

Quantitative Analysis of Folk Customs and Motion Characteristics of Bon Odori Dances in Akita Prefecture

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In this study, we investigate the Bon Odori dances of Akita Prefecture from the viewpoints of ethnological approach and motion analysis. To objectively evaluate their conditions, we adopt an approach of quantitatively analyzing numerical data. The investigation data of folk customs obtained through the emergency survey of folk cultural properties are analyzed in ethnological approach, whereas the motion capture data of the Bon Odori dances are used in motion analysis. The characteristics of the representative Bon Odori systems of Akita Prefecture (Kazuno-Odori, Akita-Ondo and Nanshu-Odori Systems) are extracted and compared. The obtained results suggest the relevance between the tendency of the folk-custom characteristics and that of the motion characteristics of the Bon Odori dances.

1. Introduction

In Akita Prefecture, Japan, a lot of folk dances have been passed down. In particular, *Bon Odori* dances*¹ have attracted a great deal of attention. By investigating the *Bon Odori* dances in detail, much valuable information contributing to understanding the folk performing arts of Akita Prefecture is expected to be obtained.

According to Ref. [1], research activities on folk dances are generally grouped into three categories: ethnological approach, motion analysis and study of music. In this study, we investigate the *Bon Odori* dances of Akita Prefecture from the viewpoints of ethnological approach and motion analysis. To objectively evaluate their conditions, we adopt an approach of quantitatively analyzing numerical data. The investigation data of folk customs obtained through the emergency survey of folk cultural properties (held in 1977-78) [2] are analyzed in ethnological approach, whereas the motion capture (Mocap) data of the *Bon Odori* dances are used in motion analysis. By investigating the obtained analysis results, we examine the relevance between folk customs and the motion characteristics of *Bon Odori* dances in Akita Prefecture.

2. Bon Odori Dances of Akita Prefecture

Reference [3] describes that *Bon Odori* dances of Akita Prefecture are grouped into four systems: *Kazuno-Odori*, *Akita-Ondo*, *Yuri-Bon-Odori* and *Nanshu-Odori* Systems. **Figure 1** shows the geo-

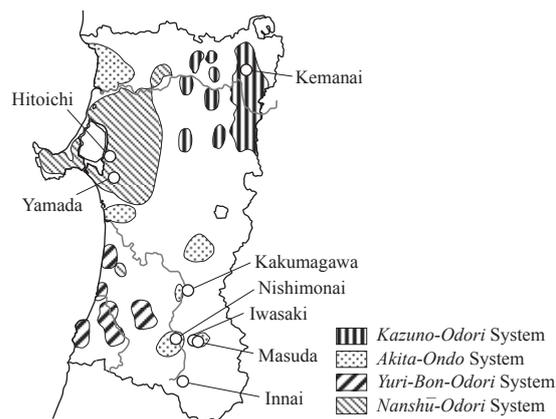


Fig. 1 Distribution of *Bon Odori* systems in Akita Prefecture (created by tracing the map on Page 17 of Ref. [3]).

graphic distribution of the four systems. This classification was proposed based on the condition of the dances in 1937. At present, however, most of the dances belonging to *Yuri-Bon-Odori* System are lost [4]. In motion analysis, therefore, we use only the Mocap data of the dances belonging to *Kazuno-Odori*, *Akita-Ondo* and *Nanshu-Odori* Systems. Specifically, the dances passed down in the eight districts shown in Fig. 1 are analyzed.

Table 1 shows the *Bon Odori* dances analyzed in this study. It is seen that the number of the dances passed down in a single district belonging to *Nanshu-Odori* System is generally larger than that of the other systems. It is also noted that the performance length of the dances belonging to *Akita-Ondo*

*¹ *Bon Odori* is a type of Japanese folk dance performed during the annual Buddhist festival called *O-Bon* (or simply *Bon*).

