Type-Verbs and Token-Verbs in Japanese Play

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Abstract
Type-Token distinction and Figure and Ground relationship are dichotomic model to explain how human distinguish vary notions. This research inspects a relationship of these two relationships in Japanese plays. At first we make two series of lattices from the rough set to show figure and ground relationships in each scene. One series are made by verbs mentioned in speech. These are defined as "type-verbs". Another are made by verbs actually did in play by some characters. These are defined as "token-verbs". Compared change of complementarity and non-distributivity of lattices about type and token verbs, in short plays two series of complementarity differ beginning to ending but in long plays they accord in ending.
Keywords : Type-token, Figure-ground, lattice theory, rough set theory, literature analysis

1   Background

Type-Token distinction [1] is notion to explain human ability to classify and distinguish things in the world. "Type" means notions designating units to classify and "Token" means concrete things belonging to type. For example in biological taxonomy "type" means scientific name and "token" means organism itself. "Type" and "token" are mutually provide each other. "Type" defines where things belong to but "token" also decide definition of "type". In biological taxonomy it frequently happens that scientific names or criterions are changed because of research about organisms themselves, for example, *Triceratops* and *Torosaurs* [2].

Many research human have ability to imagine stories from fragmentary scenes or things [3] [4] [5]. In this case fragmentary scenes are regarded as "token" and story as a whole is regarded as "type". This definition can be adapted to literatures. In literature scenes actually described are "token" and story as a whole including not described are "type". "Token" are clues to construct one story as "type" but "type" is lead to guess events not be described in text. And in this research we consider "type-token distinction" about verbs. Verbs in literatures are classified into to categories. One category includes verbs in speech of characters referring to another character or him/herself. These verbs define dispositions, past and schedule of the characters and we can regard them as "token-verbs". Second category includes verbs actually did in text. These verbs show the character's personality in the scene. We can define them as "type-verbs". We show one example following.

Susan said "Tom is running in the park, isn't he?".

In this sentence "say" is "token-verbs" and "run" is "type-verbs". In this paper we use these words in this sense.

We introduce "figure-ground relationship" into this research [6] . This notion defined the noticed things as "figure" and other things as "ground" in cognitive system. When we watch a double image illusion (for example "Rubin's vase" [6]) we change recognition about where "figure" part is in the image. This is a concept introduced in Gestalt theory [7]. This theory applied to literary theory and reading theory [8,9,10, 11]. In these researches an noticed element is defined as "figure" but which element is regarded as "figure" is different in each research. There are research that regards a considered information as "figure" and other information as "ground" [8,9], regards character having intransitive verbs as "figure" and scene description as "ground" [10]. In this research we apply the above notions, "type-verbs" and "token-verbs" into "figure-ground relationship" to detect a relationship between "type-verbs" and "token-verbs". We define characters having unique verbs as "figure" and characters having verbs that other characters have as "ground". This analysis is did about "type-verbs" and "token-verbs" to compare "figure-ground relationship" of "type-verbs" with "token-verbs".

2   Method

We use analysis method that adapts lattice theory and rough set theory made public in Kitamura and Gunji (2010) [12].

This method can objectively make lattices that show "figure-ground relationship" in characters.

This method uses a concept of lattice derived by rough set theory.

Let P be a non-empty ordered set. If $x \wedge y$ (upper bound) and $x \vee y$ (lower bound) exist for all x, y $\in$ P, P is defined as a lattice. Lattice have notion about complement. Let P be a lattice. If $x \wedge y$ is maximum element and $x \vee y$ is minimum element for any x, y $\in$ P, x and y are called complement.

If one element is complement, other complement element is not limited particular one. And the value calculated by numbers of elements that have complements divided by numbers of elements is called "complementarity" (C) and numbers of complements divided by numbers of elements having complements are called "non-distributivity" [14].

Rough set theory is theory including vagueness. This theory prepares a small set and big set including above small set and consider relationship between these two sets [15].

The lattice derived rough set theory shows method how to make a lattice from two sets.

In this research we make sets of characters and sets of verbs and make lattices from these sets by the following method.

As example we show a set including three characters (A, B, C) and set including three verbs (a, b, c) (table (1)).

