Displaying Genealogy with Mythological Relations by Using the WHIteBasE Method

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Abstract **-** In this paper, a displaying rule of 'Mo-no-za-ne' (Monozane) style in myths is redefined, and adding two new node symbols to our previous genealogy display software WHIteBasE is proposed. The Monozane style is a specific process to descendant Deities, individuals, and things via contacting individuals with things, transforming or splitting a part of individuals, different from present ordinary human marriages/intercourses. The Monozane style can be found in myths almost all over the world, however, there is no rule in the past, because each researcher of humanities draws it in a random manner. To cope with the difficulty, our improved software that can display the Monozane style is presented.

Keywords **-** Family Trees, Pedigrees, Mythology, Monozane, GEDCOM, NeWTYPe

1. Introduction

There are traditions that real present families are descendants of Deities described in myths. To display such families to genealogy, it is necessary to display every process to descendants including not only humans but also Deities. Myths almost all over the world have stories that descendant Deities, individuals and things were born via contacting individuals with things, transforming or splitting a part of individuals, different from present ordinary human marriages/intercourses.

Such things, that are not human origins, are called 'Mo-no-za-ne (物種, 物根, 物実)' in Japanese myths. All of these specific examples are named 'Monozane style' in this research.

For example, in Japanese myths, there is a story that Deity Izanagi cut off Fire-Deity Kagutsuchi by using his sword, then Deities were born from each part of Kagutsuchi's body. In addition, there is also a story that Deities were born via exchanging things between female Deity Amaterasu and male Deity Susanowo. Moreover, in Greek myths, there is also a story that Perseus cut off the neck of Medusa by using his sword, then Pegasus, that is well-known in costs of arms, was born from blood of Medusa.

To display the Monozane style, there are two problems to solve. One is that there is no rule for displaying the Monozane style in the past because each researcher of humanities read myth contents and draw the Monozane style in a random manner. The other is that not only the Monozane style but also complex human relations in genealogy such as multiple remarriages cannot be displayed in the existing software perfectly[1]-[18]. In addition, a de fact standard for recording genealogy data exchange format, GEDCOM[19], has no format for recording the Monozane style.

To cope with these difficulties, a displaying rule has already been proposed on our previous research[20]. This was the first trial for displaying the Monozane style, however, complex human relations cannot be displayed because of no segment intersections. On the other hand, a new data management method, WHIteBasE (Widespread Hands to InTErconnect BASic Elements) has also been proposed[21]. This method could display complex human relations with segment intersections perfectly, however, it had no Monozane style.

After that, a displaying rule of the Monozane style by using the WHIteBasE model has been defined[22]. With this, Assisted Reproductive Technologies (ART) that are to display medical born process has also been defined by using a new method, NeWTYPe (Nodes of Effects and/or Way through for TYing Particular Elements)[24].

These two definitions used the same symbols so that the software operation becomes simple and easy, however, in the case that both the Monozane style and human relations are displayed together, it is necessary to separate the symbols of the Monozane style from those of the ART style. Therefore, another displaying rule of the Monozane style without the ART style has been redefined by using the NeWTYPe[25].

In this research, adding two new node symbols, 'Triangle' and 'Circle' on the NeWTYPe, to our previous genealogy display software WHIteBasE is proposed. Our improved WHIteBasE software that can display the Monozane style and complex human relations together by using only mouse operations is presented.

2. Monozane Stories

First of all, for understanding the Monozane style, two typical Monozane stories in the Japanese

myth 'Kojiki' that is one of the most complicated myth stories all over the world are introduced[26].

2.1. The Slaying Of The Fire-Deity

Male Deity Izanagi cut off the neck of his child, Fire-Deity Kagutsuchi, using his august sword.

Hereupon, the names of Deities that were born from the blood that stuck to the point of the sword and bespattered the multitudinous rock masses were: Deity Iwa-saku, next Deity Nesaku, next male Deity Iwa-tsutsu.

