The Kite Tuning

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Section 1 – About the Kite Tuning

The Kite Tuning is actually a fretting, with two obvious tunings, and others possible. The fretting is every other step of 41-edo (equal division of the octave into 41 steps), i.e. 41-ED4 or "20½-edo". However, the interval between two adjacent open strings is always an odd number of 41-edosteps. Thus each string only covers half of 41-edo, but the full edo can be found on every pair of adjacent strings.

The two versions of the Kite Tuning differ only in the open string interval. The major version has 13\41, about 5/4, and the minor version has 11\41, about 6/5. Both versions have the four 3rds with the lowest odd limit (7/6, 6/5, 5/4 and 9/7) conveniently located one string higher than the chord root, and at most only two frets away from it. The 5th is conveniently located two strings higher than the root, one fret either above or below it. Low-odd-limit 6ths and 7ths are also easily accessible. Thus a huge variety of low-odd-limit nearly-just chords are extremely easy to play. The Kite Tuning combines most of the freedom of edos with most of the accuracy of just intonation.

The general concept of using only a subset of the frets of a large edo, with the full edo represented by multiple strings, takes two forms. In the first form, the partial edo that can be played on a single string is itself an edo, and the guitar has a fret at the octave. This form is widely known and used. For example, 24-edo can be played on a standard 12-edo guitar by detuning every other string by 50¢.

The second form, in which the guitar doesn't have a fret at the octave, is less well known. It has been explored deeply by Matthew Autry of Olympia, Washington. His work with ED4, ED8, ED16 etc. non-octave frettings directly inspired the Kite Tuning. Matthew's frettings tend to omit more than half the frets. Here are the guitars he has built and played:

Figure 1.1 – Matthew Autry's guitars

edo	possible intervals between adjacent open strings		
53-edo ÷ 3 = 17⅔	14\53 ≈ 6/5	17\53 ≈ 5/4	
65-edo ÷ 2 = 32½	17\65 ≈ 6/5	21\65 ≈ 5/4	
65-edo ÷ 5 = 13	11\65 ≈ 9/8	16\65 ≈ 32/27	21\65 ≈ 5/4
72-edo ÷ 3 = 24	11\72 ≈ 10/9	14\72 ≈ 8/7	23\72 ≈ 5/4
87-edo ÷ 3 = 29	13\87 ≈ 10/9	28\87 ≈ 5/4	
118-edo ÷ 4 = 29½	29\118 ≈ 32/27		
130-edo ÷ 5 = 26	22\130 ≈ 9/8	32\130 ≈ 32/27	42\130 ≈ 5/4
130-edo ÷ 4 = 32½	21\130 ≈ 19/17	25\130 ≈ 8/7	29\130 ≈ 7/6

Section 2 – About 41-edo

Dividing the octave into 41 equal steps approximates just intonation very closely. One edostep is 29.27¢, thus the maximum possible error is ~15¢, and the average error is ~7½¢. But most primes are much better than average:

Figure 2.1 – 41-edo's error from Just Intonation for primes 2-19

prime	2/1	3/2	5/4	7/4	11/8	13/8	17/16	19/16
error	0.0¢	+0.48¢	-5.8¢	-3.0¢	+4.8¢	+8.3¢	+12.1¢	-4.8¢
name	P8	P5	vM3	vm7	^^4	~6	^m2	m3

Prime 3 is extremely accurate, and primes 5 and 7 are both flat, which means their errors partially cancel out in ratios such as 7/5. Unfortunately prime 11 is sharp, so ratios such as 11/10 are near the maximum error.

41-edo can be notated with ups and downs notation. The enharmonics are d^{6}5 and ^d2, thus C$^{\sharp6}$ = G and C^ = B♯.

Figure 2.2 – 41-edo notes, with ups and downs names, and nearby ratios, with color names

step	cents	name	ratio(s)	
0	0¢	P1	1/1	w1
1	29¢	^1, vvm2	various commas	
2	59¢	^^1, vm2	28/27	z2
3	88¢	vA1, m2	21/20	zg2
4	117¢	A1, ^m2	16/15, 15/14	g2, ry1
5	146¢	~2	12/11	1o2
6	176¢	vM2	11/10, 10/9	1og2, y2
7	205¢	M2	9/8	w2
8	234¢	^M2	8/7	r2
9	263¢	^vm3	7/6	z3
10	293¢	m3	19/16	19o3
11	322¢	^m3	6/5	g3
12	351¢	~3	11/9	1o3
13	380¢	vM3	5/4	y3
14	410¢	M3	14/11	1uz4
15	439¢	^M3	9/7	r3
16	468¢	v4	21/16	z4
17	498¢	P4	4/3	w4
18	527¢	^4	27/20	g4
19	556¢	^^4	11/8	1o4
20	585¢	vA4, d5	45/32, 7/5	y4, zg5

step	cents	name	ratio(s)	
41	1200¢	P8	2/1	w8
40	1171¢	v8	various intervals	
39	1141¢	^M7	27/14	r7
38	1112¢	M7	19/10	19og8
37	1083¢	vM7	15/8, 28/15	y7, zg8
36	1054¢	~7	11/6	1o7
35	1024¢	^m7	9/5, 20/11	g7, 1uy7
34	995¢	m7	16/9	w7
33	966¢	vm7	7/4	z7
32	937¢	^M6	12/7	r6
31	907¢	M6	27/16	w6
30	878¢	vM6	5/3	y6
29	849¢	~6	13/8	3o6
28	820¢	^m6	8/5	g6
27	790¢	m6	11/7	1or5
26	761¢	vm6	14/9	z6
25	732¢	^5	32/21	r5
24	702¢	P5	3/2	w5
23	673¢	v5	40/27	y5
22	644¢	vv5	13/9	3u5
21	615¢	A4, ^d5	10/7, 64/45	ry4, g5

The next chart is for accurately tuning 41-edo intervals using an electronic tuner, useful for checking the location of temporary cable-tie frets. The left-hand side translates the tuner's calibration frequency into a cents offset. The righthand side shows all 41-edo notes. The last two columns show how to calibrate the tuner, and how many cents offcenter to tune. For example, note #4 is an ^m2 of 117¢. Tune the note to about a semitone above note #0. Then set the tuner to 444hz, and tune the note just 1¢ sharp.

