

Sakura

Hira-choshi

|| 7 7 8 - | 7 7 8 - | 7 8 9 8 | 7 87 6 - |
 sa ku ra sa ku ra no ya ma mo sa to - mo

5

|| 5 4 5 6 | 5 54 3 - | 7 8 9 8 | 7 87 6 - |
 mi wa ta su ka gi - ri ka su mi ka ku mo - ka

9

|| 5 4 5 6 | 5 54 3 - | 7 7 8 - | 7 7 8 - |
 a sa hi ni ni o - u sa ku ra sa ku ra

13

|| A B DC B | A - - O ||
 ha na za - ka ri

Rokudan no shirabe

Yatsushashi, Kengyoo
(1614-1685)

|| $\bar{5}$ - 3 1 | O 338.767 | 1 5.4 3 1 | 9 878.767 |

⁵
|| 1 5.4 3 1 | O 1 5 11 | $\bar{6}$ 15 7 $\bar{7}$ | 3387 3389 |

⁹
|| 5 A.9 8 1 | $\hat{9}$ ACDCB \hat{C} | B5A.9 8 1 | $\hat{9}$ A B \bar{B} |

¹³
|| A $\hat{9}$ A.9 8 78 | $\hat{9}$ 1 A 66 | \bar{B} 5A C DC | 88DC B A |

¹⁷
|| 98DC 88DC | B A 8 D | 5 A $\hat{9}$ A | \hat{B} A 9 A989 |

²¹
|| 7 8 $\hat{9}$ A $\hat{9}$ | 55A \hat{C} B A | D.C B B. \hat{C} | 5 A.9 8 78 |

²⁵ Section 2
|| $\hat{9}$ A $\hat{9}$ A989 | 78 $\hat{9}$ A8.767 | 1 5.4 3 1 | O 7 8767 |

²⁹
|| 1 5.4 3 55 | A9898.767 | 1 5.4 3 1 | O 1 5 11 |

The Humdrum **koto Representation

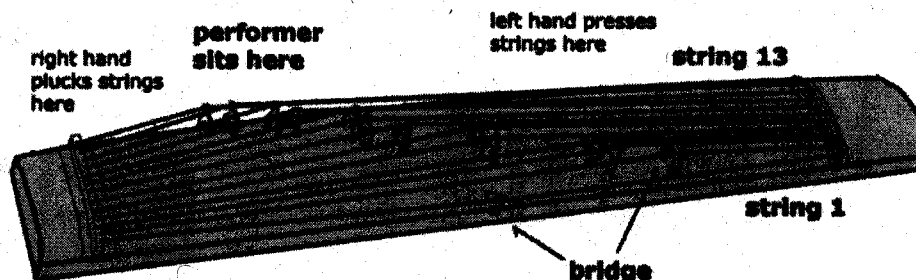
Craig Stuart Sapp and Sachiko Deguchi
Version: 19 August 2003

1. [String Related Codes](#)
2. [Rhythm Related Codes](#)
3. [Playing Technique Related Codes](#)
4. [Vocal Codes](#)
5. [**kern Related Codes](#)
6. [Related Humdrum Representations](#)
7. [Programs which can Process **koto Data](#)
8. [**koto Symbol Dictionary](#)

Introduction

Instrument and Background

The Japanese *koto* is a thirteen-string harp-like instrument related to the modern Chinese *zheng* (which usually has 21 strings) as well as to the Korean *kayagum* (with 12 strings). The body of a koto is about 183 cm (six feet) long, 24 cm (ten inches) wide, and is made of paulownia wood. The strings of the koto are traditionally made of silk but are now commonly made of synthetic fiber which is more durable. A moveable bridge for each string allows the strings to be tuned to any pitch, although the standard practice is to have high pitches closer to the performer and low pitches further from the performer. The right hand plucks the strings with plectrums attached to the thumb and first two fingers. Other right-hand techniques include scraping the edges of the plectrums along the strings, striking the strings with the plectrum, and plucking the strings with the other fingers without a plectrum. The left hand is used to change the pitch of the strings by pressing the strings on the opposite side of the bridges to raise the pitch in various types of ornamentation.