Table 1 Analyzed *Bon Odori* dances.

| District | Dance (index ¹) | Motion capture data | | |
|----------------------------|-------------------------------|---------------------|-------------------------|--------|
| | | Number | Length [s] ² | Sensor |
| Kazuno-Odori System | | | | |
| Kemanai | <i>Dainosakai</i> (D) | 3 | 10.8 | B |
| | <i>Jinku</i> (J) | 3 | 9.9 | B |
| Akita-Ondo System | | | | |
| Kakumagawa | (no particular name) | 1 | 59.3 | A |
| Masuda | (no particular name) | 2 | 69.2 | A |
| Iwasaki | <i>Otoko Odori</i> (T) | 1 | 72.6 | A |
| | <i>Onna Odori</i> (N) | 1 | 73.8 | A |
| Nishimonai | <i>Ondo</i> (O) | 3 | 44.5 | B |
| | <i>Ganke</i> (G) | 3 | 41.1 | B |
| Innai ³ | <i>Innai Ginzan Odori</i> (D) | 4 | 29.3 | A |
| | <i>Innai Ginzan Ondo</i> (N) | 2 | 39.4 | A |
| Nanshū-Odori System | | | | |
| Hitoichi | <i>Dendenzuku</i> (D) | 3 | 6.6 | A |
| | <i>Kitasaka</i> (K) | 4 | 5.5 | A |
| | <i>Sankatsu</i> (S) | 4 | 11.6 | A |
| Yamada | <i>Kitasaka</i> (K) | 5 | 5.5 | C |
| | <i>Dagasuko</i> (D) | 4 | 6.9 | C |
| | <i>Sankatsu</i> (S) | 3 | 11.8 | C |

Sensor system

A: MotionStar Wireless (Ascension Technology Corporation) (30 fps)

B: MotionStar Wireless with LIBERTY (Polhemus)×2 (30 fps)

C: MVN (Xsens) (120 fps)

1: Used in Fig. 3 (c).

2: Mean value of the used motion-capture data streams.

3: Although the dances of Innai are performed on the dates different from those of the *Bon* festival, we added them considering the theory that they had no small influence on the *Bon Odori* dances of *Akita-Ondo* System [5].

System is much longer than that of the other systems. More detailed information about the motion characteristics of these dances will be shown in Section 4.

3. Analysis of Folk Customs

The emergency-survey report [2] provides the investigation data of folk customs obtained in 150 locations within Akita Prefecture. Specifically, the distribution of a set of folk-custom categories corresponding to each of the typical 65 folk-custom items is given. **Table 2** shows the items investigated. **Figure 2** shows an example of the distribution of folk-custom categories; the distribution of five categories belonging to the item “New year’s event” (Item 46 in Table 2) is shown. The total number of the categories belonging to all the 65 items is 356. To quantitatively grasp the relationship among the four *Bon Odori* systems based on the similarity of folk customs, we apply a technique of correspondence analysis [6] to the two-way table giving the presence of each category at each location.

Figure 3 shows the analysis results obtained. **Figure 3 (a)** shows the geographic distribution of the 150 locations investigated in the emergency survey. It is indicated that *Yuri-Bon-Odori* System and part of *Kazuno-Odori* System belonged to the domains other than Akita Domain (Akita Han) in the early-modern times [7]. **Figure 3 (b)** is the scatter diagram of the locations obtained by the correspondence analysis of the investigation data. This diagram represents the distribution of the locations based on the similarity of

Table 2 Folk-custom items investigated in the emergency survey [2].