TUNER	hertz	cents	**41-EDO**				
	420	-80.5¢	0	P1	0¢	440	0¢
	421	-76.4¢	1	^1	29¢	448	-2¢
	422	-72.3¢	2	vm2	59¢	430	-2¢
	423	-68.2¢	3	m2	88¢	437	0¢
	424	-64.1¢	4	^m2	117¢	444	1¢
	425	-60.0¢	5	~2	146¢	452	0¢
	426	-56.0¢	6	vM2	176¢	434	-1¢
	427	-51.9¢	7	M2	205¢	441	1¢
	428	-47.9¢	8	^M2	234¢	449	-1¢
	429	-43.8¢	9	vm3	263¢	431	-1¢
	430	-39.8¢	10	m3	293¢	438	1¢
	431	-35.8¢	11	^m3	322¢	446	-1¢
	432	-31.8¢	12	~3	351¢	428	-1¢
	433	-27.8¢	13	vM3	380¢	435	0¢
	434	-23.8¢	14	M3	410¢	442	2¢
	435	-19.8¢	15	^M3	439¢	450	0¢
	436	-15.8¢	16	v4	468¢	432	0¢
	437	-11.8¢	17	P4	498¢	439	2¢
	438	-7.9¢	18	^4	527¢	447	0¢
	439	-3.9¢	19	~4	556¢	429	0¢
	440	**0.0¢**	20	d5	585¢	436	1¢
	441	3.9¢	21	A4	615¢	444	-1¢
	442	7.9¢	22	~5	644¢	451	1¢
	443	11.8¢	23	v5	673¢	433	1¢
	444	15.7¢	24	P5	702¢	441	-1¢
	445	19.6¢	25	^5	732¢	448	1¢
	446	23.4¢	26	vm6	761¢	430	1¢
	447	27.3¢	27	m6	790¢	438	-2¢
	448	31.2¢	28	^m6	820¢	445	0¢
	449	35.1¢	29	~6	849¢	453	-2¢
	450	38.9¢	30	vM6	878¢	434	2¢
	451	42.7¢	31	M6	907¢	442	-1¢
	452	46.6¢	32	^M6	937¢	449	2¢
	453	50.4¢	33	vm7	966¢	431	2¢
	454	54.2¢	34	m7	995¢	439	-1¢
	455	58.0¢	35	^m7	1024¢	446	1¢
	456	61.8¢	36	~7	1054¢	428	2¢
	457	65.6¢	37	vM7	1083¢	436	-1¢
	458	69.4¢	38	M7	1112¢	443	0¢
	459	73.2¢	39	^M7	1141¢	451	-1¢
	460	77.0¢	40	v8	1171¢	433	-2¢
			41	P8	1200¢	440	0¢

Section 3 – Fretboard Diagrams

Both versions of the Kite Tuning decrease the range of the guitar (the interval from the lowest open string to the highest) from the usual two octaves. The major tuning reduces it to a P12, and the minor tuning reduces it to a M10. Furthermore, because a given note only appears on every other string, the effective range is further reduced. Thus a guitar with 7 or 8 strings is recommended. For the major version, this gives a range of an octave plus either a vM7 or a vm10. For a minor version, the range is an octave plus either an ^5 or a ~7.

Each version has advantages and disadvantages:

1. The minor version has extremely compact shapes for many common triads and tetrads, spanning only two frets. Most tetrads in the major version span at least four frets. (See section 4.)
2. The major version has 8ves, 10ths, 12ths, etc. within easy reach, the minor version doesn't. For example, ^^11 ≈ 11/4 is 4 strings above the chord root. The major version has it 4 frets above the root, but the minor version has it a hard-to-reach 8 frets above. This somewhat negates the previous point.
3. The minor version has the m2, ~2 and M2 more accessible than the major version, which is perhaps better for playing melodies.
4. The major version has no P5 above the lowest two open strings. (However, there is a P12 five strings above.) The other open string notes do have a P5 above them, but it's two strings down and way up on the 24th fret. The minor version always has an accessible P5 above any note (unless it's on one of the upper two strings).

Even with the minor tuning, there is no vm3 above open strings. Therefore a chord that has its root on an open string may have limited voicings. Better to place the root a few frets up. This is another good reason to have 8 strings – the low string can be an ^D or a vD, so an E chord can have its root voiced as a low E and its 5th voiced as a low B.

Neither version allows you to easily play a triad with a neutral 3rd, or a tetrad with a neutral 7th. Both versions make playing melodies with jumps of 2 or 4 edosteps (1 or 2 frets) very easy, but jumps of 3 or 5 edosteps (1½ or 2½ frets) are awkward. Analogous to the harmonica, the layout of the instrument influences your decisions about what to play.

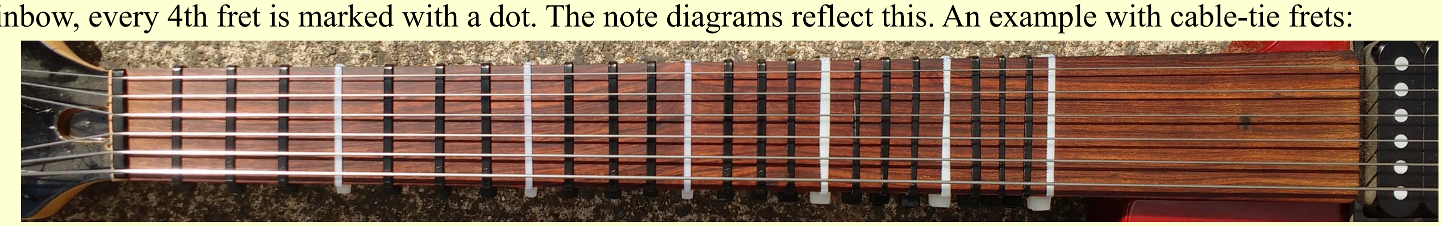
Other versions using other open string intervals are possible. Alternating vM3s and ^m3s has the disadvantage that chord shapes change depending on which string the root is on. Using a wider interval such as ^M3 or even P4 makes the M2 less accessible, and makes dissonant intervals like the ^5 and the v5 more accessible. Using a narrower interval makes the octave, 10ths, 12ths, etc. very inaccessible (although possibly more accessible 5 strings up).