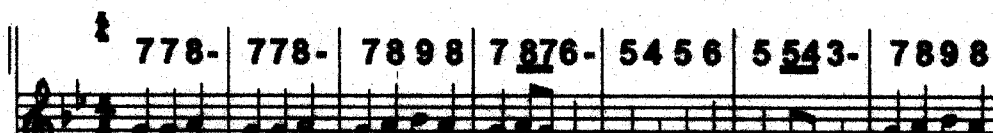


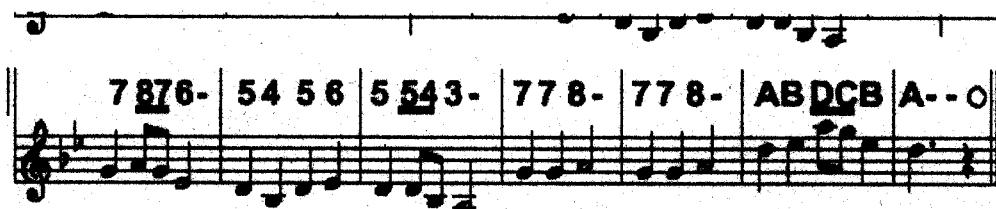
Introduced to Japanese court music (*gagaku*) in the 7-8th centuries from China, the koto was popularized as a solo instrument by the blind musician Yatsubashi Kengyo (1614-1685) in the seventeenth century. Yatsubashi learned the Tsukushi-goto style of koto playing created by the Buddhist priest Kenjun (1547-1636), but developed the string tunings *hira-choshi* (tranquil tuning) and *kumoi-choshi* which are still the two main tunings used in solo koto music.

The two of the main schools (*ryu*) of koto playing are *Ikuta* and *Yamada*. The Ikuta playing style was founded by Ikuta Kengyo (1666-1716) by merging koto and shamisen musical traditions and had an original following in the Osaka area. The Yamada school was developed by Yamada Kengyoo (1757-1817), a student of the Ikuta school, in the late eighteenth century and developed as an incorporation of the shamisen styles of Tokyo. Ikuta-school plectrums have square tip ends and are played diagonally on the pointed edge. Yamada-school plectrums are pointed at the tip and are played perpendicular to the strings.

Music notation of the Ikuta and Yamada schools are slightly different, with writing direction being the main difference. Both traditions notate pitches by string number rather than by pitch, since the strings can have several temperaments. Ikuta school music is written from the top down and from right to left, while Yamada school music is written from left to right and from the top down. The rhythm is notated with Western-music style beams in Yamada notation, while Ikuta notation rhythm is indicated with different methods, but usually indicates a beat with a box around the notes for the beat and sometimes uses Western-style beaming groups.

The Yamada school notation is used for the developing the music encoding in the Humdrum format described in this article, although the encoding system is also suitable for encoding Ikuta notated music. The following example score for *Sakura, Sakura* (Cherry Blossom) which shows the music for koto in the Yamada notation style along with the equivalent Western music notation underneath. Each number indicates a string, with 'A' = string 10, 'B' = string 11, 'C' = string 12, and 'D' = string 13. In both Ikuta and Yamada scores, Chinese numbers are used; however, Arabic numerals are used here for people not familiar with Chinese numbers. Click [here](#) to listen to a recording of a koto performance of this piece.





Digital Scores

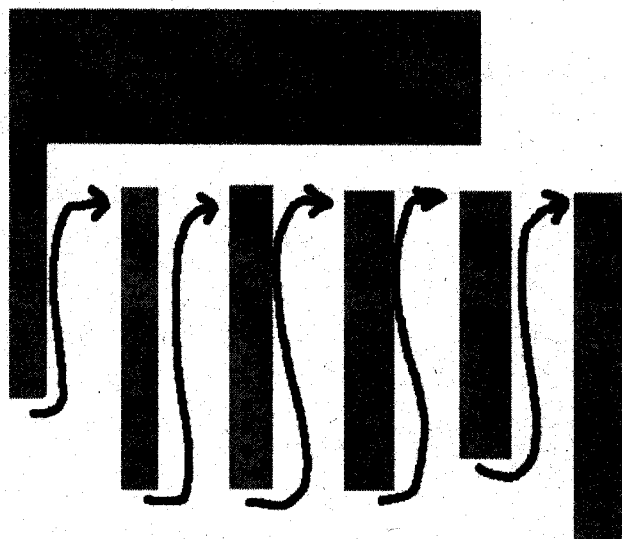
Representing koto music on the computer for analysis can be done in Western music notation, but there are distinct advantages to encoding koto music in the original tablature format:

1. Koto performers are used to performing with string numbers rather than actual pitches. This is due in part to the fact that there are several tunings for the koto, and the pitch of each string can be different in each composition.
2. The notation of ornaments is clearer in koto tablature and not standardized in Western music notation. For example the sha arpeggio takes place on two adjacent strings. If the sha arpeggio starts on the first string, the arpeggio goes down in pitch, while on other strings, it rises in pitch.
3. There is not a one-to-one mapping of pitches to strings. Strings 1 and 5 usually have the same pitch. Strings can be raised in pitch up to three half-steps, which could coincide with the next string.
4. String resonances are more easy to calculate. For example, in measure three of *Sakura, Sakura*, the strings 7, 8, 9, 8 are played in sequence. When string 8 is plucked on beat 2, the plectrum is brought to rest on string 7 which is then muted. Likewise, string 8 is muted when string 9 is played on beat 3. But when string 8 is played on the fourth beat of the measure, string 9 is still resonating and forms a chord with string 8.