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Table (1) : a sample table

	a	b	c
A	0	0	1
B	0	1	1
C	1	0	0

In table (1) "1" means the characters have this verbs and "0" means the character doesn't have this verb. In this table only character(A) have verb(c). This means that character(A) can make a particular element that includes only character(A). Character(A) and character(B) have the same verb(verb(c)). This means they make a particular element that include character(A) and (B). This is how to make elements that compose the lattice. Secondly the order of this lattice is decided. In above example the element that includes character(A) and (B) is upper than the element that includes character(A) because former element includes latter element. This is how to decide the order of elements. The minimum element is null set and the maximum element includes all characters in this scene. A lattice that produced from table(1) is figure(1).
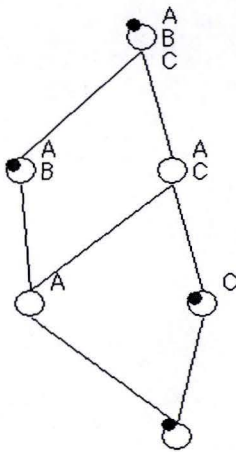

Figure 1 : A sample lattices produced by table(1).

These lattices are evaluated about complementary and non-distribution. Complementary is defined as [complement element]/[number of all elements]. In this paper complementary is wrote as "C". If $C<1$, there exist element that don't have complement . Numbers of these complement increase as C decrease. Non-distribution is defined as [complement]/[number of element with complement]. If $ND>1$, there exist element that have multiple complements. In lattices made from characters in literatures C and ND are measures how definite the separation between figure and ground is. If C is small or ND is large, the figure is clearly distinguished from ground.

In this research we make lattices from "type-verbs" and "token-verbs". We analyze Japanese plays. Plays are composed speeches and stage directions. We define that verbs in speeches are "token-verbs" and verbs in stage directions are "type-verbs". We pick up all verbs in plays. Conjugational suffix is not considered but verbs in negative sentences are distinguished from verbs in affirmative sentences. Honorific word is translated into non-honorific word. All plays are divided into brief scenes that have at least one "type-verbs" and "token-verbs" and we consider 7 scenes as a series of scenes. We make lattices from this series of scenes and inspect transition of nature and shape of lattices. In this paper "type-lattices" means lattices produced by "type-verbs" and "token-lattices" means lattices produces by "token-lattices". The plays that are analyzed in this research are table(2).

Table (2) : A list of plays that we analyze in this research.

title (in Japanese)	author	publication
M ittuno takara	A kutagawa R yunosuke	1922
S einen to shi	A kutagawa R yunosuke	1914
H aru	T akehisa Yum e ji	1926
N agasaki syohin	A kutagawa R yunosuke	1922
A kino taiwa	K ishida Kunio	1927
K iga jinei	M iyazawa Kenji	1924?
Ano hosi ha itu arawa reruk	K ishida Kunio	1931

3   Result

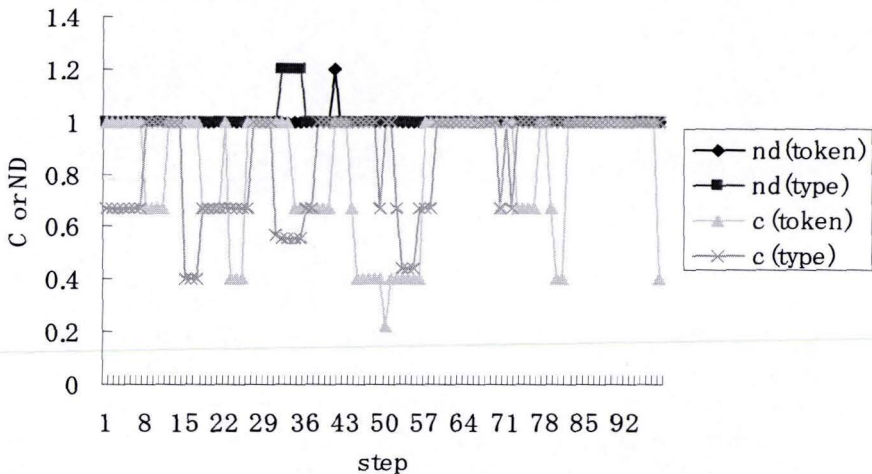The transition of C and ND of "type-lattices" and "token-lattices" about each plays are figure(2) to figure(8).