The names of Deities that were next born from the blood that stuck to the upper part of the sword and again bespattered the multitudinous rock masses were: Deity Mika-hayahi, next Deity Hi-hayahi, next male Deity Takemikazuchi.

The names of Deities that were next born from the blood that collected on the hilt of the sword and leaked out between his fingers were: Deity Kura-okami, next Deity Kura-mitsuha.

The name of Deity that was born from the head of Deity Kagutsuchi who had been slain was Deity Masaka-yamatsumi.

The name of Deity that was next born from his chest was Deity Odo-yamatsumi.

The name of Deity that was next born from his belly was Deity Oku-yamatsumi.

The name of Deity that was next born from his private parts was Deity Kura-yamatsumi.

The name of Deity that was next born from his left hand was Deity Shigi-yamatsumi.

The name of Deity that was next born from his right hand was Deity Ha-yamatsumi.

The name of Deity that was next born from his left foot was Deity Hara-yamatsumi.

The name of Deity that was next born from his right foot was Deity To-yamatsumi.

2.2. Exchanging Things

The names of Deities that were born from the mist of female Deity Amaterasu's breath when, having first begged male Deity Susanowo to hand her the sword which was girded on him, and broken it into three fragments, and washed them in the pool-well Amenomanai, and having crunched them, she blew them away, were: female Deity Takiribi, next female Deity Ichikishima, next female Deity Takitsu.

The name of Deity that was born from the mist of male Deity Susanowo's breath when, having begged Deity Amaterasu to hand him the augustly jewels of eight feet, Ihono-Misumaru that was twisted in the left august bunch of her hair, and washed them in the pool-well Amenomanai, and having crunched them, he blew them away, was male Deity Masakatsu-Akatsu-Kachihayahi-Ameno-Oshihomimi.

The name of Deity that was born from the mist of his breath when again, having begged her to hand him the jewels that were twisted in her right august bunch of her hair, and having crunched them, he blew them away, was Deity Amenohohi.

The name of Deity that was born from the mist of his breath when again, having begged her to hand him the jewels that were twisted in her august head-dress, and having crunched them, he blew them away, was Deity Amatsuhikone.

The name of Deity that was born from the mist of his breath when again, having begged her to hand him the jewels that were twisted on her left august arm, and having crunched them, he blew them away, was Deity Ikutsuhikone.

The name of Deity that was born from the mist of his breath when again, having begged her to hand him the jewels that were twisted on her right august arm, and having crunched them, he blew them away, was Deity Kumanokusubi.

3. Monozane style

In this section, the Monozane style is classified by considering two complicated Monozane stories introduced above. It can be found that there are three patterns of descendant Deities in myths as the following[22]:

(A) **Without Monozane**
In the case of a descendant from a couple both of a male Deity and a female Deity without Monozane, it is enough to display this pattern as same as present human marriages/intercourses. Therefore, this case can be displayed via previous rules for ordinary relations.

For example, Deity Kagutsuchi is a child both of male Deity Izanagi and his wife Deity Izanami*.

(B) **Effects**
In the case of a descendant from a relation between a Deity and a Monozane, it can be found that there are three effect patterns:

(1) **Deity → Monozane**
For example, female Deity Amaterasu broke the sword (Monozane) into three fragments.

(2) **Monozane → Deity**
For example, the sword (Monozane) cut off Fire-Deity Kagutsuchi.

(3) **Monozane → Monozane**
For example, the blood (Monozane) bespattered the multitudinous rock masses (Monozane).

*Note that his wife Deity is not written in section 2, however, it is written in Kojiki that the mother's name of Fire-Deity Kagutsuchi is female Deity Izanami that is the wife of Deity Izanagi.