With either version, the guitar can be tuned by ear using unisons, 4ths, 5ths and octaves. Unlike 12-edo, the 4ths and 5ths are so accurate that tuning errors won't accumulate much. The next table shows perfect intervals besides the obvious ones a few frets away. In the major version, a unison with an open string is on the 13th fret, 2 strings lower.

major version	unison =13th fret, down 2 strings	4th = 15th fret, down 1 string	8ve = 14th fret, up 1 string
minor version	unison = 11th fret, down 2 strings	4th = 14th fret, down 1 string	8ve = 15th fret, up 1 string

41-edo has seven varieties of 2nds, 3rds, 6th and 7ths. Omitting every other note makes a 4-band rainbow, shown in the interval diagrams with colors inspired by color notation. The three omitted notes appear on the edges of the diagram, and run minor – neutral – major. The major and minor notes are white, and the neutral notes are purple. Often but not always, the rainbow notes are lower odd limit than the purple or white notes. Gray notes are dissonant intervals only one edostep away from the 4th, 5th or 8ve. (Although sometimes the ^11 or v11 can sound consonant.)

A guitar fretboard usually has dots at the m3, P4, P5, M6 and P8. However, the Kite Tuning has no frets at the P4, M6 or P8. The P5 is marked with a dot at the 12th fret. To make the markings symmetrical, and to indicate the 4-band rainbow, every 4th fret is marked with a dot. The note diagrams reflect this. An example with cable-tie frets:



The Kite Tuning – major version

6	5	4	3	2	1	**0**	1	2	3	4	5	6	7	8	9	10
	m13 790¢ 22/7	~13 849¢ 13/4	M13 907¢ 27/8	Wvm7 966¢ 7/2	W^m7 1024¢ 18/5	WvM7 1083¢ 15/4	W^M7 1141¢ 27/7	**WP8 1200¢ 4/1**	Wvm9 1259¢ 33/8	W^m9 117¢ 30/7	WvM9 176¢ 22/5	W^M9 234¢ 32/7	Wm10 293¢ 19/4	W~10 351¢ 44/9	WM10 410¢ 56/11	Wv11 468¢ 21/4
		v11 468¢ 21/8	^11 527¢ 27/10	d12 585¢ 14/5	vv12 644¢ 26/9	**P12 702¢ 3/1**	vm13 761¢ 28/9	^m13 820¢ 16/5	vM13 878¢ 10/3	^M13 937¢ 24/7	Wm7 995¢ 32/9	W~7 1054¢ 11/3	WM7 1112¢ 19/5	Wv8 1171¢	W^8 1229¢	
v8 1171¢	^8 1229¢	m9 1288¢ 21/10	~9 146¢ 24/11	M9 205¢ 9/4	vm10 263¢ 7/3	^m10 322¢ 12/5	vM10 380¢ 5/2	^M10 439¢ 18/7	**P11 498¢ 8/3**	^^11 556¢ 11/4	A11 615¢ 20/7	v12 673¢	^12 732¢	m13 790¢ 22/7	~13 849¢ 13/4	M13 907¢ 27/8
m6 790¢ 11/7	~6 849¢ 13/8	M6 907¢ 27/16	vm7 966¢ 7/4	^m7 1024¢ 9/5	vM7 1083¢ 15/8	^M7 1141¢ 27/14	**P8 1200¢ 2/1**	vm9 1259¢ 33/16	^m9 117¢ 15/7	vM9 176¢ 11/5	^M9 234¢ 16/7	m10 293¢ 19/8	~10 351¢ 22/9	M10 410¢ 28/11	v11 468¢ 21/8	^11 527¢ 27/10
	v4 468¢	^4 527¢	d5 585¢ 7/5	vv5 644¢ 13/9	**P5 702¢ 3/2**	vm6 761¢ 14/9	^m6 820¢ 8/5	vM6 878¢ 5/3	^M6 937¢ 12/7	m7 995¢ 16/9	~7 1054¢ 11/6	M7 1112¢ 19/10	v8 1171¢	^8 1229¢		
^1 29¢	m2 88¢ 21/20	~2 146¢ 12/11	M2 205¢ 9/8	vm3 263¢ 7/6	^m3 322¢ 6/5	vM3 380¢ 5/4	^M3 439¢ 9/7	**P4 498¢ 4/3**	^^4 556¢ 11/8	A4 615¢ 10/7	v5 673¢	^5 732¢	m6 790¢ 11/7	~6 849¢ 13/8	M6 907¢ 27/16	
~6 849¢ 9/11	M6 907¢ 27/32	vm7 966¢ 7/8	^m7 1024¢ 9/10	vM7 1083¢ 15/16	^M7 1141¢ 27/28	**P1 0¢ 1/1**	vm2 59¢ 28/27	^m2 117¢ 16/15	vM2 176¢ 10/9	^M2 234¢ 8/7	m3 293¢ 19/16	~3 351¢ 11/9	M3 410¢ 14/11	v4 468¢	^4 527¢	

← towards the nut

towards the bridge →

The Kite Tuning – major version

open strings	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
^^E vF	^F	vF♯ G♭	^F♯ vvG	G	^^G vA♭	G♯ ^A♭	vA	^A	vA♯ B♭	vvB	B	^^B vC	^C	vC♯ D♭	^C♯ vvD	D	^^D vE♭	D♯ ^E♭	vE	^E	F	^^F vG♭	F♯ ^G♭	vG
vC♯ D♭	^C♯ vvD	D	^^D vE♭	D♯ ^E♭	vE	^E	F	^^F vG♭	F♯ ^G♭	vG	^G	vG♯ A♭	^G♯ vvA	A	^^A vB♭	A♯ ^B♭	vB	^B vvC	C	^^C vD♭	C♯ ^D♭	vD	^D	vD♯ E♭
A	^^A vB♭	A♯ ^B♭	vB	^B vvC	C	^^C vD♭	C♯ ^D♭	vD	^D	vD♯ E♭	^D♯ vvE	E	^^E vF	^F	vF♯ G♭	^F♯ vvG	G	^^G vA♭	G♯ ^A♭	vA	^A	vA♯ B♭	vvB	B
^F	vF♯ G♭	^F♯ vvG	G	^^G vA♭	G♯ ^A♭	vA	^A	vA♯ B♭	vvB	B	^^B vC	^C	vC♯ D♭	^C♯ vvD	D	^^D vE♭	D♯ ^E♭	vE	^E	F	^^F vG♭	F♯ ^G♭	vG	^G
^C♯ vvD	D	^^D vE♭	D♯ ^E♭	vE	^E	F	^^F vG♭	F♯ ^G♭	vG	^G	vG♯ A♭	^G♯ vvA	A	^^A vB♭	A♯ ^B♭	vB	^B vvC	C	^^C vD♭	C♯ ^D♭	vD	^D	vD♯ E♭	^D♯ vvE
^^A vB♭	A♯ ^B♭	vB	^B vvC	C	^^C vD♭	C♯ ^D♭	vD	^D	vD♯ E♭	^D♯ vvE	E	^^E vF	^F	vF♯ G♭	^F♯ vvG	G	^^G vA♭	G♯ ^A♭	vA	^A	vA♯ B♭	vvB	B	^^B vC
vF♯ G♭	^F♯ vvG	G	^^G vA♭	G♯ ^A♭	vA	^A	vA♯ B♭	vvB	B	^^B vC	^C	vC♯ D♭	^C♯ vvD	D	^^D vE♭	D♯ ^E♭	vE	^E	F	^^F vG♭	F♯ ^G♭	vG	^G	vG♯ A♭
D	^^D vE♭	D♯ ^E♭	vE	^E	F	^^F vG♭	F♯ ^G♭	vG	^G	vG♯ A♭	^G♯ vvA	A	^^A vB♭	A♯ ^B♭	vB	^B vvC	C	^^C vD♭	C♯ ^D♭	vD	^D	vD♯ E♭	^D♯ vvE	E

