

A formalization of rituals that allows estimating degrees of their similarity

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Abstract

Any ritual is a semiotic system and can be formalized just like any other semiotic system, and after formalization, it is possible to estimate the degrees of similarities of different rituals. Any ritual can be considered as a play/performance and can be described by the following system of sets: Participants (P), Tools and locations (T), Actions (A), and Expected results (R). To estimate the degree of similarity of two rituals should be estimated the degree of similarity of P of one ritual with P of another ritual, T of one ritual with T of another ritual, and so on, finally should be taken arithmetic mean of four received values. The procedures of formalizing and comparison of rituals are shown on the material of the Ainu bear ritual – *iomante*, Ainu ritual *kamuy nomi*, and the bear ritual that was practiced in Lithuanian Panevėžys.

Keywords: rituals; comparison of rituals; cultural anthropology; semiotics; mathematical semiotics

1. Introduction

Any ritual is a semiotic system and can be formalized just like any other semiotic system, and after formalization it is possible to estimate degrees of similarities of different rituals that is more useful than speculative discussions about similarities and dissimilarities.

Any semiotic system can be represented as $\langle A; \Omega \rangle$ structure where A is a set of elements and Ω is a set of operations/relations/distributions determined upon A (Akulov, Nonno 2017); this scheme shows the general direction of formalization, and optionally it can be modified to reflect the considered material better.

Any ritual¹ can be considered as a play/performance, and so can be described by the following system of sets: Participants (P), Tools and locations (T), Actions (A), and Expected results (R).

2. Formalization and estimating the degree of similarities of certain particular rituals

To illustrate the procedures of formalizing and comparison of rituals I here show them on the material of the following rituals: Ainu bear ritual – *iomante*, Ainu ritual *kamuy nomi*, and the bear ritual that was practiced in Lithuanian Panevėžys.

2.1. Representation of rituals in a schematic way

2.1.1. Ainu bear ritual – *iomante*

Ainu bear ritual – *iomante* consists of the following consequence of actions: at the end of winter or in early spring people catch a bear cub in a forest, bring it to their settlement where it is grown (usually 1 – 2 years), and when the bear grows large enough, it is killed and then

¹ A ritual is defined here as a set of actions that has no direct utilitarian meaning, but is meaningful in the system of symbols of a certain culture.

eaten. The bear is killed in a special place decorated by *inaw*² (see fig. 2). Men participating in the ritual wear *sapa-un-pe* (see fig. 2) – a special headdress made of *inaw*. (A bear was usually killed by arrows, but also sometimes the bear's neck was squeezed with logs.) Before the bear is shot by a usual hunting arrow it was shot by special arrows named *heperay* (see fig. 1). At the very moment of killing the bear and immediately after that they usually shoot *heperay* arrows in the sky to show the way to the *ramat*³ of the bear.

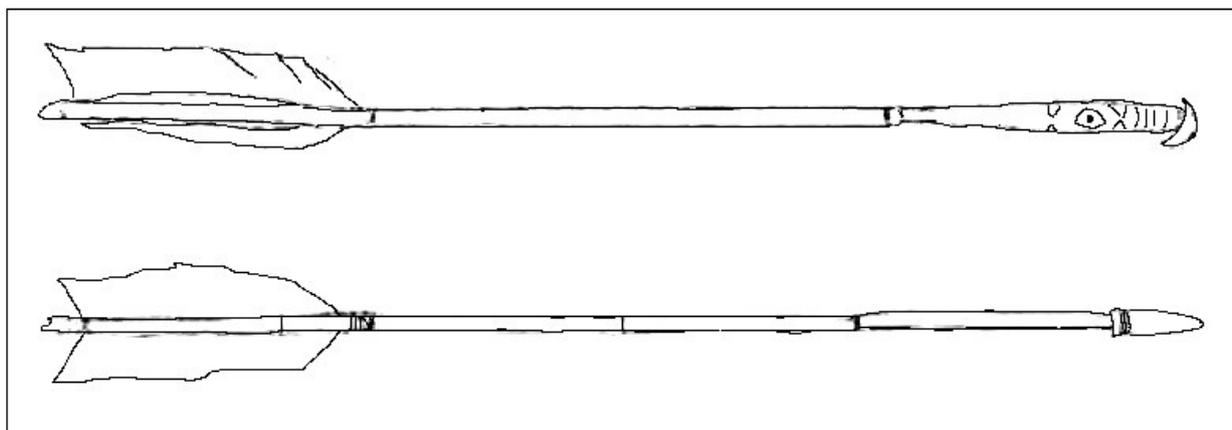


Fig.1. *Heperay* arrow (upper) and usual arrow (low) (image source – Kayano 2005: 56, 402)