| No. | Item | No. of categories |
|-----|---|-------------------|
| 1 | Name of <i>Yashiki-gami</i> (family house god) | 7 |
| 2 | Structure of a house and roof style | 6 |
| 3 | Name of the guest room | 8 |
| 4 | Name of the working hut | 3 |
| 5 | Name of the <i>irori</i> (fireplace in the floor) room | 10 |
| 6 | Name of the pothook used in the <i>irori</i> | 9 |
| 7 | Name of the iron ring used in the <i>irori</i> | 6 |
| 8 | Name of the seat for the house master in the <i>irori</i> room | 4 |
| 9 | Name of the seat for the master’s wife in the <i>irori</i> room | 10 |
| 10 | Name of the seat for the guest in the <i>irori</i> room | 7 |
| 11 | Name of the seat placed at the foot of the table in the <i>irori</i> room | 9 |
| 12 | Staple food | 6 |
| 13 | Style of the dining table (used in daily life) | 5 |
| 14 | Lunch box | 5 |
| 15 | Working clothes for male (winter, upper body) | 8 |
| 16 | Working clothes for male (winter, lower body) | 2 |
| 17 | Working clothes for female (winter, upper body) | 8 |
| 18 | Working clothes for female (winter, lower body) | 2 |
| 19 | Spinning and weaving using hemp, wisteria, etc. (materials and names) | 7 |
| 20 | Name of a wet paddy field | 11 |
| 21 | Rice drying method | 12 |
| 22 | Name of slash-and-burn farming | 4 |
| 23 | Name of <i>ta-geta</i> (farming clogs) | 7 |
| 24 | Religious belief related to fishery | 2 |
| 25 | Name of a shoulder conveyor | 13 |
| 26 | Name of a back carrier | 16 |
| 27 | Name of <i>ichi</i> (market) | 5 |
| 28 | Names of the age groups | 8 |
| 29 | Religious <i>kō</i> association (<i>kō</i> : a kind of faith group) | 18 |
| 30 | Name of a branch family | 8 |
| 31 | Name of a familial group | 8 |
| 32 | Fictitious parent-child relationship | 8 |
| 33 | Sexuality of the mountain god | 2 |
| 34 | Character of the mountain god | 4 |
| 35 | Wayside deity | 18 |
| 36 | Rite for a god of a lavatory | 3 |
| 37 | Ceremony for bride’s entry into her new house | 6 |
| 38 | Room for a newly-wed couple | 3 |
| 39 | Place for childbirth (bride’s parent’s home or the home she married into) | 2 |
| 40 | Procedure for the placenta after childbirth | 6 |
| 41 | Good luck charm for a newborn child | 3 |
| 42 | Guardian deity for safe delivery | 7 |
| 43 | Religious sect of a settlement | 7 |
| 44 | Funeral method | 2 |
| 45 | Event for drawing up water (held in New Year’s event) | 1 |
| 46 | New Year’s event | 5 |
| 47 | <i>Nanakusa</i> (a dish made with seven herbs of spring) | 2 |
| 48 | <i>Niwa Taue</i> (the rice-planting ceremony) | 2 |
| 49 | <i>Tori-boi</i> (the event of scaring off birds) | 1 |
| 50 | Event held on March 3 (“Girls’ Day”) | 4 |
| 51 | <i>Matobi</i> (the fire festival for welcoming ancestors) | 3 |
| 52 | Event of <i>Haru-higan</i> (the vernal equinox) | 4 |
| 53 | Event held on May 5 (“Boys’ Day”) | 5 |
| 54 | <i>Kashima Nagashi</i> (the event of purification) | 1 |
| 55 | <i>Mushi-okuri</i> (the event of exterminating insect pests) | 1 |
| 56 | <i>Ha-gatame</i> (the festival to wish for tooth growth) | 1 |
| 57 | <i>Tanabata</i> festival (held on July 7) | 2 |
| 58 | Event held in the <i>Bon</i> festival | 5 |
| 59 | Moon viewing (full-moon night) | 3 |
| 60 | <i>Kariage sekku</i> (the rice-reaping festival) | 2 |
| 61 | <i>O-taishi-kō</i> (Buddist festival held on November 24) | 1 |
| 62 | Festival of the mountain god | 3 |
| 63 | <i>Susuharai</i> (year-end house cleaning) | 1 |
| 64 | <i>Usu-fuse</i> (divination of rice harvest) | 1 |
| 65 | <i>Namahage</i> (visit of deities during a New Year’s event) | 3 |

Total: 356 categories

folk customs. It is seen that the locations belonging to Nanbu Domain (Nanbu Han) are especially far from the other locations. This might have been caused by the fact that Nanbu Domain belonged to Mutsu Province, whereas all other domains in Akita Prefecture

46 正月礼



Fig. 2 An example of the investigation data of folk customs: Item 46 “New Year’s event” (including five categories) (reproduced from Page 51 of Ref. [2]).

belonged to Dewa Province. In fact, the locations of *Akita-Ondo* and *Yuri-Bon-Odori* Systems concentrated in almost the same region, even though these systems belonged to different domains. As for the locations of *Nanshu-Odori* System, they occupied a relatively independent single region.