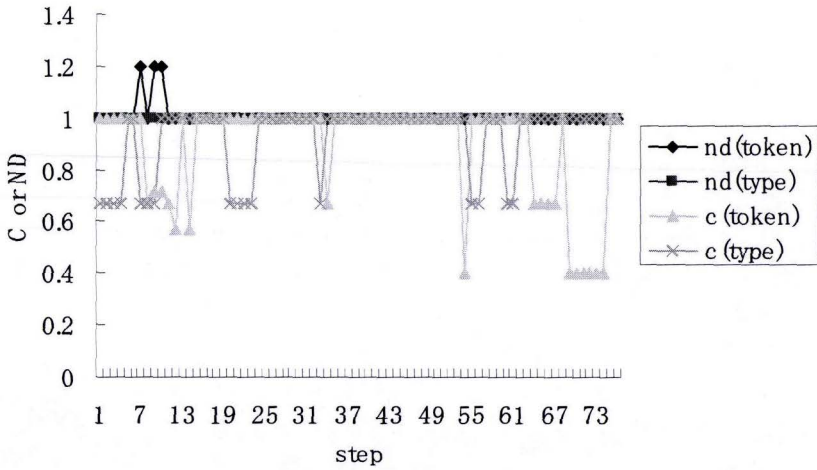**Figure (2) :** transition of C and ND in "Mittu no takara"

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Figure (3) : transition of C and ND in " Seinen to shi"
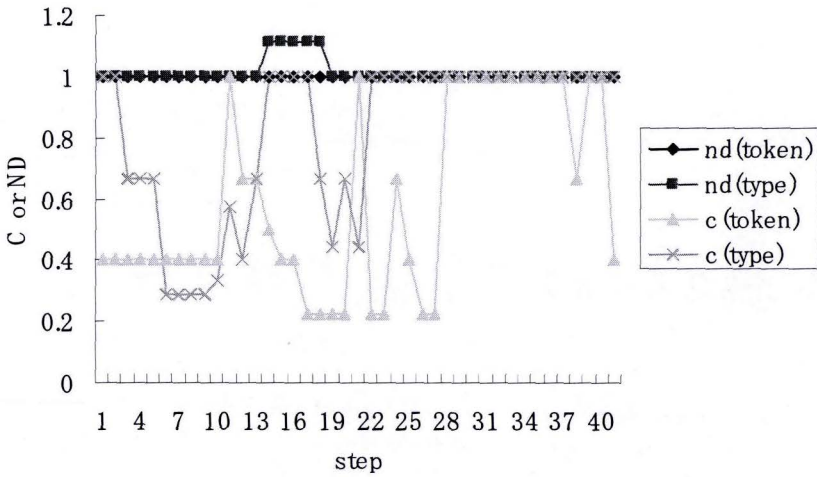

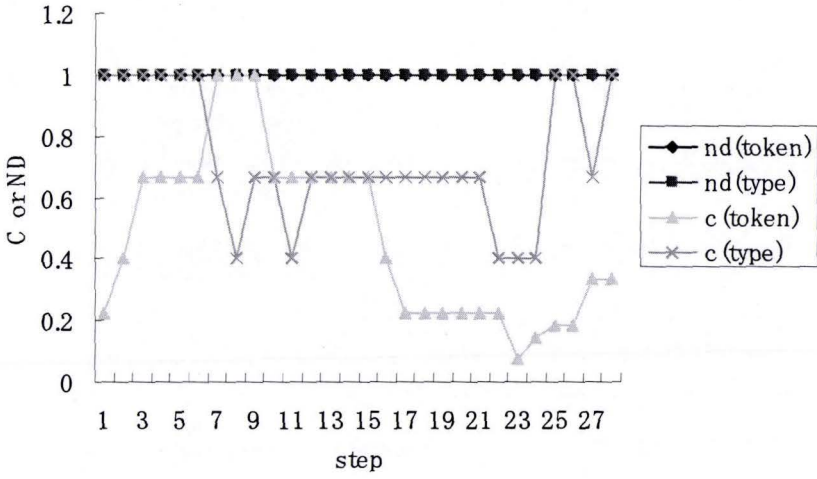**Figure (4) :** transition of C and ND in "Haru"