The Humdrum file format was chosen as a base for encoding koto tablature for computer analysis. The Humdrum file format allows users to create their own data formats for musical or non-musical information and is well-suited to encoding non-Western musical information. This article describes a data format for encoding traditional koto musical notation in the Humdrum ****koto** data format.

The Humdrum Toolkit has many analytical programs for processing data in the Humdrum file format. In addition, several programs were specifically written to work with the ****koto** data format described in this article.

The following example gives the ****koto** encoding of *Sakura, Sakura*. Compare the encoding to the notate score above. Barlines are encoded as equal signs '=' with the bar number following the equal sign. String numbers are encoded as numbers/letters and the rhythms are encoded with beams ('f') and plus signs ('+') for durations longer than one quarter note.



1. String Related Codes

The thirteen strings on the koto are numbered starting with string 1 furthest from the performer and going to string 13 which is the closest to the performer. Koto performance scores indicate a string with traditional Japanese Kanji numbers for each string, although strings 11, 12, and 13 use non-numeric Kanji so that a single character can represent the string. Below is a table of the ****koto** string codes for each string in the ****koto** representation. Strings 10 through 13 are encoded with letters of the alphabet to keep the representation for the string numbers as a single character.

- 1 = string 1 (furthest from performer)
 2 = string 2 5 = string 5 8 = string 8 B = string 11

3 = string 3 6 = string 6 9 = string 9 c = string 12
 4 = string 4 7 = string 7 A = string 10 D = string 13 (nearest performer)

The modern bass koto developed by Michio Miyagi (1894-1956) has 17 strings. Strings 14-17 of the bass koto can be encoded by using the letters E, F, G, and H respectively. Other koto variants include instruments with 20, 21, 23, 25, and 30 strings. For these instruments, string numbers can be encoded in a similar manner to octaves in the **kern music representation format: 4 = string 4, 44 = string 14, 444 = string 24, A = string 10, AA = string 20, and AAA = string 30, etc.

Each string on the koto can be tuned to any pitch, but typically strings are tuned from low to high order, except for string 1 which is usually higher in pitch than strings 2, 3 and 4. *Hira-choshi* (tranquil-tuning) is the standard tuning for solo koto performance. The tuning was developed by Yatsubashi Kengyo from shamisen scales. Many other scales exist for playing koto music in various genres and traditions. Another standard solo koto scale is *Kumoi-choshi*. Nogi-choshi is used when accompanying Japanese folk songs of the early 20th century. The word *choshi* means tuning, and is pronounced "joshi" when it is part of a compound word, such as *hira-choshi*. The slurs indicate the grouping of notes by octave. Here are some sample koto tunings:

Hira-choshi

string no. 1 2 3 4 5 6 7 8 9 10 11 12 13

Kumoi-choshi

string no. 1 2 3 4 5 6 7 8 9 10 11 12 13

Nogi-choshi

Note that the tuning patterns contains 5 pitches that repeat in two and a half octaves. All tunings are in a just temperament rather than equal-temperament. The tonic note is repeated on strings 1 and 5, although string 1 is sometimes tuned one octave down.

To indicate the tuning used in the **koto data, a tandem interpretation is used to indicate the pitch of each string in the standard **kern format. For example, Hira-choshi would be indicated by this tandem interpretation occurring before any string numbers in the **koto data:

```
*tune[d:G:A:B-:d:e-:g:a:b-:dd:ee-:gg:aa]
```

If the tuning is changed during the piece, only the new string changes are necessary to encode, e.g:

```
*tune[::c:~::~:]
```

Which would indicate a change in the pitch of the 4th string from B-3 to C4.

In addition, the tuning of the strings can optionally be indicated in a Humdrum bibliographic record, which describes the tuning like this:

```
!!!tune: Nogi-choshi
```

Non-pitch codes:

Additional codes which are analogous to string numbers but stand for other musical qualities are:

- 0 =rest
- w =wa-ren: a light, quick stroke along the lower strings with the side of the plectrum of the third finger of the right hand. Standard practice dictates starting with string 1 at the far right of the string, then ending up on the fifth string by the end of the stroke. The actual strings stroked is approximate: some performers will stroke strings 1-3, or 2-5, or vary the exact pitches during the performance.
- Z, z =suri-tsume: scraping of the strings 5 and 6 with the sides of the plectrums on fingers 2 and 3. To the left (Z) and to the right (z). The effect generates a wind-like noise rather than a distinct pitch. A suri-tsume to the left is written as a rest with an arrow above pointing to the left in Yamada scores, and a suri-tsume to the right is written as a rest with an arrow above pointing to the right.
- =place holder for a string currently being played which is longer than 1 beat in duration. Used as a seat for articulations which occur on the string after it has been plucked.