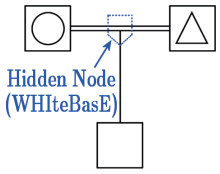


Fig. 1: Ordinary family layout in genealogy

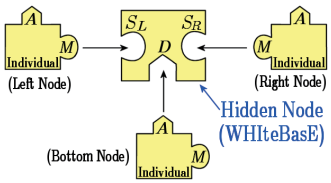


Fig. 2: Connection model of WHIteBasE

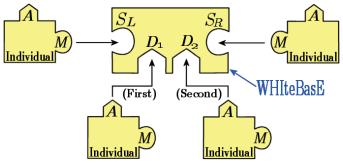


Fig. 3: Brothers and sisters

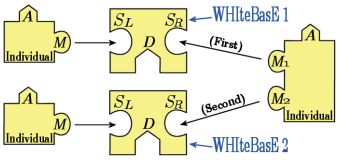


Fig. 4: Remarriages

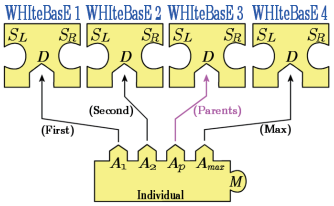


Fig. 5: Adoptions

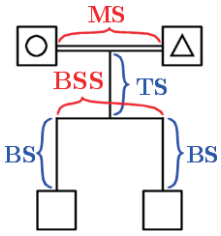


Fig. 6: Ordinary layout

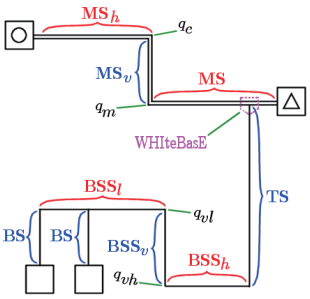


Fig. 7: Various Layouts

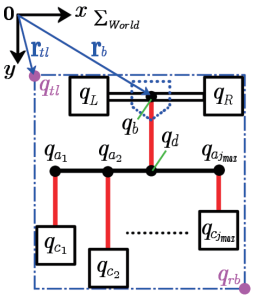


Fig. 8: Coordinate System

(C) **Parts**
In the case of a descendant from a part of Deity's body including hands, foots, blood, and etc., it can be found that there are two patterns:

(1) **Location**
This is the case of describing only a location of a Monozane without any effect. For example, the jewels were twisted in her august head-dress.

(2) **Transformation**
This is the case of a descendant Deity from a part of body (Monozane). For example, Deity Masaka-yamatsumi was born from head of Deity Kagutsuchi.

Note that types of the Monozanes can be classified as the following:

- **Deity's things**
For example, sword, jewel.
- **External things except Deity's things**
For example, the multitudinous rock masses, the pool-well Amenomanai.
- **Parts of Deity's body**
For example, head, neck, blood.

4. WHIteBasE

In this section, WHIteBasE method that is our previous proposal is briefly introduced[21]-[24].

4.1. For Complicated Relations

A married couple and their child is managed as an event by a Hidden Node, WHIteBasE shown in Fig. 1. The connection model is shown in Fig. 2. WHIteBasE has three keyholes, S_L, S_R (Substance) and D (Descendant). Individuals have two keys, A (Ascendant) and M (Marriage). A can connect with D, and M can connect with S_L or S_R, where denote one ordinary family.

Multiple Keyholes D_j manage brothers and sisters (Fig. 3). Multiple Keys M_k with plural WHIteBasEs manage remarriages (Fig. 4). Multiple keys A_l manage adoptions (social parents) where only A_p denotes biological parents (Fig. 5).

The ordinary Japanese layout style has four segments; MS (Marriage Segment), TS (Trunk Segment), BSS (Brothers and Sisters Segment), and BS (Branch Segment), where '△' denotes a male, and '◯' denotes a female (Fig. 6). Various layouts can be displayed using DB (Double Bend) with MS, MS_v, and MS_h, and HS (Hooked Segment) with BSS_h, BSS_v, and BSS_l(Fig. 7).

