

Star Dance

for three retuned, computer-driven pianos

by Kyle Gann

2015-16

Technical Specifications

The 33-pitch tuning of the three pianos (the same in every octave) is as follows, given first in the number of cents above E-flat, and then as ratios to the nearest E-flat 1/1 below:

Piano	1		2		3	
D	1088	15/8	977	225/128	1044	117/64
Db	969	7/4	938	55/32	906	27/16
C	857	105/64	773	25/16	840	13/8
B	738	49/32	755	99/64	729	195/128
Bb	702	3/2	590	45/32	609	91/64
A	551	11/8	551	11/8	481	169/128
Ab	471	21/16	440	165/128	408	81/64
G	386	5/4	320	77/64	342	39/32
Gb	204	9/8	275	75/64	275	75/64
F	155	35/32	192	143/128	192	143/128
E	92	135/128	53	33/32	27	65/64
Eb	0	1/1	1103	121/64	1173	63/32

Note that no string needs to be raised higher than its natural tuning except for the B-flat on piano 1, which is 2¢ sharp (or if one prefers, 2¢ could be subtracted from all quantities).

For electronic realization of the piece, it can prove helpful to reconfigure the tuning as a reference pitch in cycles per second for each piano, and ratios derived from that standard:

Tuning pitch:	38.891 cps	36.7641 cps	38.2833 cps
D	15/8	225/121	13/7
Db	7/4	20/11	12/7
C	105/64	200/121	104/63
B	49/32	18/11	65/42
Bb	3/2	180/121	13/9
A	11/8	16/11	169/126
Ab	21/16	15/11	9/7
G	5/4	14/11	26/21
F#	9/8	150/121	25/21
F	35/32	13/11	143/126
E	135/128	12/11	65/63
Eb	1/1	1/1	1/1

In the configuration of certain tuning softwares, the following sequences might facilitate getting the required tuning:

Piano 1:

38.891 = Eb0

1/1, 135/128, 35/32, 9/8, 5/4, 21/16, 11/8, 3/2, 49/32, 105/64, 7/4, 15/8

Piano 2:

36.7641485 = Eb0

1/1, 12/11, 13/11, 150/121, 14/11, 15/11, 16/11, 180/121, 18/11, 200/121, 20/11, 225/121

Piano 3:

38.283333 = Eb0

1/1, 65/63, 143/126, 25/21, 26/21, 9/7, 169/126, 13/9, 65/42, 104/63, 12/7, 13/7

For purposes of analysis, the entire scale (which I refer to as my 8x8 scale) is given below, grouping its pitches into eight harmonic series' on the 1st, 3rd, 5th, 7th, 9th, 11th, 13th, and 15th harmonics of E-flat, and naming each pitch in a typographical equivalent of Ben Johnston's just-intonation notation:

Pitch name	Ratio	Cents	1/1	3/2	5/4	7/4	9/8	11/8	13/8	15/8
Db^^-	121/64	1103						11		
D	15/8	1088	15	5	3					1
Db13	117/64	1044					13		9	
C#+	225/128	977								15
Db7	7/4	969	7			1				
C^	55/32	938			11			5		
C+	27/16	906		9			3			
C7+	105/64	857				15				7
Cb13	13/8	840	13						1	
B	25/16	773			5					
Bb^	99/64	755					11	9		
Cb77+	49/32	738				7				
Bb13	195/128	729							15	13
Bb	3/2	702	3	1						
Bbb713	91/64	609				13			7	
A+	45/32	590		15	9		5			3
Ab^	11/8	551	11					1		
Abb1313	169/128	481							13	
Ab7+	21/16	471		7		3				
G^	165/128	440						15		11
G+	81/64	408					9			
G	5/4	386	5		1					
Gb13	39/32	342		13					3	
Gb7^	77/64	320				11		7		
F#+	75/64	275			15					5
F+	9/8	204	9	3			1			
Fb13^	143/128	192						13	11	
F7+	35/32	155			7	5				
E+	135/128	92					15			9
Eb^	33/32	53		11				3		
Eb13	65/64	27			13				5	
Eb	1/1	0	1							
Eb7+	63/32	1173				9	7			

In Johnston's notation, + raises a pitch by 81/80, # raises it by 25/24, b lowers it by 24/25, 7 lowers it by 35/36, ^ raises it by 33/32, 13 raises it by 65/64, and F-A-C, C-E-G, and G-B-D are all perfectly tuned 4:5:6 major triads.

Star Dance

Kyle Gann
2015-16

$\text{♩} = 42$

Piano 1

p *pp* *mf*

Piano 2

p *mf*

$\text{♩} = 42$

Piano 3

mf

11

Pno1

Pno2

Pno3

21

Pno1

Pno2

Pno3

Pno1

Pno2

Pno3

Pno1

Pno2

Pno3

48

Pno1

Pno2

Pno3

57

Pno1

Pno2

Pno3

The musical score is divided into three systems, each for a different piano (Pno1, Pno2, Pno3).
- **Pno1:** Starts at measure 57. The right hand has a melodic line with a triplet of eighth notes marked *mp*. The left hand has a steady eighth-note accompaniment. Dynamics include *mf*.
- **Pno2:** Features a melodic line with a triplet of eighth notes marked *pp*. The left hand has a bass line with a 7-measure rest marked *mf*. Dynamics include *pp* and *mf*.
- **Pno3:** Features a complex melodic line with a 7-measure rest marked *pp*. The left hand has a bass line with a 7-measure rest marked *pp*. Dynamics include *pp* and *mp*.