Figure 4 shows examples of the distribution of folk-custom categories. In this figure, the categories are plotted on the scatter diagram identical to that shown in Fig. 3 (b) (the scales of the vertical and horizontal axes are suitably changed.). Figure 4 (a) shows the distribution of the categories related to the

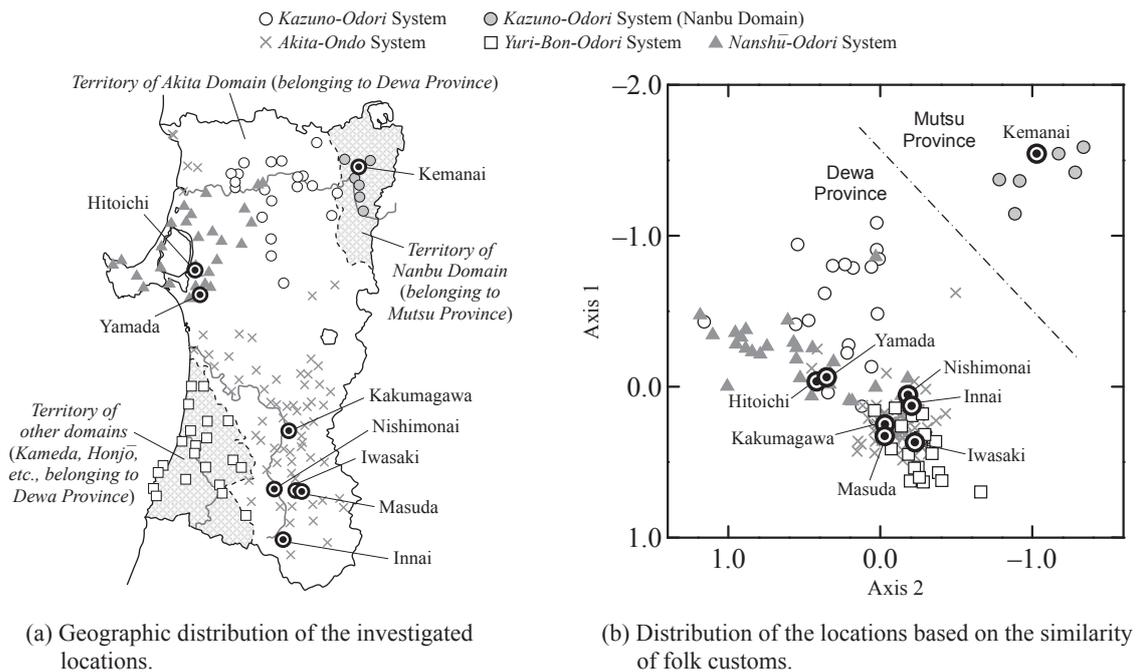


Fig. 3 Distribution of the investigated locations obtained by the folk-custom analysis.