2. Rhythm Related Codes

By default, **koto string data without a rhythm indication implies a duration of one beat, or quarter-note. This one-beat duration can be modified by beamlines and/or augmentation dots which work in a similar manner to Western music notation.

If the duration is two beats or longer, a plus sign (+) is used to add one more beat to the duration. For example, a whole note for string 6

would be notated as: 6+++ . One beat by default, plus three more beats from the three plus signs. Here are example rhythms modifying string 5:

- 5 = quarter-note on string 5
- 5| = eighth-note on string 5
- 5|. = dotted eighth-note (three sixteenth-notes) on string 5
- 5|| = sixteenth-note on string 5
- 5. = dotted quarter-note (three eighth-notes) on string 5
- 5+ = half-note on string 5
- 5++ = dotted half-note (three quarter-notes) on string 5
- 5+. = dotted half-note (three quarter-notes) on string 5
- 5+++ = whole-note on string 5

Here is a list of the rhythm qualifiers in the **koto data format:

- no = quarter note
- rhythm
 - | = half the previous duration, similar to beams in Western notation.
 - || = sixteenth-note rhythm.
 - . = augmentation dot, first dot adds 1/2 of original rhythm, second dot adds 1/4 of original rhythm, third dot adds 1/8 of original rhythm, etc. Similar in behavior to augmentation dots in Western notation.
 - + = add one beat to the duration, 1++ would be string 1 with a duration of 3 beats.
 - = beat spacer following string number datum containing a +. number of dashes (-) following a note must match the number of pluses (+).
 - q = grace note modifier. The duration of the note does not have any duration in the score, and the duration of the note in the performance is very short. Follows other rhythm indicators.

If plus signs are used to increase the duration of the beat, then there must be an equivalent number of lines (with possible intervening barlines) containing a dash (-) which match to each plus sign. The score duration of each of the dash is one beat. No string indication is used with the dash, but articulations may be attached to the dashes to indicate performance techniques used during that portion of the currently playing note.

3. Playing Technique Related Codes

There are numerous playing techniques incicated in koto scores. In particular, the left hand is used to play many pitch ornaments by pushing down or pulling the string on the opposite side of the bridge. The composition *Rokudan no shirabe* by Yatsushashi Kengyo is an etude which introduces many of these techniques to the koto student. Here are the opening measures of *Rokudan* in traditional notation and Western notation. The mark above the 5 in measure 1 indicates a *hiki-iro* where the string is pulled by the left hand to gradually lower the pitch of the string about a half-tone.

5 - 3 1 | 0 3 3 8 7 6 7 | 1 5 4 3 1 | 9 8 7 8 7 6 7 |



```
!!!OTL@@JA: Rokudan no shirabe
!!!OTL@EN: Six-part Composition
**koto
*tune[d:G:A:B-:d:e-:g:a:b-:dd:ee-:gg:aa]
*M4/4
(5+1
-
3
1s
=2
0)
(3|sb
3|sc
8|
7|
6|
7|o
=3
1c
5|
4|
3)
(1s
=4
9
8|
7|
8|
7|
6|
7|o
*-
```

Accidentals: oshi-iro (push-colorations) or oshide

* = yowa-oshi (weak-push) sharpen string by a 1/2-step by depressing the string slightly with the left hand. Indicated in Yamada scores by a hollow triangle point up above the string number. Indicated in Ikuta scores to the left of the string number with the katakana character which looks like a reversed capital F letter.

- ** = tsuyo-oshi (strong-push) sharpen string by a wholestep by depressing the string hard with the left hand. Indicated in Yamada scores by a solid triangle pointing upwards above the string number.
- *** = sharpen string by a 1 and 1/2 steps by depressing the string very hard with the left hand. Indicated in Yamada scores by a hollow triangle pointing upwards with a dot in the center above the string number.

Other left-hand techniques:

- o = oshi-tome, or ato-oshi. start in natural position, then glissando up a wholetone by the end of the note by pressing down on the string with the left hand. Indicated in Yamada scores with a line followed by a solid triangle above the string. Indicated in Ikuta scores by a katakana 'o' under and to the right of the string number.
- h = oshi-hanashi (pushed string released). start with string in double-sharp position, then glissando down a wholetone by the end of the note to the natural open string position (the reverse of oshi-tome). Indicated in Yamada scores with a solid triangle followed by a line above a string number.
- r = oshi-tome-hanashi: "push release". A combination of the two techniques above. Start with the string in the natural position, then press the string down to raise the pitch by a whole tone. Hold the string down for a while, and then release the string to lower the pitch back to the natural position release the string to lower the pitch back to the natural position. Japanese scores indicate an oshi-tome-hanashi with an oshi-tome symbol above a string number, followed by the katakana character ha.
- K = oshi-hibiki: "bouncing"; press and release quickly. Start with the string in the natural position. Then start pressing down to raise the pitch a whole tone. Immediately release the string to return to the natural position. The effect should immitate a bouncing ball, for example.
- k = tsuki-iro (sharp-color), or chitsu. Similar to oshi-hibiki, but occurs much quicker and the string is only depressed to raise the pitch 1/2 tone. Yamada scores indicate tsuki-iro with a small tsu katakana character above the string number. Ikuta scores indicate tsuki-iro with a small tsu katakana character below and to the left of the string number.
- ow = oshi-tome yuri-iro: "shake, wiggle". Perform at least two oshi-tomes in sequence to produce the pitch pattern: low, high, low, high, low. Similar to a tremolo, but slower.
- hw = oshi-hanashi yuri-iro: "shake, wiggle". Perform at least two oshi-hanashi in sequence to produce the pitch pattern: high, low, high, low, high. The reverse of oshi-tome yuri-iro. Similar to a tremolo, but slower.
- i = hiki-iro (pull-color). Pull the indicated string with the left hand towards the right to lower the pitch of the currently playing string. The lowering usually occurs halfway though the duration of the note, and the ending tone is approximately a half-step.
- * = keshi (*extinguish*), or keshi-tsume (*extinguish-nail*). Place the left hand second finger's nail on the string near the right side of the bridge. The string is played as normal by the right hand, but the left hand on the string generates a noisy tone which dies more quickly than an un-stopped string. Indicated in Yamada scores with a dot above the string number, and indicated in Ikuta scores with a double hash mark to the right of the string number.
- .. = kake-oshi. When two strings must be pressed by the left hand in quick succession, they are usually pressed at the same time.
- indicates the start of a kake-oshi and '--' indicates the end of the kake-oshi.

Right-hand Techniques:

- V = sukui-tsume. repeated string in the reverse direction, string is not indicated in score. In Yamada scores, a large 'V' replaces the string number. In Ikuta scores, a large katakana 'su' replaces the string number.
- v = same as V, but string is indicated explicitly in the score.
- vv = furi-tsume ornament. A tremolo on one string with the plectrum hitting the string on both forward and backward strokes. In Yamada scores, the tremolo is indicated with a wavy line above the string number. In Ikuta scores, the string number is followed by a 'tr' mark for a trill, followed by a wavy line.
- s = ura-ren (in kuchijamisen: sararin, sara) ornament. The 13th string is stroked quickly along its length from right to left. Then fingers 2 and 3 of the right hand lightly stroke in reverse direction on the 13th to 12th or 11th strings until it is time to play the last two notes of the sara technique. The time playing the 13th to 11th strings may be very short for a short duration sara, or can be very long for a long duration sara. The sara is left by playing with the back of the 3rd finger plectrum until the thumb reaches the grace note of the ending sequence of the sara. The following note after the sara technique indicator should be a grace note followed by the final note of the sara technique which is one string below the grace note string.
- R = hiki-ren or hiki-sute ornamentation. An upward string glissando using finger 3 with the first two note and last two notes of the glissando more pronounced than strings in the middle of the glissando. Indicated in Yamada scores with a light line above the starting and ending strings. Hike-sute does not play all strings, while hiki-ren starts with string 1 and ends on string 13.
- N = nagashi-tsume. A downward string glissando covering all pitches, the last two strings being played distinctly. Indicated with a thick line above the notes of the ornament in Yamada scores.
- M = nami-gaeshi (returning wave). A string glissando which starts on a low string, then goes up to a specified high string, and then back down to a specified lower string. The first two and last two strings are played distinctly. In Yamada scores, the ornament is notated as a wavy line above the notes specifying the ornament.
- = kaki-tsume, wari-tsume (in kuchijamisen: sha). The note indicated for the sha is played strongly as a grace note on the beat. The finger playing that note then plays the next string closer to the performer (the next highest string). This is done quickly so that the two strings sound as if they were played together. A Kaki-tsume is played typically with the third finger, and the plectrum comes to rest on the string above the two strings in the ornament. With wari-tsume which is played more quickly with alternating fingers, the plectrum is drawn away from the strings and does not rest on the next higher string.