nut → ← towards the bridge →

^^E / vF	is tuned to	F	431 hz	-1¢	**or**	440 hz	-36.5¢
vC♯ / D♭	is tuned to	C♯ / D♭	436 hz	-1¢	**or**	440 hz	-17¢
A	is tuned to	A	441 hz	-1¢	**or**	440 hz	+2.5¢
^F	is tuned to	F	446 hz	-1¢	**or**	440 hz	+22¢
^C♯ / vvD	is tuned to	C♯ / D♭	451 hz	-1¢	**or**	440 hz	+41.5¢
^^A / vB♭	is tuned to	B♭	430 hz	+1¢	**or**	440 hz	-39¢
vF♯ / G♭	is tuned to	F♯ / G♭	435 hz	0¢	**or**	440 hz	-19.5¢
D	is tuned to	D	440 hz	0¢	**or**	440 hz	0¢

The Kite Tuning – minor version

5	4	3	2	1	**0**	1	2	3	4	5	6	7	8	9	10	11	12
^M10 439¢ 18/7	**P11 498¢ 8/3**	^^11 556¢ 11/4	A11 615¢ 20/7	v12 673¢	^12 732¢	m13 790¢ 22/7	~13 849¢ 13/4	M13 907¢ 27/8	Wvm7 966¢ 7/2	W^m7 1024¢ 18/5	WvM7 1083¢ 15/4	W^M7 1141¢ 27/7	**WP8 1200¢ 4/1**	Wvm9 1259¢ 33/8	W^m9 117¢ 30/7	WvM9 176¢ 22/5	W^M9 234¢ 32/7
^m9 117¢ 15/7	vM9 176¢ 11/5	^M9 234¢ 16/7	m10 293¢ 19/8	~10 351¢ 22/9	M10 410¢ 28/11	v11 468¢ 21/8	^11 527¢ 27/10	d12 585¢ 14/5	vv12 644¢ 26/9	**P12 702¢ 3/1**	vm13 761¢ 28/9	^m13 820¢ 16/5	vM13 878¢ 10/3	^M13 937¢ 24/7	Wm7 995¢ 32/9	W~7 1054¢ 11/3	WM7 1112¢ 19/5
m7 995¢ 16/9	~7 1054¢ 11/6	M7 1112¢ 19/10	v8 1171¢	^8 1229¢	m9 1288¢ 21/10	~9 146¢ 24/11	M9 205¢ 9/4	vm10 263¢ 7/3	^m10 322¢ 12/5	vM10 380¢ 5/2	^M10 439¢ 18/7	**P11 498¢ 8/3**	^^11 556¢ 11/4	A11 615¢ 20/7	v12 673¢	^12 732¢	
v5 673¢	^5 732¢	m6 790¢ 11/7	~6 849¢ 13/8	M6 907¢ 27/16	vm7 966¢ 7/4	^m7 1024¢ 9/5	vM7 1083¢ 15/8	^M7 1141¢ 27/14	**P8 1200¢ 2/1**	vm9 1259¢ 33/16	^m9 117¢ 15/7	vM9 176¢ 11/5	^M9 234¢ 16/7	m10 293¢ 19/8	~10 351¢ 22/9	M10 410¢ 28/11	
~3 351¢ 11/9	M3 410¢ 14/11	v4 468¢	^4 527¢	d5 585¢ 7/5	vv5 644¢ 13/9	**P5 702¢ 3/2**	vm6 761¢ 14/9	^m6 820¢ 8/5	vM6 878¢ 5/3	^M6 937¢ 12/7	m7 995¢ 16/9	~7 1054¢ 11/6	M7 1112¢ 19/10	v8 1171¢	^8 1229¢		
^1 29¢	m2 88¢ 21/20	~2 146¢ 12/11	M2 205¢ 9/8	vm3 263¢ 7/6	^m3 322¢ 6/5	vM3 380¢ 5/4	^M3 439¢ 9/7	**P4 498¢ 4/3**	^^4 556¢ 11/8	A4 615¢ 10/7	v5 673¢	^5 732¢	m6 790¢ 11/7	~6 849¢ 13/8	M6 907¢ 27/16		
M6 907¢ 27/32	vm7 966¢ 7/8	^m7 1024¢ 9/10	vM7 1083¢ 15/16	^M7 1141¢ 27/28	**P1 0¢ 1/1**	vm2 59¢ 28/27	^m2 117¢ 16/15	vM2 176¢ 10/9	^M2 234¢ 8/7	m3 293¢ 19/16	~3 351¢ 11/9	M3 410¢ 14/11	v4 468¢	^4 527¢			