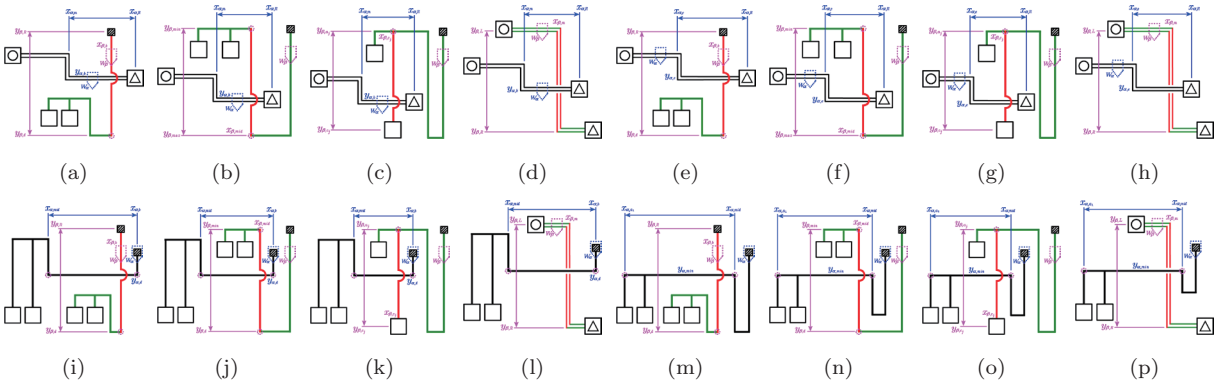
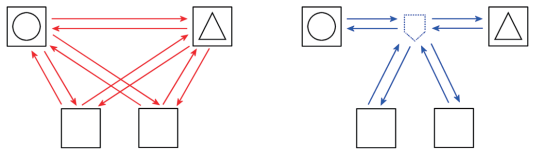


Fig. 9: Search pattern of segment intersections for various layouts



(a) Existing Method (b) WHIteBasE Method

Fig. 10: Number of references

A set of coordinate values **Q** that includes each position of individuals and nodes measured from the origin in the displaying area, is managed by each WHIteBasE (Fig. 7, Fig. 8).

A set of WHIteBasEs W_i and a set of Individual Nodes I_j are represented by

$$\begin{aligned} W_i &= \{S_L, S_R, D_j, \mathbf{Q}\} \\ I_j &= \{M_k, A_l\} \end{aligned} \quad \begin{cases} i = 0, 1, \cdots, i_{max} \\ j = 0, 1, \cdots, j_{max} \\ k = 0, 1, \cdots, k_{max} \\ l = 0, 1, \cdots, p, \cdots, l_{max} \end{cases} \tag{1}$$

$$\mathbf{Q} = \{q_b, q_L, q_R, q_d, q_{c_j}, q_{a_j}, q_{vl}, q_{vh}, q_m, q_e, q_{tl}, q_{rb}\}. \tag{2}$$

Segment intersections can be calculated by only 16 line crossing patterns because there are only four horizontal and four vertical segment styles (Figs. 9(a)-(p)). The half arcs are displayed on the positions of segment intersections. Note that the detailed algorithm has already been written in our previous research [23].

This algorithm is very fast because it skips when two WHIteBasEs' areas do not overlap. In addition, when adoptions are set, the segment style changes to the dotted segments named AS (Adopted Segment) and the arcs are not used.

One of advantages using the WHIteBasE is the decreased reference volume. If the existing software is used, all of individuals connect with other individuals as shown in Fig. 10(a). In contrast, if the WHIteBasE is used, two reference links per a child decrease as shown in Fig. 10(b). As a result, the users can understand the complex relations intuitively and can input and inspect them easily by only mouse operations.

4.2. For The Monozane Style

In our previous WHIteBasE model[22], a married couple and their children are managed as an event by a hidden node, WHIteBasE as shown in Fig. 4. WHIteBasE has only two keyholes for connecting parents and 1-n keyholes for connecting children. In contrast, there is a case that plural Monozanes are concerned with one individual.