- ^u = uchi-tsume (strike-plectrum) ornament. Strike the string with the face of the plectrum, typically finger 3. Release the string quickly to allow the string to resonate. In Yamada school notation, the technique is indicated with a small katakana 'u' above the string number. Indicated in Ikuta scores with a small kanji 'u' to the right of the string number(s).
- ⁿ = chirashi-tsume ornament. Scraping quickly and lightly on the side of the string with the plectrum to generate a pitch. Indicated in Yamada scores with a small 'chi' katakana character above the string. Indicated in Ikuta scores with an arrow above the string number pointing to the right.
- j = hajiki
- ... awase-tsume, or in kuchijamisen: chan (chord). strings played simultaneously. Usually two strings an octave apart plucked at the same time with the thumb and middle finger. For example, a chan on the strings 10 and 5 would be indicated with a space between the two string numbers: "1 5". In Yamada scores, the string numbers are stacked vertically and an opening parenthesis is placed to the left to indicate that the notes are to be played together. In Ikuta scores, the notes are placed on the same horizontal line.
- ... oshi-awase -- similar to the sha arpeggio, but usually played in the opposite direction by the thumb. The two strings are tuned to the same pitch by raising the pitch of the lower string to match the upper string's pitch. For example, oshi-awase on strings 5 and 6 in hira-choshi would be notated: 6: 5*. The first string to be played is given first, and the second string last. The **kern mark for arpeggiation is appended to each string code in the oshi-awase ornament.

Fingerings:

By default, fingering marks are for the right hand. Left hand fingerings are indicated by appending an "L" after the finger mark. The first three fingers of the right hand play the string with plectra. Softer sounds can be produced with the left hand or with the fourth finger of the right hand. The fifth finger of the right hand is never used in traditional koto playing.

- a = first finger (thumb) is to be used to play the note
- b = second finger (index finger) is to be used to play the note
- c = third finger (middle finger) is to be used to play the note
- d = fourth finger (ring finger) is to be used to play the note. This finger does not wear a plectrum, so if a string is played with this finger, the tone is softer and more similar to an orchestral harp. This technique is called pizzicato (pichikaato) in Ikuta scores, which are usually indicated by drawing a circle around the string number, although sometimes written with the numeral 4 on the upper right of the string number to indicate playing with the fourth finger.
- e = fifth finger (pinky finger) is to be used to play the note. Note the fifth finger is not used in traditional koto performance.
- L = fingering for left-hand

4. Vocal Codes

Koto music is often accompanied by voice. The pitches for the voice are notated with koto string numbers, and can be encoded in a separate **koto spine. The rhythm of the vocal part is much more free than the accompanying koto music, and it usually has an incomplete rhythmic specification. When the vocal part is in a free rhythm, the tandem interpretation marker *free can be used to indicate that the rhythmic durations are not precise. The marker *strict can be used to indicate that the rhythms are to be followed exactly.

When the *free marker is in effect, the note attacks are assumed to start where the notes occur in the score, but the note durations depend on the position of the next note in the spine.

Additional codes which can be used in **koto spines for use with vocal parts:

- , = breath mark
- ^ = note is one octave higher than notated

The voice's lyrics can be encoded as **lyrics, with the following additional codes.

- # = the token syllable(s) are written in katakana rather than the default use of hiragana.

Here is an example voice part from the composition *Chidori no kyoku* (Song of the Sand Plovers). Notice that the vocal part does not have a well defined rhythm, while the koto part is precisely notated in a 2/4 meter. Click [here](#) to listen to this example converted into MIDI. The approximate position of the vocal notes are given by their relationship to the strictly notated rhythm of the koto line.

```

**koto  **lyric  **koto
**Ikoto  *      *Ivox
**M2/4   *      *
**MM50   **MM50  **MM50
*tune[d:G:A:c:d:e:g:a:cc:dd:ee-:gg:aa] *
*      *      *tune[d:G:A:c:d:e:g:a:cc:dd:ee-:gg:aa]
*      *      *free
*      *      *
(A+ 5+  .      .
-      .      .

```


.	shi	A
=	-	=
0	-	.
.	o	A
0	-	.
=	-	=
A+ 5+	-	.
-	-	9
.	no	A
=	-	=
A	-	.
[9	-	9
.	-	A
=	-	=
9 o)		8
.	.	0
A	ya	8
9	-	.
8	-	.
=	-	=
7	-	.
.	-	7
W	-	6
.	-	=
0	-	7
D	-	.
C	-	.
B	-	.
.	-	B
=	-	=
A+ 5+	-	A
-)	-	9
.	-	A
=	-	=
0	ma	A
0	-	.
=	-	=
{5+ 1+	-	.
-		.
=	-	=
*_	*_	*_

5. **kern Related Codes

Musical codes of the **kern music representation format for encoding Western music in Humdrum can be used in the **koto representation when they do not conflict in meaning with **koto symbols. This section notes some of the more common borrowings. Barlines are equivalent to those found in the **kern representation. Some common examples of barlines include:

- = = barline
- =34 = barline for measure 34
- =|| = double barline
- =34|| = double barline at measure 34
- == = final barline

Phrase, slur, and tie marks work in a similar manner to **kern data. These markings may only be attached to string data, and not to measure data.