← towards the nut — towards the bridge →

The Kite Tuning – minor version

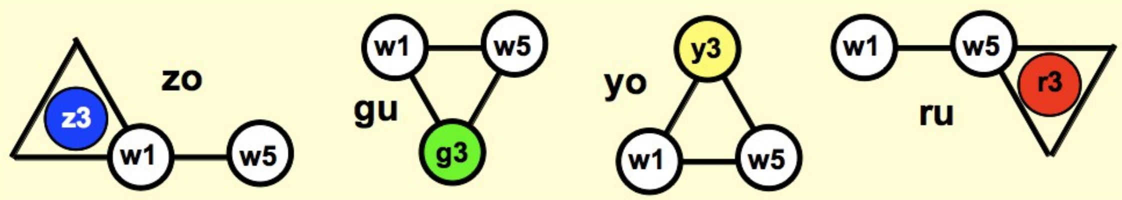
open strings	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
^^C vD♭	C♯ ^D♭	vD	^D	vD♯ E♭	^D♯ vvE	E	^^E vF	^F	vF♯ G♭	^F♯ vvG	G	^^G vA♭	G♯ ^A♭	vA	^A	vA♯ B♭	vvB	B	^^B vC	^C	vC♯ D♭	^C♯ vvD	D	^^D vE♭
^A	vA♯ B♭	vvB	B	^^B vC	^C	vC♯ D♭	^C♯ vvD	D	^^D vE♭	D♯ ^E♭	vE	^E	F	^^F vG♭	F♯ ^G♭	vG	^G	vG♯ A♭	^G♯ vvA	A	^^A vB♭	A♯ ^B♭	vB	^B vvC
F♯ ^G♭	vG	^G	vG♯ A♭	^G♯ vvA	A	^^A vB♭	A♯ ^B♭	vB	^B vvC	C	^^C vD♭	C♯ ^D♭	vD	^D	vD♯ E♭	^D♯ vvE	E	^^E vF	^F	vF♯ G♭	^F♯ vvG	G	^^G vA♭	G♯ ^A♭
vD♯ E♭	^D♯ vvE	E	^^E vF	^F	vF♯ G♭	^F♯ vvG	G	^^G vA♭	G♯ ^A♭	vA	^A	vA♯ B♭	vvB	B	^^B vC	^C	vC♯ D♭	^C♯ vvD	D	^^D vE♭	D♯ ^E♭	vE	^E	F
^^B vC	^C	vC♯ D♭	^C♯ vvD	D	^^D vE♭	D♯ ^E♭	vE	^E	F	^^F vG♭	F♯ ^G♭	vG	^G	vG♯ A♭	^G♯ vvA	A	^^A vB♭	A♯ ^B♭	vB	^B vvC	C	^^C vD♭	C♯ ^D♭	vD
^G♯ vvA	A	^^A vB♭	A♯ ^B♭	vB	^B vvC	C	^^C vD♭	C♯ ^D♭	vD	^D	vD♯ E♭	^D♯ vvE	E	^^E vF	^F	vF♯ G♭	^F♯ vvG	G	^^G vA♭	G♯ ^A♭	vA	^A	vA♯ B♭	vvB
^F	vF♯ G♭	^F♯ vvG	G	^^G vA♭	G♯ ^A♭	vA	^A	vA♯ B♭	vvB	B	^^B vC	^C	vC♯ D♭	^C♯ vvD	D	^^D vE♭	D♯ ^E♭	vE	^E	F	^^F vG♭	F♯ ^G♭	vG	^G
D	^^D vE♭	D♯ ^E♭	vE	^E	F	^^F vG♭	F♯ ^G♭	vG	^G	vG♯ A♭	^G♯ vvA	A	^^A vB♭	A♯ ^B♭	vB	^B vvC	C	^^C vD♭	C♯ ^D♭	vD	^D	vD♯ E♭	^D♯ vvE	E

nut → ←

towards the bridge →

Section 4 – Chord Shapes

41-edo chords can be named with ups and downs notation as downmajor-7, upminor-6, etc. They can also be named with color notation as yo-7, sub-6, etc. Ru = upmajor, yo = downmajor, gu = upminor and zo = downminor. Chord shapes in the lattice can be translated into chord shapes on the fretboard, and vice versa. Four basic 7-limit triads:



The upminor (gu) chord is the **octave inverse** of the down (yo) chord, i.e. it's the down chord turned upside-down. Because of this, both its lattice shape and its fretboard shape is the down shape rotated 180 degrees:

^m or g chord – major version							
					w8		
			w5				
			g3				
				w1			
		w5					
		g3					
			w1				

^m or g chord – minor version										
									w8	
						w5				
					g3					
					w1					
		w5								
	g3									
	w1									

∨ or y chord – major version							
					w8		
			w5				
				y3			
				w1			
		w5					
			y3				
			w1				

∨ or y chord – minor version										
									w8	
						w5				
						y3				
					w1					
		w5								
		y3								
	w1									

The downminor (zo) and up (ru) triads have a similar symmetry (as do the sus2 and sus4 chords):

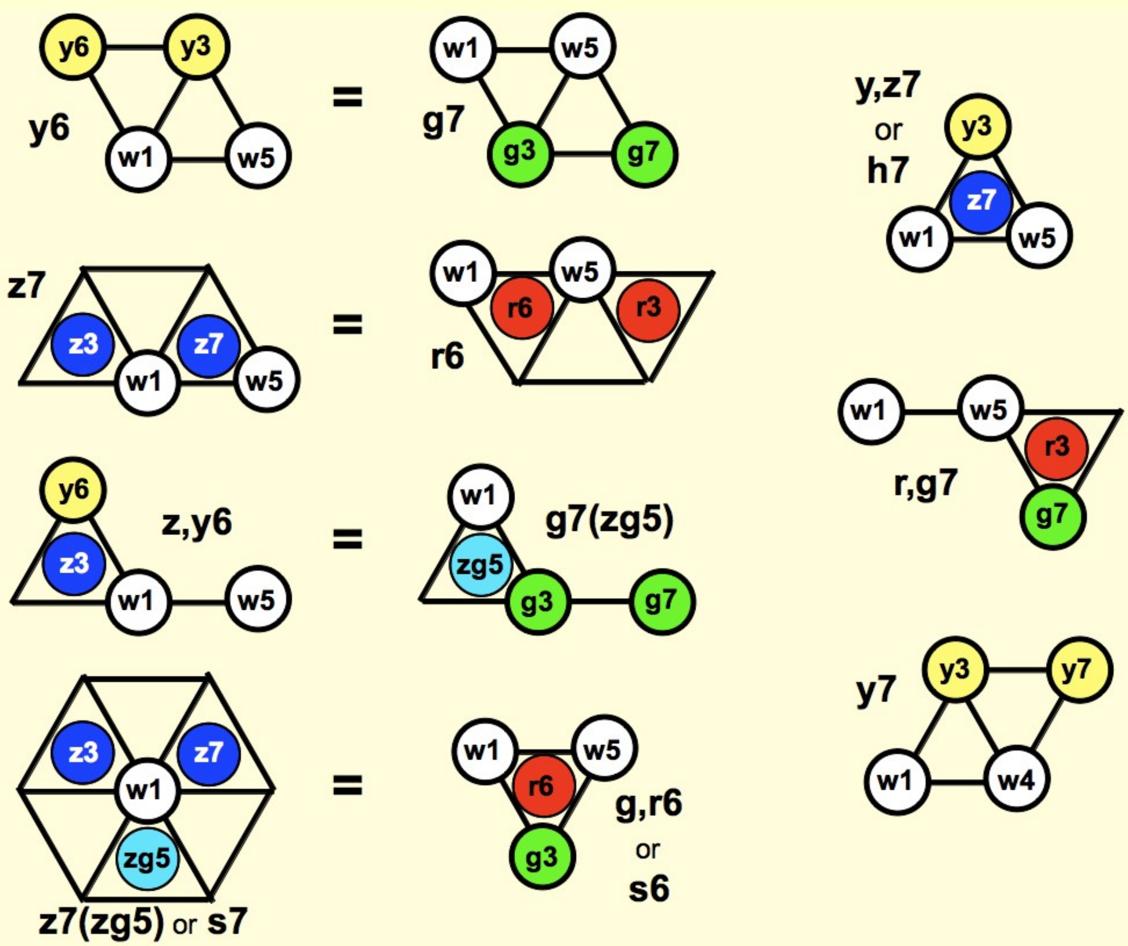
∨m or z chord – major version							
					w8		
			w5				
		z3					
				w1			
		w5					
	z3						
			w1				