After the bear is killed, it is placed upon a special place arranged by *inaw* and other goods; the killed bear is decorated by *inaw*. People eat bear meat, drink sake using special tableware named *tuki* (see fig. 2) and *iku-pasuy* – drinking stick (see fig. 2), recited special prayers to *kamuy*⁴, offered sake to *kamuy* using *tuki* and *iku-pasuy* (sprayed some sake by *iku-pasuy*), sang and danced. The skin and skull of the bear were preserved and hold as reliquiae.

The Ainu believed that by performing the *iomante* ritual, they return the *ramat* of killed animals back, and thereby contribute to the maintenance/increase in the number of game animals (see Nonno, Akulov 2022).

The *iomante* ritual (I) can be schematically represented as the following:

P(I)

- 1) bear
- 2) people

T(I)

- 1) *inaw*
- 2) *sapa-un-pe*
- 3) *heperay* arrows

² *Inaw* is usually a wooden stick arranged with shavings, *inaw* is an inseparable item of any Ainu ritual (Akulov, Nonno 2019)

³ *Ramat* literary means “vital energy exists”, one of two key concepts of Ainu beliefs (Nonno 2015).

⁴ *Kamuy* are beings/items that have a lot of *ramat* and can share it, *kamuy* is another key concept of Ainu beliefs (Nonno 2015).

- 4) plain/usual arrows
- 5) *ikupasuy*
- 6) *tuki*
- 7) sake
- 8) bear meat
- 9) settlement
- 10) house
- 11) cage
- 12) special place decorated by *inaw*
- 13) special place arranged by *inaw* and other goods
- 14) bear skull
- 15) bear skin

A(I)

- 1) People catch a bear cub.
- 2) People bring the cub to their settlement.
- 3) People hold small bear cub in a house.
- 4) People hold the growing cub in a cage.
- 5) People lead the bear to the special place arranged by *inaw*.
- 6) Men wear *sapa-un-pe*.
- 7) People play with the cub by *heperay* arrows.
- 8) People kill the bear by usual arrows and/or by logs.
- 9) People decorate the dead bear by *inaw*.
- 10) People eat the bear.
- 11) People drink sake using *tuki* and *iku-pasuy*.
- 12) People recite special prayers.
- 13) People offer sake to *kamuy* using *tuki* and *iku-pasuy*.
- 14) People offer *inaw* to *kamuy*.
- 15) People send the bear soul/*ramat* to the land of *kamuy*.
- 16) People sing.
- 17) People dance.
- 18) People preserve the skin and skull of the bear.

An action is a matter that can be described by a simple sentence, i.e.: a sentence containing only one meaningful verb.

In a schematized description of actions, it is not important to convey the order of actions, it is important that all the main actions are listed.

R(I)

- 1) Sending the soul of the bear back to *kamuy* land.
- 2) Increasing the number of game animals.
- 3) Getting a special grace from *kamuy* to be lucky in hunting.

Any particular ritual can be described in a more or less detailed way, also it may be rather complicated to distinguish the actions that form the ritual itself from preparatory actions, and so sometimes schematic representations of the same ritual can differ. However, if all actions forming a ritual are mentioned then the description should be considered sufficient.

2.1.2. Ainu *kamuy nomi* ritual

The Ainu *kamuy nomi* ritual is a 'standard' Ainu ritual of prayer to different *kamuy*. *Kamuy nomi* can be performed in the house and outdoor. Here I am going to describe the most simple and the most frequently performed *kamuy nomi*, the *kamuy nomi* that is performed for *Cisekor-kamuy* – The *kamuy* protecting the house and *Ape-huci-kamuy* – the Old woman of fire.

Kamuy nomi consists of the following consequence of actions: people set *inaw* inside a house near the fireplace, men wear *sapa-un-pe*, men offered sake to *kamuy* using *tuki* and *iku-pasuy* (sprayed some sake by *iku-pasuy*), men recited prayers, drink sake using *tuki* and *iku-pasuy*.