If WHIteBasE had more than three keyholes for connecting parents, handling data becomes very complicated because the search algorithm of segment intersections has already been constructed with the premise only two individuals are for a parent. In addition, the display as if Deities and Monozanes are 'Parent(s)' makes inconvenient to understand the genealogy.

Considering these problems, it is necessary to define a new displaying rule of the Monozane style.

4.3. For The ART Style

There is a similar style in the medical field, called ART (Assisted Reproductive Technologies). The ART has already been defined as shown in Figs. 11(a)-(e) [27] that (a) denotes Sperm donor, (b) denotes Ovum donor, (c) denotes Surrogate only, (d) denotes Surrogate ovum donor, and (e) denotes Planned adoption, where 'D' denotes Donor, 'P' denotes Pregnant, 'S' denotes Surrogate, '◯' denotes a female, '□' denotes a male, '◇' denotes sex unknown. This ART style has a problem that slant segments between a couple and a child are very complicated if segment intersections are occurring.

To cope with this difficulty, a new method, NeWTYPe (Nodes of Effects and/or Way through for TYing Particular Elements), that uses only horizontal and vertical segments for displaying the ART style, has been proposed by extending our previous WHIteBasE method as shown

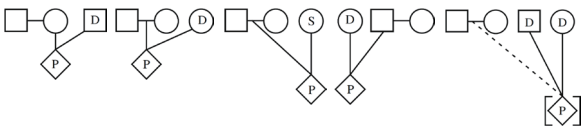


Fig. 11: ART Definitions[27]

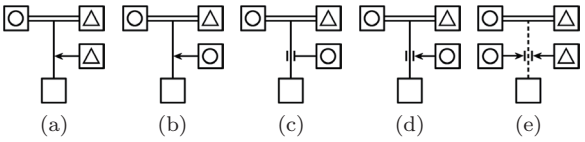


Fig. 12: Our NeWTYPe Definitions

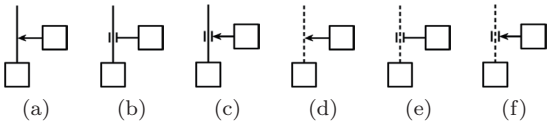


Fig. 13: Symbols for the NeWTYPe

in Figs. 12(a)-(e)[24]. A connecting node from a third person (donor/surrogate) is set on a vertical segment between a couple and a child where solid vertical segments denote a stream line to a biological child, and dotted vertical segments denote a stream line to an adoption.

The NeWTYPe method has three connecting symbols: 'Arrow' as shown in Figs. 13(a),(d), 'Pipe' as shown in Figs. 13(b),(e), and 'Arrow and Pipe' as shown in Figs. 13(c),(f), where 'Arrow' means a connection from a donor, 'Pipe' means a connection from a surrogate, and 'Arrow and Pipe' mean a connection from both a donor and a surrogate.

5. New Displaying Rule

To make the users understand the meaning where the Monozane style is displayed, connecting nodes with new symbols on stream lines between a parent's Deity and a descendant Deity should be displayed.

This requirement is completely similar to the ART style by using the NeWTYPe. Therefore, it can be considered that the same symbols are used for displaying both the ART style and the Monozane style, however, there is a case that it is necessary to display both the Monozane style and ordinary human relations together, and there is also a case that it is necessary to display both ordinary human relations and the ART style together. Therefore, there is a case that it is necessary to display all of these three styles together.

Then, it is necessary to draw a clear distinction between the ART style and the Monozane style. To define a new rule for displaying the Monozane style, previous NeWTYPe is extended to be able to use both of Effects and Parts via new simple symbols except the ART symbols[25].