∨m or z chord – minor version										
									w8	
						w5				
				z3						
					w1					
		w5								
z3										
	w1									

^ or r chord – major version							
					w8		
			w5				
					r3		
				w1			
		w5					
				r3			
			w1				

^ or r chord – minor version										
									w8	
						w5				
							r3			
					w1					
		w5								
			r3							
	w1									

In conventional music theory, because Amin7 and Cmaj6 have the same notes, the min7 chord and the maj6 chord are said to be **homonyms** of each other. This concept is extended to just intonation for two chords containing the same ratios, and hence having the same lattice shape. The next diagram indicates homonym pairs with an equal sign:



The homonym concept in a 41-edo context equates two chords with the same edostep intervals in the same order. For example, the y(yy5) and y(ry5) chords are 41-edo homonyms but not just intonation homonyms.

Har and sub (h and s) stand for harmonic and subharmonic. The har-7 and sub-7 chords are octave inverses of each other. Their 41-edo names are down-7 and downminor-7 flat-5 (or down-half-dim).

Since the octave appears 3 strings from the root, every tetrad has two notes on one string. One note can be dropped, or can be alternated with its string-mate.

v7 or h7 chord – major version							
	z7				w8		
			w5				
				y3			
z7				w1			
		w5					
			y3				
			w1				

v7 or h7 chord – minor version										
					z7				w8	
						w5				
						y3				
	z7				w1					
		w5								
		y3								
	w1									

vm7(♭5) or s7 chord – major version							
	z7				w8		
	zg5						
		z3					
z7				w1			
zg5							
	z3						
			w1				

vm7(♭5) or s7 chord – minor version										
					z7				w8	
				zg5						
				z3						
	z7				w1					
zg5										
z3										
	w1									

The upminor-6 or sub-6 chord is a homonym of the sub-7 chord:

^m6 or s6 chord – major version							
					w8		
			w5				r6
			g3				
				w1			
		w5				r6	
		g3					
			w1				

^m6 or s6 chord – minor version										
									w8	
						w5				r6
					g3					
					w1					
		w5				r6				
	g3									
	w1									

Pentads have even more string-mates. Here are the down-9 (har-9) and up-9 (sub-9) pentads, which are octave inverses of each other:

v9 or h9 chord – major version							
	z7				w8		
			w5				
	w9			y3			
z7				w1			
		w5					
			y3				
			w1				

v9 or h9 chord – minor version										
					z7				w8	
						w5				
			w9			y3				
	z7				w1					
		w5								
		y3								
	w1									

^9 or s9 chord – major version							
		g7			w8		
			w5				
	w9				r3		
	g7			w1			
		w5					
				r3			
			w1				

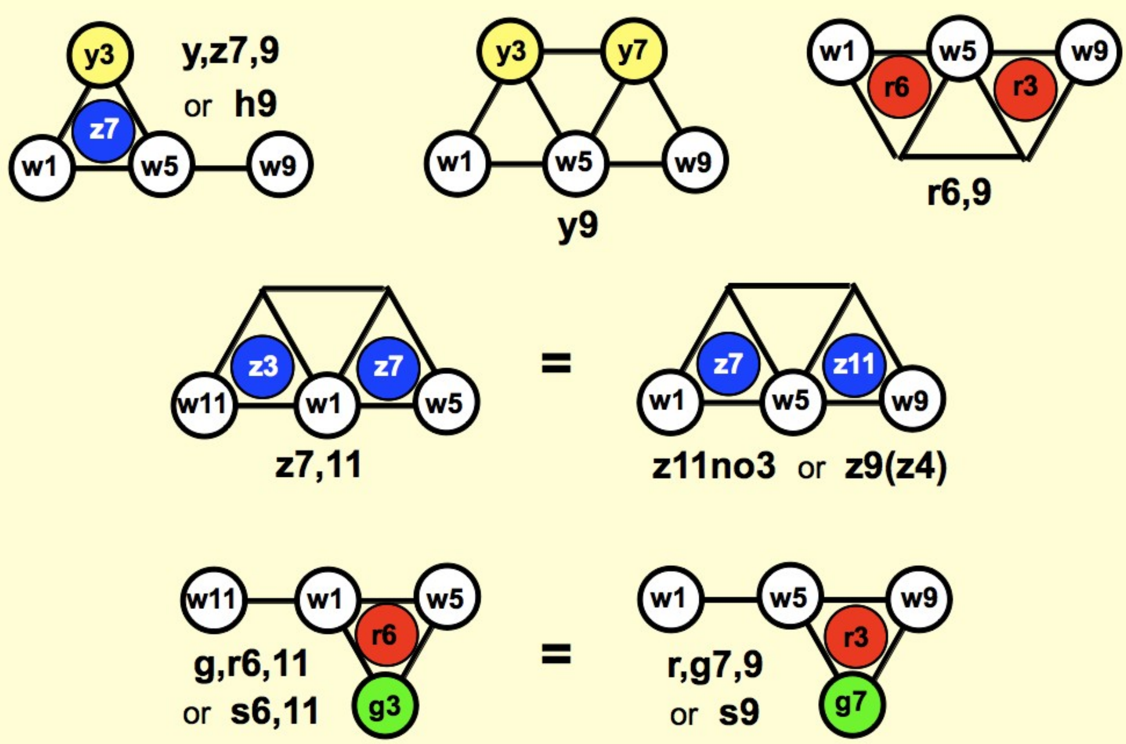
^9 or s9 chord – minor version										
						g7			w8	
						w5				
			w9				r3			
		g7			w1					
		w5								
			r3							
	w1									