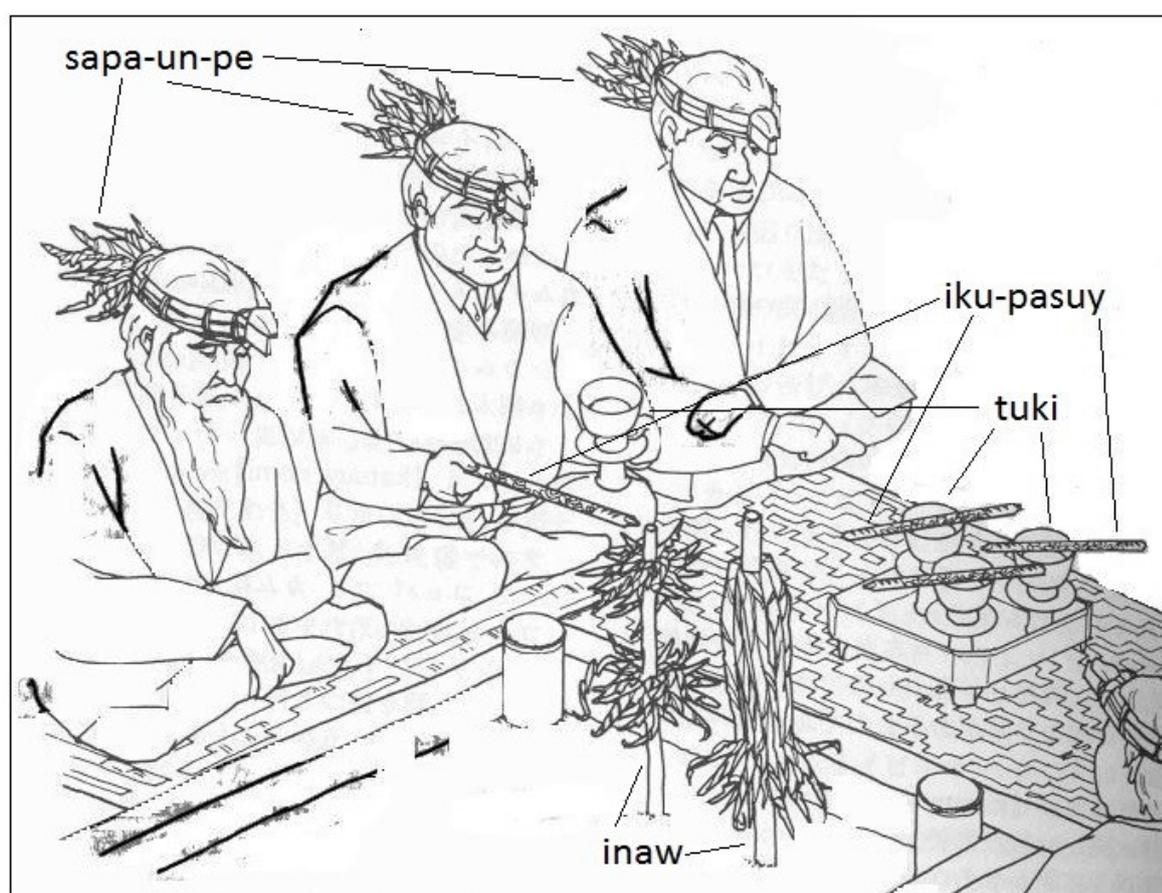


Fig. 2. A group of Ainu elders performing a *kamuy nomi* ritual; can be seen *inaw*, *sapa-un-pe*, *iku-pasuy*, and *tuki* (image source – Kayano 2005: 200)

Kamuy nomi (KN) can be schematically represented as the following:

P(KN)

- 1) people

T(KN)

- 1) house
- 2) fireplace
- 3) *inaw*
- 4) *sapa-un-pe*
- 5) *ikupasuy*
- 6) *tuki*
- 7) sake

A(KN)

- 1) People drink sake using *tuki* and *iku-pasuy*.
- 2) People recite special prayers.
- 3) People offer sake to *kamuy* using *tuki* and *iku-pasuy*.
- 4) People offer *inaw* to *kamuy*.

R(KN)

- 1) Getting grace from *kamuy*.

