Toward the typology of stativization: the polysemous structure of the Japanese -te iru form

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Toward the Typology of Stativization: The Polysemous Structure of the Japanese *-te iru* Form

Enoch Iwamoto

Abstract

This paper modifies and develops Jackendoff's (1996) SP-binding to make it a function-application model by examining the concept of projection and density. It proposes Cross-Section (CRS) function as an inverse function to projection and argues that it plays a crucial role in stativization. As the types of events are defined by the combination of projected arguments and sp-binding, typology of stativization can also be captured by the combination of arguments to which CRS applies. I will argue that the Japanese imperfective formative *-te i-ru* specifies that it apply only to the temporal argument and that application of CRS to other arguments is conditioned by the Principle of Parallel Application of Aspect Transformation Function, which yields several stataive CSs, i.e., the versatile semantic interpretations *-te i-ru* has. On the other hand, progressive of English type specifies that CRS necessarily apply to both the temporal and space arguments. It is the single parameter that conditions the typology of stativization.

Keywords: SP-bindg, aspect, *-te i-ru*, stativization, progressive

0. Introduction

The principal aim of this paper is to explicate the polysemous structure of stativization by modifying and developing Jackendoff's (1996) Structure Preserving (SP) Binding Theory. It is known that stativization consists of several aspectual classes such as progressive, iterative, habitual, result state and perfect (De Swart 1998, Michaelis 2004). In some languages these aspectual classes manifest themselves in distinct morpho-syntactic forms as in English. In others, some of them if not all are aspectual interpretations of a single morpholo-syntactic form as Japanese *-te i-ru* and French imparfait. Where there is always one-to-one correspondence between morpho-syntactic forms and aspectual interpretations, the conceptual relations among these stative meanings would not be recognized as an important theoretical issue. Whereras, where a single morpho-syntactic form is responsible for several stative meanings, it gives rise to a problem of polysemy; the combination of the single aspectual meaning of the morpheme and the semantic information from S or VP derives the polysemous aspectual interpretations.

The Japanese *-te i-ru* forms are said to have several aspectual meanings: progressive, result state, iterative, habitual, maintenance, perfect and simple state.

（1） a. Ken-wa hashit-te i-ru — Progressive
Ken-Top run-*te i-* Pres
'Ken is running'

b. Kabin-wa ware-te i-ru — Result State
vase-Top broken-*te i*-Pres
'The vase is broken'

c. Kyaku-wa tugigutito toochakushi-te i-ru — Iterative
guests-Top one-after-other arrive-*te i*-Pres
'The guests are arriving one after another'

d. Ken-wa aruite gakko-ni it-te iru — Habitual
Ken-Top walking school-Goal go-*te i*-Pres
'Ken goes to school on foot.'

e. Ken-wa shibaraku mado-o ake-te i-ru — Maintenance
Ken-Top for-a-while window-Acc open-*te i*-Pres
'Ken keeps the window open for a while'

f. Ken-wa Chuugoku-o ichido otozure-te i-ru   Perfect
Ken-Top China-Acc once visit-*te i*-Pres
'Ken has visited China once.'

g. Kono kuruma-wa handoru-ga migi-ni tui-te i-ru   Simple State
this car-Top steering-Nom right-Loc attach-*te i*-Pres
'This car is right steered'

Beside precise description of the facts, how to define the respective meanings on the basis of the semantic information involved in the clause and the unambiguous meaning of the formative *-te i-ru* has been a central issue in Japanese linguistics (Kindaichi 1950, Okuda 1977, Moriyama 1988, Kudo 1995, Ogihara 1998, Shirai 2000, Iwamoto and Uehara 2003, Iwamoto 2008, 2009 among many others). It is known that in unmarked cases, the *-te i-ru* forms of activities and accomplishments are progressive and those of achievements are result state; sentence internal as well as contextual information may affect their interpretations. While the morphology of *-te i-ru* indicates that it is a stativization construction because *iru* is a stative locative verb, no unified account of the phenomena has been given because of the lack of necessary theoretical device that captures the relationship among these stative meanings, which in turn has led several researchers to consider that *te-i-ru* comprises at least two distinct aspectual classes (Shirai 2000 and Kudo 2004, Ogihara 1998).