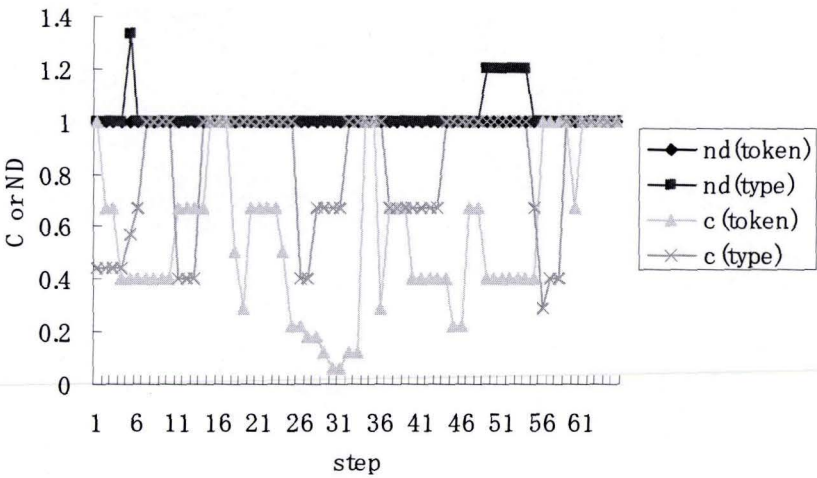**Figure (5)** : transition of C and ND in "Nagasaki shohin"

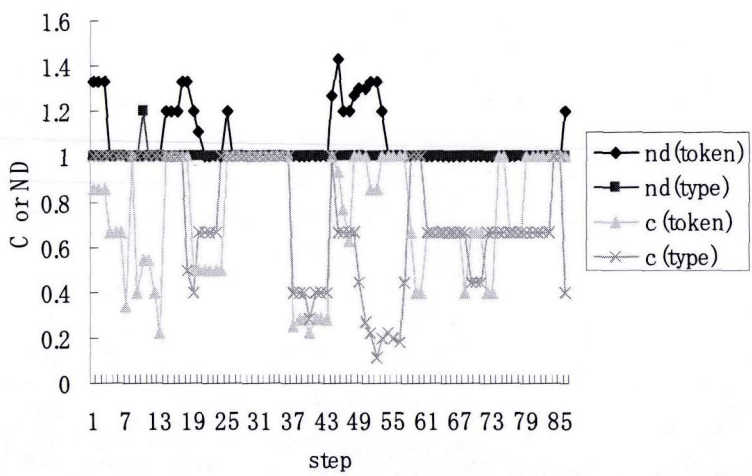**Figure (6)** : transition of C and ND in "Aki no taiwa"

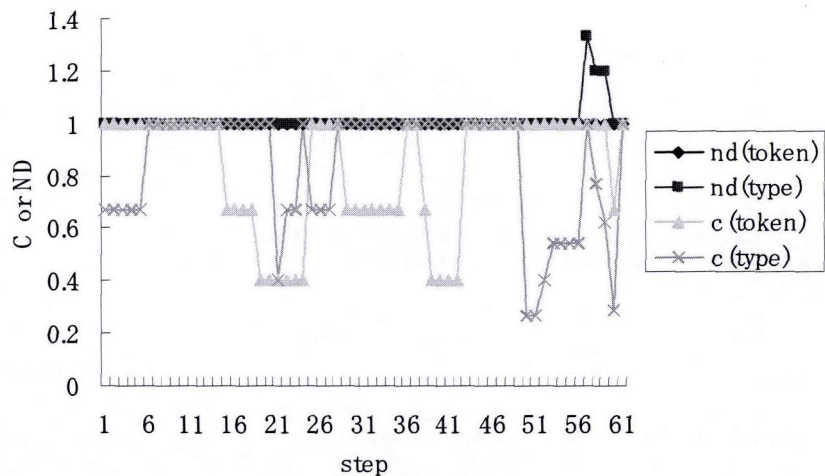**Figure (7) :** transition of C and ND in ""Kiga zinei"

Figure (8) : transition of C and ND in "Ano hoshi ha itu arawareruka"

In some plays C of "type-lattices" and C of "token-lattices" accord in the latter half and this trends continue for more than five steps. This trends are seen in figure(2), (4), and (6). Number of characters and letters and correlation coefficient (c. c) between C of "type-lattices" and "token-lattices" in the first half and the latter half of each plays, and whether C of two lattices accord in the latter half or not are shown in table(3).