- (= start of phrase mark
-) = end of phrase mark
- (= start of slur mark
-) = end of slur mark
- { = start of tie mark
- } = end of tie mark
- _ = continuation of tie mark

Other symbols equivalent to their meanings in **kern:

- q = grace note
- ; = fermata
- ~ = breath mark

Recognized Interpretations

**kern interpretations are either recognized or ignored properly. In particular, the following **kern tandem interpretations have the same meanings in the **koto representation:

- *M4/4 = 4/4 time signature

*MM120 = tempo marking of 120 beats per minute

6. Related Humdrum Representations

Traditional koto music was transmitted orally using mnemonic syllables called *kuchijamisen* ("mouth-shamisen/instrument"). These katakana words represent how the shamisen (or koto) sounds. They are used to remember melodies; however, they do not express the pitches exactly. Traditional players sing the melody of shamisen (or koto) part using these words, which is why they are called "kuchi-jamisen".

To record the *kuchi-jamisen* syllables, a Humdrum representation called ****kuchi** is used. It has similar properties to the ****text** representation. The *kuchi-jamisen* syllables are usually written above the music staff in Katakana characters when it is displayed with modern printed koto music. Here is a sample of *kuchijamisen* for the opening of *Rokudan no shirabe*

```
!!!OTL@@JA: Rokudan no shirabe
!!!OTL@EN: Composition in Six Parts
**koto **kuchi
*M4/4 *M4/4
*tune(d:G:A:B-:d:e-:g:a:b-:dd:ee-:gg:aa)
(5+1 te
- n
3 ton
1s shan
=2 =2
0)
(3|sb sha
3|sc sha
8| koo
7| ro
6| rin
7|o chin
=3 =3
1c ton
5| koo
4| ro
3| rin
(1s shan
=4 =4
9 chin
8 te
7 tsu
8 koo
7 ro
6 rin
7|o chin
*_
```

7. Programs which can process ****koto** data

Four programs have been developed to process ****koto**: koto2eps, koto2kern, koto2midi, and kern2koto.

koto2eps

Converts monophonic ****koto** data into a performance score in the Encapsulated PostScript (EPS) graphics format. Multiple lyric verses can be displayed properly. Here is an example of the first section of *Rokudan* typeset with koto2eps. Click [here](#) for a basic MIDI version of this part of the score.

Rokudan no shirabe

Yatsushashi, Kengyoo
(1614-1685)

```
| 5̣ - 3 11 | 0 3̣3̣8̣7̣6̣7̣ | 1 5̣.4̣3̣ 11 | 9 8̣7̣8̣7̣6̣7̣ |
| 1 5̣.4̣3̣ 11 | 0 11 5̣ 11 | 6̣ 1̣5̣ 7̣ - | 3̣3̣8̣7̣3̣3̣8̣9̣ |
| 5̣ Ạ9̣8̣ 11 | 9̣ ẠC̣ḌC̣ḄC̣ | Ḅ5̣Ạ9̣8̣ 11 | 9̣ Ạ Ḅ Ḅ |
| Ạ9̣Ạ9̣8̣ 7̣8̣ | 9̣ 11 Ạ 8̣6̣ | Ḅ 5̣Ạ C̣ ḌC̣ | 8̣8̣ḌC̣ Ḅ Ạ |
| 9̣8̣ḌC̣ 8̣8̣ḌC̣ | Ḅ Ạ 8̣ Ḍ | 5̣ Ạ 9̣ Ạ | ḄẠ 9̣ Ạ9̣8̣9̣ |
```

| 7 8 9 A 5 5 A C B A | D C B B. C | 5 A 9 8 7 8 |
| 9 A 9 A 9 8 9 | 7 8 9 A 8 7 6 7 | 1 5 4 3 1 |

koto2kern

Converts ****koto** data into ****kern** data. Glissando markings and most other special techniques are translated approximately into Western music notation. Here are the first four bars of *Rokudan* converted into ****kern** data automatically with the **koto2kern** program:

```
!!!OTL@@JA: Rokudan no shirabe
!!!OTL@EN: Composition in Six Parts
**koto  **kern
*M4/4    *M4/4
*tune[d:G:A:B-:d:e-:g:a:b-:dd:ee-:gg:aa]
(5+i    (2d
-
3        4A
1s      4d: 4G:
=2      =2
0)      4x)
(3|sb   (8A: 8B-:
3|sc    8A: 8B-:
8|      8.a
7|      16g
6|      8e-
7|o     16gH
.       16ah
=3      =3
1c      4d
5|      8.d
4|      16B-
3)      4A)
(1s     (4d: 4G:
=4      =4
9       4b-
8|      8a
7|      8g
8|      8.a
7|      16g
6|      8e-
7|o     16gH
.       16ah
*-      *-
```

Special codes understood by the koto2eps program: Color Highlighting

Music in a koto score can be highlighted using special color commands which are embedded in local or global comments. This highlighting can be used for analysis display or any other purpose. Here is the format for a color selection command:

- !CLR:xxx = Set the printing color to xxx, where xxx is a particular color name, or a 6-hex digit color code in the form RRGGBB as in HTML color codes.
- !!CLR:xxx = Same but for all staves in system

Here is a sample of color highlighting:

|| 5̃ - 3 1 | O 338.767 |
 2 3

Text in score

Text can be placed above or below any musical object in the score. **TA** will place the text above the staff/system, and **TB** will place the text below the staff/system.