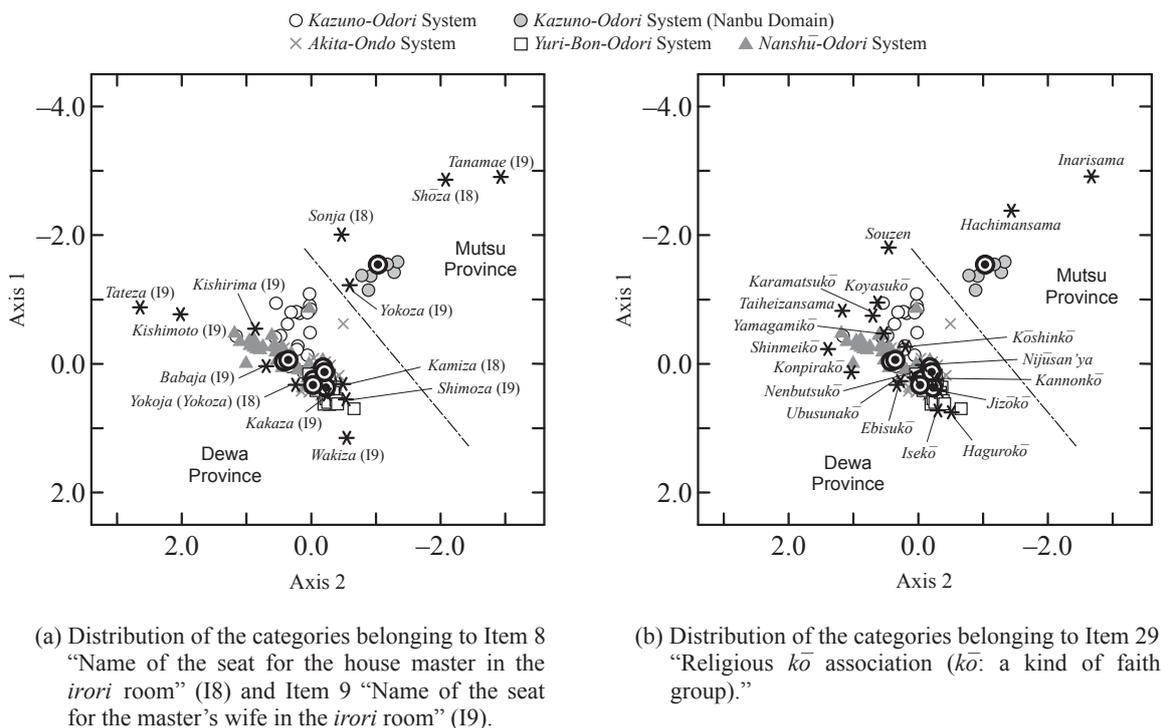


Fig. 4 Examples of the distribution of folk-custom categories.

names of the seats in the *irori* room (*irori*: fireplace in the floor [8]) (corresponding to Items 8 and 9 in Table 2). In an old-style Japanese private residence, the seat order in the *irori* room has been strictly defined for each of the family members [9], and the naming of the seats is thought to be affected by the

folk customs of each district.

Figure 4 (a) shows that the seat for the house master (Item 8) is named *Kamiza* or *Yokoja* (or *Yokoza*) in Dewa Province, whereas *Shōza* or *Sonja* in Mutsu Province. According to Ref. [9], *Yokoza* is an old name of the seat for the house master, and has been

distributed widely throughout the country. In fact, the use of the name *Yokoza* can be seen also in Saga Prefecture [10], which is far away from Akita Prefecture. On the other hand, there are not many places where the name *Shōza* (or *Sonja*) has been used, at least to our knowledge. As for the seat for the master's wife (Item 9), there are many names in Dewa Province, whereas only two names (*Yokoza* and *Tanamae*) exist in Mutsu Province.

Figure 4 (b) shows the distribution of the categories related to the local religious association called *kō* [11] (Item 29 in Table 2). Many types of *kō* can be seen in Dewa Province: Buddhist line (*Kannonkō*), Shinto line (*Shinmeikō*), etc. It should be noted that the categories related to the local gods (*Taiheizansama* and *Karamatsukō*) are included mainly in the area of *Nanshū-Odori* System. In contrast, almost all the categories included in the area of *Akita-Ondo* System have been distributed widely throughout the country [11]. On the other hand, only two categories (*Hachimansama* and *Inarisama*, both belonging to Shinto Sect) can be identified as being unique to Mutsu Province including part of *Kazuno-Odori* System.

As mentioned above, each of the areas in Akita Prefecture shows its own folk-custom characteristics. Their relevance to the motion characteristics seen in each of the *Bon Odori* systems will be discussed in Section 5.

4. Analysis of Dance Motion

In motion analysis, we use the Mocap data of the *Bon Odori* dances shown in Table 1. These data are analyzed using the method of Ref. [12]. This method characterizes each dance by two time-domain quantities (beat intensity and rhythm complexity) and 12 spatial-domain quantities (average amounts and fluctuations of spread along the frontal, vertical and sagittal axes [13] and on the frontal, sagittal and horizontal planes [13]). The obtained characteristics are visualized as a scatter diagram on a two-dimensional space.