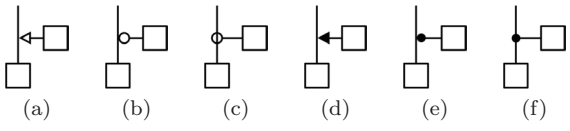


Fig. 14: Candidate for symbols (solid segments)

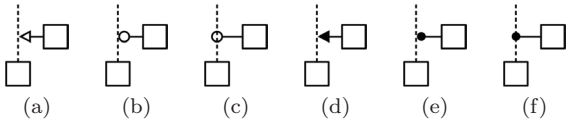


Fig. 15: Candidate for symbols (dotted segments)

To select new symbols of the NeWTYPe for displaying the Monozane style, candidates by using solid segments as shown in Figs. 14(a)-(f), and by using dotted segments as shown in Figs. 15(a)-(f) were considered.

In the case of Effects, it is important to display the direction where the Effects come. It is desirable to use 'Arrow', however, it has already been defined in the ART. Therefore, 'Triangle' symbol with a blank inside is good for displaying the Effects instead of the 'Arrow', and it connects with vertical segments. As a result, Figs. 14(a), 15(a) for displaying Effects are selected, and Figs. 14(d), 15(d) are deviated from the candidates.

In the case of Parts, 'Rectangle' is complicated because individual's text boxes are also rectangle. As a simple symbol instead, there is 'Circle', however, 'Circle' that filled in color with black looks a symbol of connecting nodes such as a circuit diagram. Then, Figs. 14(e), 14(f), 15(e), 15(f) are deviated from the candidates. In contrast, if 'Circle' with a blank inside is used and overlaps on the vertical segments, it looks like the segment intersections and the 'Pipe' symbol of the ART. Then, Figs. 14(c), 15(c) are also deviated from the candidates. As a result, Figs. 14(b), 15(b) for displaying Parts are selected.

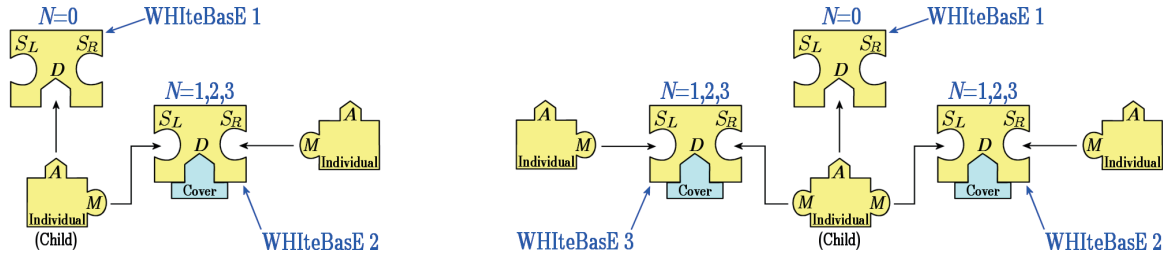
6. NeWTYPe

6.1. Previous Method

In the previous NeWTYPe method[24], the ART symbols are managed by using the NeWTYPe flag N in the set of WHIteBasE W_i represented by

$$W_i = \{S_L, S_R, D_j, \mathbf{Q}, N\}\,. \tag{3}$$

If N=0, the WHIteBasE is the ordinary mode. On the other hand, if N=1,2,3, the WHIteBasE changes to the NeWTYPe mode and the keyhole