Table (3) : number of characters and letters, value of correlation coefficient of the first and latter half, and whether C of "type-lattices" and "token-lattices" accord in the latter scene.

	chacaters	letters	c.c (the first half)	c.c (the latter half)	accord in the latter scene
M ittu no takara	9	7356	−0.1665	0.441483	○
Seine to shi	9	3685	−0.0613	−0.20955	×
Haru	6	2646	−0.16965	0.027482	○
Nagasaki syohin	15	2996	−0.56997	0.164531	×
Akino taiwa	8	4893	0.063643	−0.15836	○
Kiga jinei	13	7364	0.646604	−0.32228	×
Ano hosiha itu arawareruka	4	5175	0.01976	−0.31473	×

Number of characters can be classified into 3 categories (n≦5, 5<n≦10, 10<n).
Number of letters can be also classified into 3 categories (n≦3000, 3000<n≦ 4 000, 4000<n).
Value of correlation coefficient can be classified into "plus" or "minus".
Table(3) can be rewrote into table(4).

Table (4)

	chacaters	letters	c.c (the first half)	c.c (the latter half)	accord in the latter scen
M ittu no takara	5<n≦10	4000<n	m inus	plus	○
Seine to shi	5<n≦10	3000<n≦4000	m inus	m inus	×
Haru	5<n≦10	n≦3000	m inus	plus	○
Nagasaki syohin	10<n	n≦3000	m inus	plus	×
Akino taiwa	5<n≦10	4000<n	plus	m inus	○
Kiga jinei	10<n	4000<n	plus	m inus	×
Ano hosiha itu arawareruka	n≦5	4000<n	plus	m inus	×

In this table "Mittu no takara", "Haru", and "Aki no taiwa" have nature that the two lattices suddenly accord in the later half. Numbers of these characters are 5<n≦10. Numbers of letters of "Mittu no takara" and "Aki no taiwa" are both 4000<n, "Haru" is n≦3000.

4 Discussion

From table(3) and table(4) we discover a principle as follows.
(1) Plays have nature that the two lattices suddenly accord in the later half if plays satisfy conditions as follows: (a) Numbers of characters are 5<n≦10. (b) Numbers of letters are 5000<n or n≦3000.

(2) Plays have nature that the correlation coefficients between C of "type-lattices" and "token-lattices" is minus in the first half and plus in the latter half if plays satisfy conditions as follows: (c) Numbers of letters are $4000 < n$ or $n \leq 3000$.

In table(4) "Mittu no takara", "Haru", and "Aki no taiwa" have condition (a) and (b) and satisfy principle (1). In these plays only "Mittu no takara" and "Haru" have condition (c) and satisfy principle (2). Principles (1) and (2) mean that the two lattices disagree in the first half and suddenly accord in the latter half. This means figure and ground relationships of "type-verbs" and "token-verbs" in these plays differ in the first half but accord in the latter half. This result means hypothesis that in the plays the character who is figure about "type-verbs" in the first half differ character who is figure about "token-verbs" but in the latter half figure about "type-verbs" accord figure about "token-verbs". The reason for this phenomenon is probably that in the first half of plays characters on the stage mention other characters who is not on the stage yet. So character who is figure on the stage in not character who is figure in the talk. But in the latter half distinguished character on the stage accords distinguished character in the talk. But conditions (1) is not seen in the plays that have numbers of characters are $n \leq 5$ or $10 < n$ or numbers of letters are $3000 < n \leq 4000$. Condition (2) is not seen in the plays that have number of letters are $3000 < n \leq 5000$. This means that above nature is only in plays that have middle number of characters and are very shot or long.

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