However, if *te-i-ru* forms are an instance of polysemy in the sense of Pustejovsly (1995) and the versatile interpretations are given generatively by mental computation, we can still maintain that the formative *te-i-ru* has a sole unambiguous meaning. This paper presents an argument that a proper treatment of stativization is given by modifying and developing Jackendoff's (1996) theory of sp-binding and that the semantic types of the *-te i-ru* forms are derivable accordingly, which will suggest the direction of the study of the typology of stativization in general (cf. DeSwart 1998, Michaelis 2004).

1. The SP-Binding Theory

Sp-binding captures the spatio-temporal properties of events by decomposing EVENT into STATE and projecting axes. The basic intuition is as follows. Consider motion events such as ‘run’ and ‘walk’. These events are considered as a set of ordered infinite locative situations with sp-bound temporal points as schematized in (2):

(2) Motion →

$$\begin{array}{lllll} X & X & & X & X \quad (=\text{theme}) \\ \hline l_1 & l_2 & \cdots & l_{k-1} & l_k \quad (=\text{location}) \\ \hline t_1 & t_2 & \cdots & t_{k-1} & t_k \quad (=\text{time}) \end{array}$$

Each situational slice constitutes a cross-section of the motion. Thus motion can be conceptually defined by projecting a zero dimensional place and time onto one dimensional axes, which are sp-bound to each other. (3) is Jackendoff’s (1996) sp-binding representation of motion.

(3)

$$\begin{bmatrix} [1d]^{\alpha} & & [1d]^{\alpha} & [1d]^{\alpha} \\ \| & & \| & \| \\ 0d & & & \\ {}_{Sit}\ BE\ ([_{Thing}\ X], [_{Space}\ 0d]); [_{Time}\ 0d] & & & \end{bmatrix} \begin{array}{l} [sp-bound\ axes] \\ \\ \\ [cross-section] \end{array}$$

The superscripted αs indicate sp-binding.

Sp-binding representation makes it possible to define event types by the combination of projection and sp-binding. According to Jackendoff (1996), these axes may or may not project and may or may not be sp-bound. Their combination eventually defines several event types. (In what follows, I will eliminate event projection since it is redundant. See Iwamoto 2008 for detail.) For example, staying is an event in which only time argument and nothing else project as in (4a). On the other hand, stative situations of extending, covering and filling have a conceptual structure in which the thing and space arguments project and are sp-bound to each other and the time argument does not project ((4b)). Motion is a situation in which both space and time arguments project and are sp-bound to each other ((4c)):

(4)

a. **Staying**

$$\left[{}_{Sit}\ \mathrm{BE}\ ([X],\ [{}_{Space}\ Y]);\ [{}_{Time}\ \begin{array}{c}[1d]\\ \| \\ 0d\end{array}]\right]$$

b. **Extending, Covering, Filling**

$$\left[{}_{Sit}\ \mathrm{BE}\ ([{}_{Thing}\ \begin{array}{c}[1/2/3d]^{\alpha}\\ \| \\ 0d\end{array}],\ [{}_{Space}\ \begin{array}{c}[1/2/3d]^{\alpha}\\ \| \\ 0d\end{array}]);\ [{}_{Time}\ 0d]\right]$$

c. **Motion**

$$\left[{}_{Sit}\ \mathrm{BE}\ ([X],\ [{}_{Space}\ \begin{array}{c}[1d]^{\alpha}\\ \| \\ 0d\end{array}]);\ [{}_{Time}\ \begin{array}{c}[1d]^{\alpha}\\ \| \\ 0d\end{array}]\right]$$

If events are defined by projecting a state, states must also be definable by extracting a cross-section out of the projected event. I will call the extracting function Cross-Section function (CRS) and argue that the types of stativization are defined by the combination of arguments to which CRS applies.