Note that the sub-9 chord is upmajor, while the sub-7 chord is downminor. The sub-9 chord is formed from the sub-7 chord not by adding a 9th above it, but by adding a new root below it. The upminor-6 add-11 or sub-6 add-11 chord is a homonym of the up-9 or sub-9 chord:

^m6,11 or s6,11 chord – major version							
					w8		
			w5				r6
			g3			w11	
				w1			
		w5				r6	
		g3					
			w1				

^m6,11 or s6,11 chord – minor version										
									w8	
						w5				r6
					g3			w11		
					w1					
		w5				r6				
	g3									
	w1									

More pentads:



The next two tables list some 7-limit triads and tetrads. The last two columns show the fretboard shape. To avoid negative fret numbers, the root is always on fret 3. This is by no means an exhaustive survey. One of the pleasures of playing in the Kite Tuning is that one's fingers are constantly stumbling across new and unusual chords. Some of these are fairly dissonant, but because the component intervals are all consonant, the dissonance perhaps seems less alien.

Figure 4.1 – Various 41-edo triads

edo name		edosteps	color name		major version	minor version	homonym
sus2	P1 M2 P5	0 7 24	2	w1 w2 w5	3 0 2	3 1 4	sus4
sus4	P1 P4 P5	0 17 24	4	w1 w4 w5	3 5 2	3 6 4	sus2
v	P1 vM3 P5	0 13 24	y	w1 y3 w5	3 3 2	3 4 4	–
^m	P1 ^m3 P5	0 11 24	g	w1 g3 w5	3 2 2	3 3 4	–
vm	P1 vm3 P5	0 9 24	z	w1 z3 w5	3 1 2	3 2 4	–
^	P1 ^M3 P5	0 15 24	r	w1 r3 w5	3 4 2	3 5 4	–
^dim	P1 ^m3 d5	0 11 20	g(zg5)	w1 g3 zg5	3 2 0	3 3 2	z,y6no5
vdim	P1 vm3 d5	0 9 20	z(zg5)	w1 z3 zg5	3 1 0	3 2 2	s6no5

All the edosteps run even-odd-even. As previously noted, the neutral triad is difficult to play in the Kite Tuning. This is because its edosteps are 0-12-24, all even. In a 1-3-5 voicing, half of the strings are useless. A more playable voicing is 5-1-3, using open strings: 5 7 x 0 for major, or 2 5 x 0 for minor.

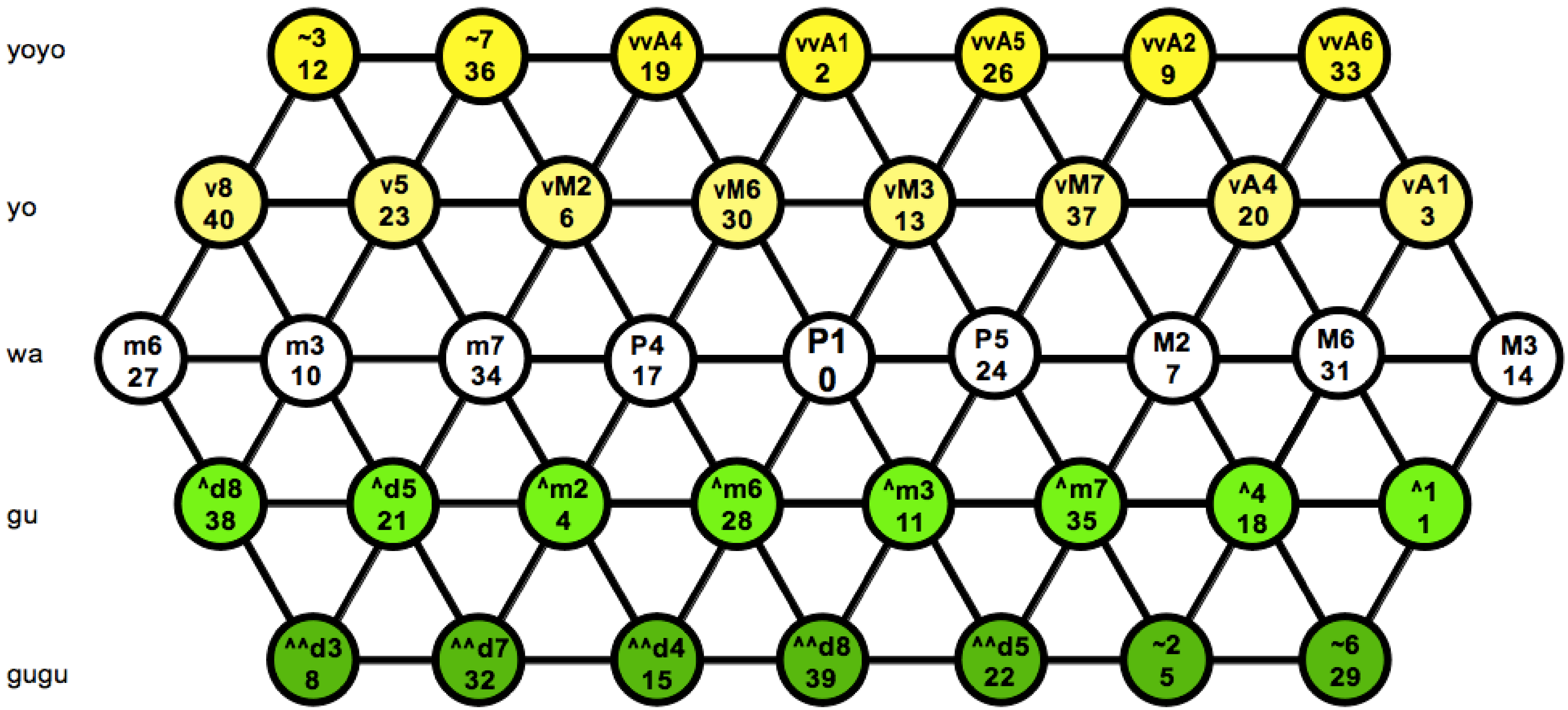
In tetrads, the edosteps generally run even-odd-even-odd. But most 6th chords run even-odd-even-even. These chords have string-mates that are written e.g. 2/5 to indicate chord notes at frets 2 and 5. Another possibility is to voice either the 5th or the 6th below the root.