2.1.3. Bear ritual of Panevėžys

People from Lithuanian Panevėžys used to practice the following ritual: when building a new house, they first let in a bear, if the bear entered the house without resistance, it meant there were no evil spirits in the house, and then they brought a black hen, to which the bear cut off its head (Kolesnikova, Peleckis 2022: 15).

The scheme of the bear ritual of Panevėžys (P) is the following:

P (P)

- 1) bear
- 2) people
- 3) black hen

T(P)

- 1) new house

A(P)

- 1) People make a bear enter a house.
- 2) People bring a black hen.
- 3) Bear kills the hen.

R(P)

- 1) To check whether there are evil spirits in a new house.
- 2) To purify a new house.



Fig. 3. Location of Panevėžys (the map has been made after a Google maps screenshot)

2.2. Estimating degrees of similarity

2.2.1. The algorithm of comparison

To estimate the degree of similarity of two rituals should be estimated the degree of similarity of P of one ritual with P of another ritual, T of one ritual with T of another ritual, and so on, and then should be taken their arithmetic mean of four received values.

To get the degree of similarity of two sets, we need to find the intersection, take the ratio of the number of intersection elements to the number of elements of each set, and then take the arithmetic mean.

2.2.2. *Iomante* and *kamuy nomi*

$P(I) \cap P(KN) = \{\text{people}\}.$

$P(I) \wedge P(KN) = (1/2 + 1/1)/2 = 0.75.$

$T(I) \cap T(KN) = \{\text{house, inaw, sapa-un-pe, iku-pasuy, tuki, sake}\}.$

$T(I) \wedge T(KN) = (6/15 + 6/7)/2 \approx 0.63$

$A(I) \cap A(KN) = \{\text{people drink sake using tuki and iku-pasuy, people recite prayers, people offer sake to kamuy using tuki and iku-pasuy, people offer inaw to kamuy}\}$

$A(I) \wedge A(KN) = (4/18 + 4/4)/2 \approx 0.61$

$R(I) \cap R(KN) = \{\text{getting grace from kamuy}\}.$

$R(I) \wedge R(KN) = (1/3 + 1/1)/2 \approx 0.66.$

And thus, the degree of similarity of *iomante* and *kamuy nomi* is: $(0.75 + 0.63 + 0.61 + 0.66)/4 \approx 0.66.$

2.2.3. *Iomante* and bear ritual of Panevėžys

$P(I) \cap P(P) = \{\text{bear, people}\}$

$P(I) \wedge P(P) = (2/2 + 2/3)/2 \approx 0.83$

$T(I) \cap T(P) = \{\text{house}\}.$

$T(I) \wedge T(P) = (1/15 + 1/1)/2 \approx 0.53$

In the case of $A(I)$ and $A(P)$ the only item that can be intersection is the killing: people kill the bear ~ bear kills the hen.

These actions aren't similar and so in this case the formula of calculation of the degree of similarity of two sets should be multiplied by the degree of similarity of elements that form the intersection.

Each action here is described by a sentence containing three elements: agent, patient, and verb. Agents and patients here demonstrate zero correlation. The only common item is the verb. And thus, $A(I) \wedge A(P) = (1/18 + 1/3)/2 * (1/3 + 1/3)/2 \approx 0.06.$

$R(I) \cap R(P) = \{\emptyset\}.$ If the intersection is an empty set, then the degree of similarity is zero.

And finally, the degree of similarity of *iomante* and the bear ritual of Panevėžys is: $(0.83 + 0.53 + 0.06 + 0)/4 \approx 0.35.$

2.2.4. *Kamuy nomi* and bear ritual of Panevėžys

$P(KN) \cap P(P) = \{\text{people}\}.$

$P(KN) \wedge P(P) = (1/1 + 1/3)/2 \approx 0.66.$

$T(KN) \cap P(P) = \{\text{house}\}.$

$T(KN) \wedge P(P) = (1/7 + 1/1)/2 \approx 0.57.$

$$A(KN) \cap P(P) = \{\emptyset\}.$$

$$A(KN) \wedge P(P) = 0.$$

$$R(KN) \cap R(P) = \{\emptyset\}.$$

$$A(KN) \wedge P(P) = 0.$$

The degree of similarity of *kamuy nomi* and the bear ritual of Panevėžys is:
 $(0.66 + 0.57)/4 \approx 0.31$.

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