Before making necessary modifications to the theory, let us briefly look at the aspectual features and aspect transformation functions adopted here. I will follow Jackendoff (1991) and assume [+/-bounded] and [+/-internal structure] features as well as [+/-directional] and [0/1/2/3 dimensional] features as shown in (5). [+/-b] and [+/-i] define the aspectual properties of both Material and Events, which is summarized in (6):

(5) Aspect feature system
[+/-bounded] ([+/-b]) and [+/-internal structure] ([+/-i])
[+/-directional], [0/1/2/3 dimensional]

(6) Jackendoff's (1991) aspect classes

		+b	-b
+i	Material	・Groups *ten apples/a committee*	・Aggregates *apples/buses/cattle*
	Event	・Bounded iterative events *John ate ten apples* *The light flashed until dawn*	・Unbounded iterative events *John ate apples* *The light flashed continually*
-i	Material	・Individuals *an apple/the store*	・Substances *custard/water*
	Event	・Closed events *John ate an apple* *John ran to the store*	・Unbounded homogeneous events *John ate custard* *John slept*

Jackendoff (1991) also proposes some functions that transform their aspectual properties: PL, ELT, GR and COMP.[1] They transform the values of the aspectual distinctive features as follows:

(7) PL (plural) : $\begin{bmatrix} -b, +i \\ PL([+b, -i]) \end{bmatrix}$ PL makes a singular entity plural.

ELT (element of) : $\begin{bmatrix} +b, -i \\ ELT([-b, +i]) \end{bmatrix}$ ELT makes a plural entity singular.

COMP (composed of) : $\begin{bmatrix} +b \\ COMP([-b]) \end{bmatrix}$ COMP delimits a nonbounded entity.

GR (grinder) : $\begin{bmatrix} -b, -i \\ GR([+b, -i]) \end{bmatrix}$ GR makes a bounded entity nonbounded.

Let us call these functions Aspect Transformation Functions (ATFs). ATFs consist of two types: including functions (PL and GR) and extracting functions (ELT and COMP), where they are inverse functions to each other.

2. Modification of the Theory

Now I will make necessary modifications to the sp-binding theory in order to make the system work. First, I will modify Jackendoff's projection structure suitable to function-application, so that the input-output relations may be more explicit. Jackendoff's sp-binding structures (3)-(4) involve a projected argument or two which are defined by the combination of cross-section and projecting axis. It is an algebraic abstraction of Marr's (1982) geometric generalized cone representation but cannot represent such situations in which projected arguments undergo further function application, where input-output relations are required to be explicitly represented. For example, a nonbounded motion event may be delimited by a frame adverb whose CS consists of COMP and an accomplishment may be un-delimited onto a nonbounded event by GR (Jackendoff 1991, Iwamoto 2008). Projected arguments must be able to serve to be inputs for further function application. In order to represent input-output relations explicitly, the sp-binding structure is modified as follows:[2]

（8）　Motion

$$\left[_{\text{Sit}}\ \text{BE}\left([X],\ \left\langle\begin{matrix}\text{PR}\\ \text{1d}, +\text{dir}\\ -\text{b}, -\text{i}\end{matrix}\right\rangle^{\alpha} \begin{matrix}\begin{bmatrix}\text{1d}, +\text{dir}\\ -\text{b}, -\text{i}\end{bmatrix}\\ \uparrow\\ [_{\text{Space}}\ \text{0d}]\end{matrix}\right);\ \left\langle\begin{matrix}\text{PR}\\ \text{1d}, +\text{dir}\\ -\text{b}, -\text{i}\end{matrix}\right\rangle^{\alpha} \begin{matrix}\begin{bmatrix}\text{1d}, +\text{dir}\\ -\text{b}, -\text{i}\end{bmatrix}\\ \uparrow\\ [_{\text{Time}}\ \text{0d}]\end{matrix}\right]$$

The upward arrow and angle brackets represent a function. The entity under the arrow is the input and the one on top of it is the output. The capital letters in the angle brackets indicate the function and small letters, its features. In (8), PR is the function and [1d, +dir, -b, -i] are the aspectual features that constitute this PR function. The zero dimensional Space and Time arguments are mapped onto the Space and Time with the features [1d, +dir, -b, -i] by the sp-bound PR functions. Similarly the projection structures for staying and stative situations of extending, covering and filling are also modified as follows:

（9）　a. Staying

$$\left[_{\text{Sit}}\ \text{BE}([X],\ [_{\text{Space}}\ \text{Y}]);\ \left\langle\begin{matrix}\text{PR}\\ \text{1d}, +\text{dir}\\ -\text{b}, -\text{i}\end{matrix}\right\rangle \begin{matrix}\begin{bmatrix}\text{1d}, +\text{dir}\\ -\text{b}, -\text{i}\end{bmatrix}\\ \uparrow\\ [_{\text{Time}}\ \text{0d}]\end{matrix}\right]$$

b. Stative extending, covering, filling

$$\left[_{\text{Sit}}\ \text{BE}\left(\left\langle\begin{matrix}\text{PR}\\ \text{1/2/3d},\\ -\text{b}, -\text{i}\end{matrix}\right\rangle^{\alpha} \begin{matrix}\begin{bmatrix}\text{1/2/3d}\\ -\text{b}, -\text{i}\end{bmatrix}\\ \uparrow\\ [_{\text{Thing}}\ \text{0d}]\end{matrix},\ \left\langle\begin{matrix}\text{PR}\\ \text{1/2/3d}\\ -\text{b}, -\text{i}\end{matrix}\right\rangle^{\alpha} \begin{matrix}\begin{bmatrix}\text{1/2/3d}\\ -\text{b}, -\text{i}\end{bmatrix}\\ \uparrow\\ [_{\text{Space}}\ \text{0d}]\end{matrix}\right);\ [_{\text{Time}}\ \text{0d}]\right]$$

Next, let us introduce the motion-change dichotomy into our sp-binding representation. Motion and change are known to be a fundamental aspectual opposition. An easy but pervasive approach has been to posit an independent function to each of them. In such a taxonomic approach BECOME or INCHOATIVE, for example, is posited for change and ACT, DO, MOVE or PROCESS, for motion (Dowty 1979, Jackendoff 1990, Levin and Rappaport Hovav 1995, Kageyama 1996, 1997). However it is unable to explain such transition phenomena illustrated by the following:

(10) a. Ki-ga taore-te i-ru
tree-Nom fall.down-*te i*-Pres
A tree is fallen down there
b. Ki-ga yukkuri taore-te i-ru
tree-Nom slowly fall-down-*te i-ru*
A tree is slowly falling down
(11) a. Doa-ga ai-te i-ru
Door-Nom open-*te i*-Pres
The door is open
b. Doa-ga sukoshizutu ai-te i-ru
Door-Nom little.by.little open-*te i-ru*
'The door is opening little by little'

Introduction of process adverbials makes the result state progressive (Yoshikawa 1975, Okuda 1977, Kudo 1982, Iwamoto 2008, among others).

In order to capture both the opposition and the transition, we need to introduce an aspectual distinctive feature into the projection function PR. Jackendoff (1996) suggests that projecting axis is either dense or nondense. This is based on the understanding that the possessive field is different from others in that the Paths of change of possession consists only of the source person and the goal person and there is no point between them. Similarly there can be no interval between the former possession and the latter when something changes its possessor (Jackendoff 1992). Iwata (1999), following Jackendoff, argues that introduction of [+/-dense] feature renders distinction of the possessive field from other semantic fields. I will adopt Iwata's [+/-dense] to encode two types of projections. But modification is in order. While Paths of the possessive field is always nondense, it is not trivial that Paths of other semantic fields are necessarily dense. Achievements by definition have no process at all, which suggests that their Paths are nondense. Thus [-dense] Paths are not restricted to the possessive field but can be found in any semantic field where the change is conceptualized as not involving a process, whether or not the change in the real world may involve some (Iwamoto 2008).[3] The [+/-dense] feature as adopted here distinguishes two types of projection to define motion and change, the fundamental dichotomy of events.