- !TA:xxx = text above a staff
- !TB:xxx = text below a staff
- !!TA:xxx = same as !TA:xxx, but applies to whole system
- !!TB:xxx = same as !TB:xxx, but applies to whole system

 above
|| 5̃ - 3 1 | O 338.767 | 1 5 4 3 1 |

| 0 - 0 1 | 0 2 2 2 2 2 | 2 2 0 1 |
below

Text font selection and positioning

!FNT:TR14L = set text font to Times Roman 14 point left centered at selected positions in the score. Font size can be an integer or a floating-point number.

font	face	position
T = times	R = regular/romanc	= center justify
H = helvetica	= italic	L = left justified
C = courier	B = bold	R = right justified

!!FNT:xxx = same as **!FT:xxx**, but applies to whole system

koto2midi

Approximates a koto performance of the score. Converts ****koto** data directly into MIDI data with pitch bend messages used to model glissandos. The durations of strings are also determined from the score. MIDI data can also be generated from the output of the koto2kern program.

kern2koto

Converts ****kern** data into the ****koto** representation for creating koto performance scores from Western-style scores.

8. **koto Symbol Dictionary

Preferred ordering of elements in a ****koto** datum:

open slur/phrase/tie mark -- string -- rhythm -- accidentals -- articulations -- fingerings -- closing phrase mark

0	= rest
1	= string 1, 11 = alternate string 11 code, 111 = string 21
2	= string 2, 22 = alternate string 12 code, 222 = string 22
3	= string 3, 33 = alternate string 13 code, 333 = string 23
4	= string 4, 44 = alternate string 14 code, 444 = string 24
5	= string 5, 55 = alternate string 15 code, 555 = string 25
6	= string 6, 66 = alternate string 16 code, 666 = string 26
7	= string 7, 77 = alternate string 17 code, 777 = string 27
8	= string 8, 88 = string 18, 888 = string 28
9	= string 9, 99 = string 19, 999 = string 29
A	= string 10, AA = string 20, AAA = string 30
a	= finger 1 (thumb)
B	= string 11
b	= finger 2 (index finger)
C	= string 12
c	= finger 3 (middle finger)
D	= string 13
d	= finger 4 (ring finger); Ikuta pizzicato
E	= string 14 (bass koto only)
e	= finger 5 (pinky finger)
F	= string 15 (bass koto only)
G	= string 16 (bass koto only)
H	= string 17 (bass koto only)
h	= oshi-hanashi glissando
i	= hiki-iro pitch inflection
j	= hajiki
K	= oshi-hibiki glissando
k	= tsuki-iro glissando
L	= indicates fingering is for left hand (default is right hand)
M	= mami-gaeshi ornament
N	= nagashi-tsume ornament
n	= chirashi-tsume
o	= oshi-tome glissando
r	= oshi-tome hanashi glissando
R	= hiki-ren, hiki-sute ornament
S	= ura-ren (sara) ornament
t	= soe-tsume
s	= kaki-tsume (sha) ornament

u	= uchi-tsume ornament
v	= sukui-tsume -- reverse stroke on string; using previously indicated string (string not indicated)
v	= sukui-tsume -- reverse stroke on string
vv	= furi-tsume (tremolo), plucked tremolo
w	= wa stroke
w	= yuri-iro glissando technique, used only with o and h: ow and hw
z	= suri-tsume to the left.
z	= suri-tsume to the right.
#	= sharp (oshi-iro)
##	= double-sharp (oshi-iro)
###	= triple-sharp: raise the string pitch by 1 and 1/2 steps (oshi-iro)
+	= 1 beat duration addition to current note
.	= augmentation dot
:	= oshi-awase, and other arpeggiations
-	= continuation of tie mark
-	= continuing long note
(= end of phrase mark
)	= end of slur mark
]	= end of tie mark
:	= fermata
	= rhythm beam (if not in barline data)
*	= keshi-tsume stopped string
(= start of phrase mark
(= start of slur mark
[= start of tie mark
<	= start of crescendo
,	= breath mark for voice
^	= 8va mark for vocal part
#	= katakana marker (in **lyric)
<<	= end of crescendo
>	= start of decrescendo
>>	= end of decrescendo
space	= chord note separator (chan)

8. References

- David Huron. The Humdrum Toolkit: Software for Music Research. <http://dactyl.som.ohio-state.edu/Humdrum>
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