(a) Single (b) Double

Fig. 16: Improved WHIteBasE model

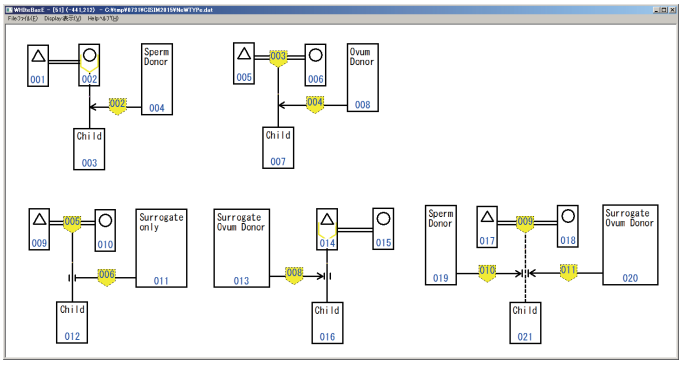


Fig. 17: NeWTYPe Display result for the ART

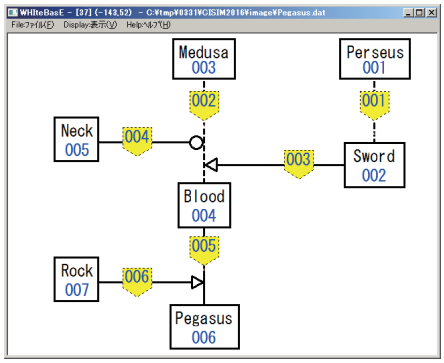


Fig. 18: Display Result of the Monozane Style

D is covered, that means connecting descendants is not allowed as shown in Fig. 16(a). The N means 'Arrow' (N=1), 'Pipe' (N=2), and 'Arrow and Pipe' (N=3). The left individual that has connected with ascendant WHIteBasE denotes a child of reproductive treatment. For adoptions, connections as shown in Fig. 16(b) is used. Fig. 17 shows the NeWTYPe display result for the ART.

6.2. Improved Method

It is very easy to improve our software for displaying the Monozane style. The NeWTYPe flag N represented by Eq. (3) is only extended from N=0,1,2,3 to N=0,1,2,3,4,5 where new N means 'Triangle' (N=4) and 'Circle' (N=5). Note that N=0,1,2,3 continuously means the same as the ART symbols.

7. Result

Fig. 18 shows the story that Perseus cut off the neck of Medusa by using his sword, then Pegasus was born from blood of Medusa by using our improved software. In this figure, a vertical segment between Perseus and the sword by using WHIteBasE001 is set to a dotted segment because this sword is the Perseus's weapon (Monozane).

Similarly, a vertical segment between Medusa and the blood by using WHIteBasE002 is also set to a dotted segment because the blood is a part of Medusa (Monozane).

A 'Triangle' from the sword to the vertical segment by using WHIteBasE003 means 'cutting off' (Effects). A 'Circle' from the neck to the vertical segment by using WHIteBasE004 means 'Medusa's neck' (Parts). In this case, the vertical segment that has connected with two Monozanes mentioned above, means that Medusa's neck is cut off by the sword of Perseus. As a result, the blood has appeared.

A vertical segment from the blood to Pegasus by using WHIteBasE005 means that Pegasus was born from the blood, however, a 'Triangle' from the rock to another vertical segment by using WHIteBasE006 means 'bespattering' (Effects). In this case, the vertical segment that has connected with one Monozane means that the blood is bespattering on the rock. As a result, all of the Monozane styles had been able to be displayed.

8. Discussion

Using the improved our software, two Monozane stories described in section 2 have been displayed. Fig. 19 and Fig. 20 show the displaying result for 'The Slaying Of The Fire-Deity' and 'Exchanging Things' respectively. These results have a lot of segment intersections because the stories are originally very complicated, however, it is possible to display them easily and perfectly.

According to stories, it is possible to set the Monozane using only 'Triangle' and 'Circle' of the