64 

Pno1

Pno2

Pno3

mp

Star Dance

Pno1

Musical score for Pno1, measures 72-78. The score consists of five staves: two treble clefs and three bass clefs. The first two staves are for the right hand, and the last three are for the left hand. Dynamics include *mp*, *pp*, *mf*, and *p*. Fingerings are indicated with numbers 3, 5, and 7. There are also slurs and accents throughout the piece.

Pno2

Musical score for Pno2, measures 72-78. The score consists of five staves: two treble clefs and three bass clefs. The first two staves are for the right hand, and the last three are for the left hand. Dynamics include *mp*, *pp*, *mf*, and *p*. Fingerings are indicated with numbers 3, 5, and 7. There are also slurs and accents throughout the piece.

Pno3

Musical score for Pno3, measures 72-78. The score consists of five staves: two treble clefs and three bass clefs. The first two staves are for the right hand, and the last three are for the left hand. Dynamics include *pp*, *mp*, and *mf*. Fingerings are indicated with numbers 3, 5, and 7. There are also slurs and accents throughout the piece.

Pno1

Pno2

Pno3

The musical score is divided into three systems, each for a different piano (Pno1, Pno2, Pno3). Each system contains multiple staves with musical notation. Dynamics include *mf*, *mp*, and *p*. Fingerings are indicated by numbers 3, 5, 7, and 8. There are also slurs and accents throughout the score. The notation includes treble and bass clefs, notes, rests, and various musical symbols.

86

The musical score is divided into three systems, each labeled on the left as Pno1, Pno2, and Pno3. Each system contains multiple staves. Pno1 consists of five staves (treble and bass clefs). Pno2 consists of three staves (treble and bass clefs). Pno3 consists of four staves (treble and bass clefs). The score includes various musical notations such as chords, scales, and fingerings (e.g., 5, 7). The first system starts with a treble clef and a key signature of one flat (B-flat). The second system starts with a treble clef and a key signature of one sharp (F#). The third system starts with a treble clef and a key signature of one sharp (F#). The score is written in a standard musical notation style with various clefs and accidentals.

12 91

Pno1

Pno2

Pno3

97

Pno1

Pno2

Pno3

Pno1

Musical score for Pno1, measures 102-107. The system includes a grand staff with treble and bass clefs. The right hand features complex chordal textures with 7th and 5th fingerings. The left hand has a steady bass line with double bar lines (//) indicating repeat points.

Pno2

Musical score for Pno2, measures 102-107. The system includes a grand staff with treble and bass clefs. The right hand has a melodic line with 7th and 5th fingerings. The left hand has a steady bass line with double bar lines (//) indicating repeat points.

Pno3

Musical score for Pno3, measures 102-107. The system includes a grand staff with treble and bass clefs. The right hand has a melodic line with 5th and 7th fingerings. The left hand has a steady bass line with double bar lines (//) indicating repeat points.

Pno1

Musical score for Pno1, measures 108-110. The score consists of five staves: two treble clefs and three bass clefs. The first treble staff contains a complex melodic line with many accidentals and a '7' fingering. The second treble staff has a few notes with a '5' fingering. The three bass staves feature sustained notes with 'Ped.' markings and double bar lines. Dynamics include 'pp'.

Pno2

Musical score for Pno2, measures 108-110. The score consists of five staves: two treble clefs and three bass clefs. The first treble staff has a few notes with a '7' fingering. The second treble staff has a long note with a sharp sign. The three bass staves have long notes with double bar lines. Dynamics include 'pp'.

Pno3

Musical score for Pno3, measures 108-110. The score consists of five staves: two treble clefs and three bass clefs. The first treble staff has a few notes with a '5' fingering. The second treble staff has a complex melodic line with a '7' fingering. The three bass staves have long notes with double bar lines. Dynamics include 'pp'.

111

Pno1

Pno2

Pno3

115

Pno1

Pno2

Pno3

The musical score is divided into three systems, one for each piano (Pno1, Pno2, Pno3). Each system contains six measures of music. The notation includes treble and bass clefs, notes, rests, and various musical symbols such as slurs, ties, and fingerings (e.g., 7, 11, 5). The score is complex, featuring many chords and arpeggiated figures. The page number 115 is at the top left, and 17 is at the top right.

121

Pno1

Pno2

Pno3

The musical score is organized into three main sections, Pno1, Pno2, and Pno3, each consisting of two systems of staves. Each system contains a grand staff (treble and bass clefs) and a single bass clef staff. The score begins at measure 121. Pno1 features complex rhythmic patterns with slurs and dynamic markings of *p* and *f*. Pno2 and Pno3 also feature intricate melodic and harmonic lines with various slurs and dynamic markings. The overall texture is dense and multi-layered.

Pno1

Musical score for Pno1, measures 127-131. The score consists of seven staves. The top two staves are treble clef, and the bottom three are bass clef. The music features complex rhythmic patterns with many sixteenth and thirty-second notes, often beamed together. Dynamic markings include *p* (piano) and *f* (forte). There are several slurs and ties across measures. A fermata is present at the end of measure 131.

Pno2

Musical score for Pno2, measures 127-131. The score consists of five staves. The top two are treble clef, and the bottom three are bass clef. The music is characterized by wide intervals and sustained notes, often with slurs. Dynamic markings include *p* and *f*. There are several ties and slurs across measures.

Pno3

Musical score for Pno3, measures 127-131. The score consists of three staves. The top two are treble clef, and the bottom is bass clef. The music features wide intervals and sustained notes, often with slurs. Dynamic markings include *p* and *f*. There are several ties and slurs across measures.

133

Pno1

Pno2

Pno3

Completed July 18, 2016
from a fall, 2015, sketch
Germantown, NY