Figure 4.2 – Various 41-edo tetrads

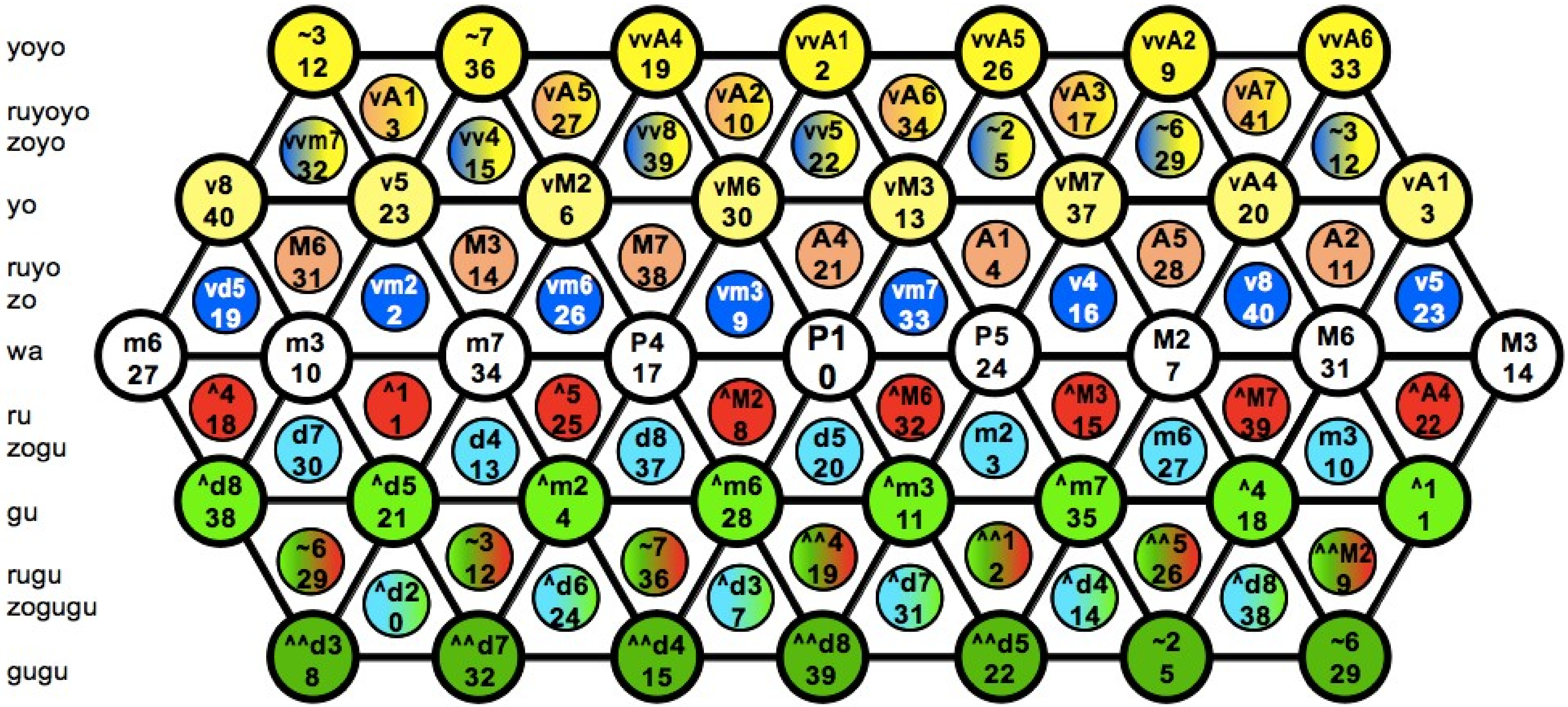
edo name		edosteps	color name		major version	minor version	homonym
v6	P1 vM3 P5 vM6	0 13 24 30	y6	w1 y3 w5 y6	3 3 2/5	3 4 4/7	g7
^m7	P1 ^m3 P5 ^m7	0 11 24 35	g7	w1 g3 w5 g7	3 2 2 1	3 3 4 4	y6
vm7	P1 vm3 P5 vm7	0 9 24 33	z7	w1 z3 w5 z7	3 1 2 0	3 2 4 3	r6
^6	P1 ^M3 P5 ^M6	0 15 24 32	r6	w1 r3 w5 r6	3 4 2/6	3 5 4/8	z7
v7	P1 vM3 P5 vm7	0 13 24 33	h7	w1 y3 w5 z7	3 3 2 0	3 4 4 3	–
vm7(♭5) or vhalfdim	P1 vm3 d5 vm7	0 9 20 33	s7	w1 z3 zg5 z7	3 1 0 0	3 2 2 3	s6
^m6	P1 ^m3 P5 ^M6	0 11 24 32	s6	w1 g3 w5 r6	3 2 2/6	3 3 4/8	s7
^7	P1 ^M3 P5 ^m7	0 15 24 35	r,g7	w1 r3 w5 g7	3 4 2 1	3 5 4 4	–
vm6	P1 vm3 P5 vM6	0 9 24 30	z,y6	w1 z3 w5 y6	3 1 2/5	3 2 4/7	g7(zg5)
^m7(♭5) or ^halfdim	P1 ^m3 d5 ^m7	0 11 20 35	g7(zg5)	w1 g3 zg5 g7	3 2 0 1	3 3 2 4	z,y6
vM7	P1 vM3 P5 vM7	0 13 24 37	y7	w1 y3 w5 y7	3 3 2 2	3 4 4 5	–

Chord progressions can be written out as Cv – vA^m – Fv – Gv7 or as Iv – vVI^m – IVv – Vv7.

The next chart shows 41-edo mapped onto the 5-limit harmonic lattice. Each node has its 41-edo name and its 41-edo keyspan. The color of each lattice row is on the left.



On the 7-limit lattice:



The vanishing of the Bizozogu comma (2401/2400), the Lulu comma (243/242), and the Thuthu comma (512/507) allow a 2-D representation of 13-limit just intonation. The purple notes in the center row represent three pairs of neutral intervals, each equated by one of these commas. Thus "~3 12" represents both 60/49 and 49/40, as well as 11/9 and 27/22, and also 16/13 and 39/32.