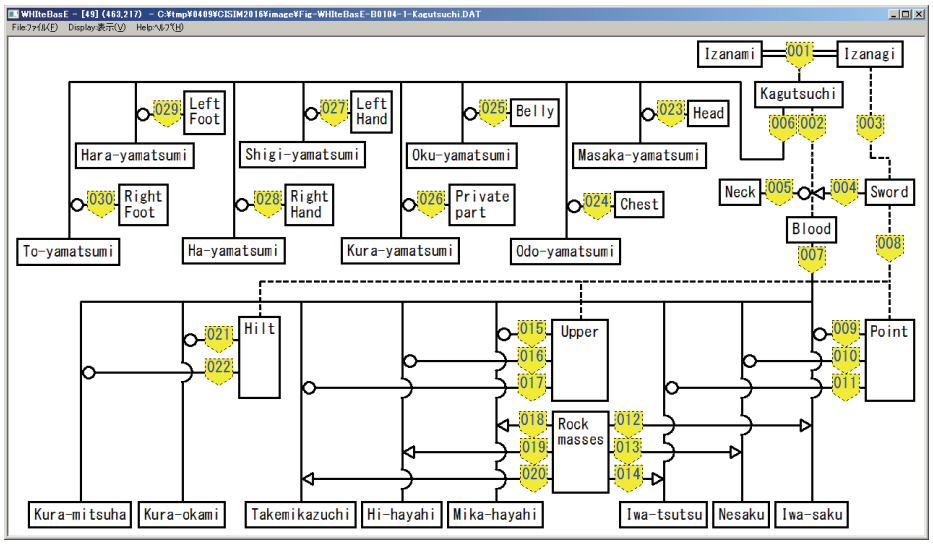


Fig. 19: Display Result for 'The Slaying Of The Fire-Deity'

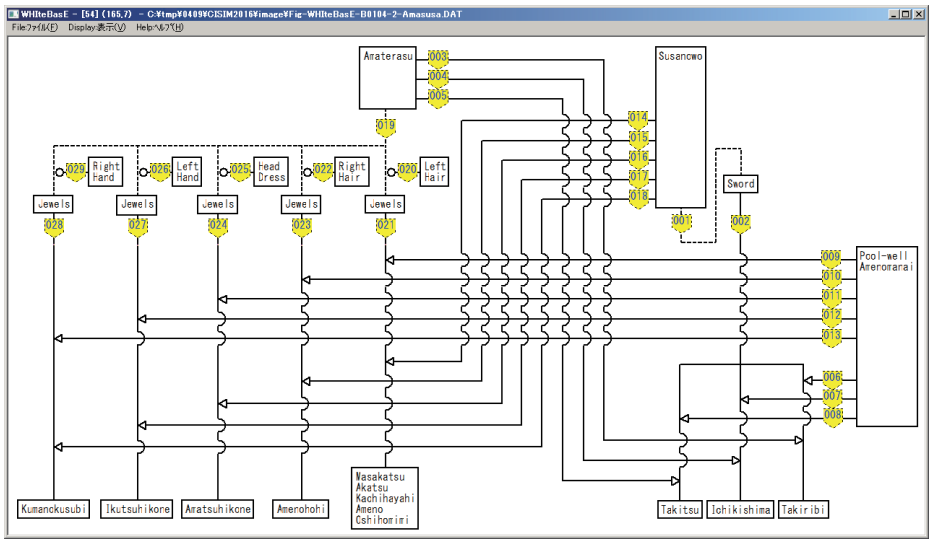


Fig. 20: Display Result for 'Exchanging Things'

NeWTYPe symbols. Note that the 'Triangle' (Effects) has various meanings, therefore, the interpretation of Effects is left to the users.

The advantage of using the Monozane style that is the simply improved NeWTYPe is to be able to display not only the Monozane style but also the ordinary complex genealogy and the ART with segment intersections simultaneously. In addition, all of the previous functions in the WHIteBasE can be used without changing.

As a result, it is easy for the users to understand the operations, and all kinds of relations can be seen in only one displaying area. This solution is necessary for the humanities' field.

Note that again, the existing genealogy display software cannot display the Monozane style, because there is no displaying rule of the Monozane style in the past. In addition, it is enough that the Monozane style is defined by using only two Japanese myth stories, because Kojiki is one of the most complicated myths all over the world.

9. Conclusion

In this research, the displaying rule of the Monozane style that is called in the Japanese myth stories for describing a specific process to descendant Deities, individuals, and things, have been defined.

As a result, it could be found that using only two node symbols, 'Triangle' and 'Circle' can display the Monozane style via extending the NeWTYPe

and our improved WHIteBasE software could display the very complicated samples easily and perfectly.

Future plans, for improving our WHIteBasE method, will be conducted to construct grid-layouts on semi-automatic, and solving user's new requirements.

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