02465
I	0.01000
II	0.00002

4.4 Key Change Chord Distribution

II	0.45648
V	0.15977
VII	0.15874
IV	0.11401
III	0.08431
VI	0.02565
I	0.00104
V7	0.00000

5   Jazz7

5.1   Emission Distribution

Beat category: 0 (1st beat)

D = 0	0.24477	(chord root)
D = 1	0.17444	(chord 3rd)
D = 2	0.34011	(chord 5th)
D = 3	0.21422	(other scale note)
D = 4	0.02646	(non-scale note)

Beat category: 1 (3rd beat)

D = 0	0.21089	(chord root)
D = 1	0.17186	(chord 3rd)
D = 2	0.42392	(chord 5th)
D = 3	0.15126	(other scale note)
D = 4	0.04206	(non-scale note)

Beat category: 2 (2nd or 4th beat)

D = 0	0.18776	(chord root)
D = 1	0.17931	(chord 3rd)
D = 2	0.32419	(chord 5th)
D = 3	0.24131	(other scale note)
D = 4	0.06742	(non-scale note)

Beat category: 3 (off beat)

D = 0	0.16012	(chord root)
D = 1	0.15062	(chord 3rd)
D = 2	0.29032	(chord 5th)
D = 3	0.30290	(other scale note)
D = 4	0.09604	(non-scale note)

5.2   Key Transition Distribution

Previous mode: major

Key	Mode	
I	major	0.61598
IV	major	0.09283
V	major	0.06531
VI	minor	0.05730
bVII	major	0.03635
III	minor	0.03542
VII	minor	0.02061
II	major	0.01818
II	minor	0.01571
III	major	0.01374
V	minor	0.00993
bIII	major	0.00648
VII	major	0.00504
VI	major	0.00378
I	minor	0.00210
bVI	major	0.00120
bV	major	0.00004
bII	minor	0.00000
bIII	minor	0.00000
bVI	minor	0.00000
IV	minor	0.00000
bV	minor	0.00000
bII	major	0.00000
bVII	minor	0.00000

Previous mode: minor

Key	Mode	
I	minor	0.25805
bVII	major	0.16788
bVI	major	0.13757
bIII	major	0.11919
IV	minor	0.09637
IV	major	0.06071
bII	major	0.05670
V	minor	0.05100
bV	major	0.01944
VI	minor	0.01650
I	major	0.00819
VI	major	0.00364
V	major	0.00214
VII	major	0.00174
bIII	minor	0.00089
II	minor	0.00000
III	minor	0.00000
bVII	minor	0.00000
bVI	minor	0.00000
II	major	0.00000
bV	minor	0.00000
bII	minor	0.00000
VII	minor	0.00000
III	major	0.00000

5.3   Chord Transition Distribution

Previous chord: I

I	0.63405
V7	0.19716
IV	0.12295
II	0.04584
VI	0.00000
III	0.00000
V	0.00000
VII	0.00000

Previous chord: II

V7	0.97962
II	0.02038
III	0.00000
I	0.00000
IV	0.00000
VI	0.00000
V	0.00000
VII	0.00000

Previous chord: III

I	0.74403
III	0.21502
VI	0.04073
IV	0.00022
V7	0.00000
V	0.00000
II	0.00000
VII	0.00000

Previous chord: IV

V7	0.77870
IV	0.20370
III	0.01760
II	0.00000
VI	0.00000
I	0.00000
V	0.00000
VII	0.00000

Previous chord: V

I	0.13478
III	0.13158
V7	0.12984
VI	0.12586
IV	0.12190
V	0.12160
II	0.12042
VII	0.11403

Previous chord: VI

VI	0.78257
IV	0.15660
I	0.06083
V7	0.00000
II	0.00000
III	0.00000
V	0.00000
VII	0.00000

Previous chord: VII

VI	0.12970
V7	0.12778
II	0.12594
IV	0.12586
III	0.12522
I	0.12373
V	0.12119
VII	0.12057

Previous chord: V7

V7	0.74865
I	0.12436
VI	0.06111
IV	0.03386
III	0.03201
II	0.00000
V	0.00000
VII	0.00000

5.4 Key Change Chord Distribution

V7	0.95529
VI	0.03330
IV	0.00989
III	0.00151
II	0.00000
I	0.00000
V	0.00000
VII	0.00000