Figure 5 shows the motion-characteristic distribution of the *Bon Odori* dances analyzed. The axes q_{BI} and q_{ApEn} are those of beat intensity and rhythm complexity, respectively. These quantities provided high correlation-coefficient values with respect to the coordinates on the axes of the scatter diagram (over 0.85). This means that these quantities particularly gave a remarkable influence on the obtained distribution.

The difference between the location belonging to Nanbu Domain (i.e., the Kemanai district, one of the locations in *Kazuno-Odori* System) and the other locations (i.e., the set of the districts belonging to *Akita-Ondo* and *Nanshū-Odori* Systems) is seen

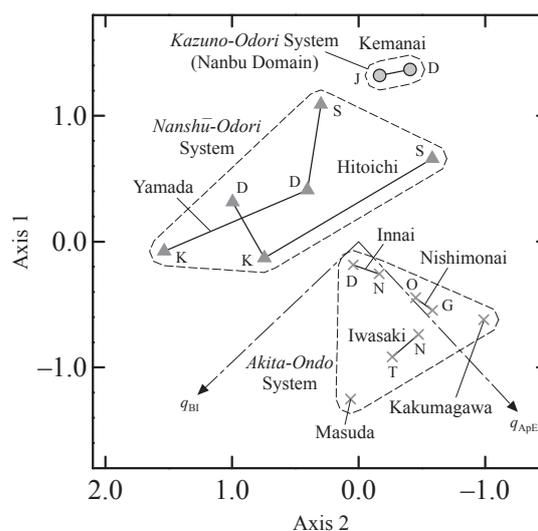


Fig. 5 Distribution of the *Bon Odori* dances obtained by the dance-motion analysis.

mainly in the beat-intensity characteristic. The beat intensity of the dances passed down in the Kemanai district is considerably low. On the other hand, *Akita-Ondo* System and the other systems were separated by the difference in rhythm complexity. The dances of *Akita-Ondo* System were plotted on the area providing a highly complex rhythmic structure. It is also seen that each of the districts belonging to *Nanshū-Odori* System gave a wider variety of motion styles compared with those belonging to the other systems.

5. Discussion

As mentioned in Section 3, the locations included in Dewa Province, especially those belonging to *Akita-Ondo* System, showed the tendency that many of the folk-custom categories were the ones distributed widely throughout the country. This tendency was also seen in several items other than those shown in Section 3. According to Ref. [12], the locations belonging to *Akita-Ondo* System were connected by a network system consisting of Ushū Kaidō Road and Omono River in the early-modern times. This caused the influx of culture from other regions, and might have brought the sophisticated dancing style of the *Bon Odori* dances (i.e., long performance length and a highly complex rhythmic structure). The tendency of folk customs also shows relevance with other regions, and therefore might have been attributed to the same factor.

On the other hand, the locations belonging to *Nanshū-Odori* System showed a distinctive dance-motion characteristic (i.e., a wide variety of motion styles). This may have some relevance with the folk-custom characteristics specific to this system

(e.g., occupying a relatively independent single region in Fig. 3 (b), relationship with the local gods shown in Item 29, etc.). As for the dances of the Kemanai district belonging to *Kazuno-Odori* System, Nanbu Domain and Mutsu Province, a mild and simple rhythmic style was shown. Currently, however, the relevance between the above motion style and the folk-custom characteristics of this district is still unknown.

As mentioned in Section 1, the emergency survey in which the analyzed folk-custom data was acquired was held in 1977-78. On the other hand, the Mocap data used in this study was acquired in 2003-2015. The above time lag is not considered in the present stage. Additional work is needed to investigate the influence of the time lag.

6. Conclusions

In this study, we investigated the *Bon Odori* dances of Akita Prefecture from the viewpoints of ethnological approach and motion analysis. Through the quantitative analysis of the investigation data of folk customs and the Mocap data of the dances, we obtained a new insight into, or at least a slight clue to, the relevance between the folk customs and the motion characteristics of *Bon Odori* dances in Akita Prefecture. However, the verification of the obtained results is not sufficient in the present stage. This will be the subject of future work.

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