In accordance with the general understanding that motion is nonbounded, and change, bounded unless otherwise specified, we assume that [+/-dense] is associated with PR and the boundedness feature [+/-b(ounded)], so that in unmarked cases projection is either [+dense, -b] or [-dense, +b], the former pertaining to motion and the latter, change. [-dense] projection maps a [0d] argument onto a goal. Achievement verbs such as English *die* and corresponding Japanese *shinu* have a projection structure in which the goal is DEAD state and the temporal [0d] argument is mapped onto another [0d] point by the sp-bound function as in (12b):

(12) a. Activity e.g. *hashiru* 'run'

$$\left[\begin{array}{llll}
 & \qquad\begin{bmatrix}1d,+dir\\+den\\-b,-i\end{bmatrix}_{\alpha} & & \qquad\begin{bmatrix}1d,+dir\\+den\\-b,-i\end{bmatrix}_{\alpha}\\
 & \left\langle\begin{array}{l}PR\\1d,+dir\\+den\\-b,-i\end{array}\right\rangle\uparrow & & \left\langle\begin{array}{l}PR\\1d,+dir\\+den\\-b,-i\end{array}\right\rangle\uparrow\\
{}_{\text{Sit}}\ \text{BE}([X], & [_{\text{Space}}\ 0d]); & & [_{\text{Time}}\ 0d]
\end{array}\right]$$

b. Achievement e.g. *shinu* 'die'

$$\left[\begin{array}{llll}
 & \qquad[\text{DEAD}]_{\alpha} & & \qquad[0d,\ t_i]_{\alpha}\\
 & \left\langle\begin{array}{l}PR\\1d,+dir\\-den\\+b,-i\\bdby^{+}([\text{DEAD}])\end{array}\right\rangle\uparrow & & \left\langle\begin{array}{l}PR\\1d,+dir\\-den\\+b,-i\\bdby^{+}([t_i])\end{array}\right\rangle\uparrow\\
{}_{\text{Sit}}\ \text{BE}([X], & [_{\text{Prop}}\ 0d]); & & [_{\text{Time}}\ 0d]
\end{array}\right]$$

Introduction of [+/-dense] reconstructs the theory into a dynamic computational model that explains many problems concerning stativization as well as the problems concerning degree achievement and ambiguous boundedness, the latter of which we do not discuss here for want of space. (See Iwamoto 2008, cf. Dowty 1979, Hay 1998, Hay et.al. 1999, Kennedy and McNally 2005, Kennedy and Levin 2008, Kearns 2008, Sugioka 2002). The above is the basic machinery of the modified sp-binding theory.

3. Stativization and the Cross-section Function

When I discussed the four ATFs, PL, ELT, GR and COMP, I mentioned Jackendoff's (1991) claim that ATFs are coupled: Where there is an ATF, there is an inverse ATF to it. Now consider PR, especially dense PR. Since it is not a function that modifies the values of the aspectual features [+/-b] and [+/-i], it has different characteristics from these four ATFs. However, it is an including function that projects a cross-section along an axis. Thus it is an

ATF that transforms an n-dimensional cross-section onto an n+1 dimensional entity. If so, there must be an extracting inverse function that transforms an n-dimensional entity onto an n-1 dimensional cross-section. Let us call this function Cross-section Function (CRS). I will claim that it is CRS that plays a crucial role in stativization. CRS maps a one-dimensional event onto a zero dimensional state. This is an sp-binding implementation of Jackendoff's idea of 'snapshot' for progressive aspect. 'Snapshot' puts a focuss on a stataive slice out of an event. But progressive is not the only form of stativization. Result state, iterative, perfect and habitual are also known to constitute stativized events (De Swart 1998, Michaelis 2004 among others). These senses of stativization are all covered by the single formative-*te i-ru* in Japanese. Thus if we can formalize the semantics of *te i-ru* in the modified sp-binding framework, we will reach a deeper understanding of the notion stativization in general. From now on, I will call the modified sp-binding theory Event Projection Theory, since the types of projection play a crucial role in determining event types.

As Jackendoff (1996) suggests, event types are defined by the combination of projecting arguments and sp-binding. Similarly, types of stativization must be defined by the combination of arguments and CRS applying to them.

Here I will claim that Japanse *-te i-ru* has the LCS in which CRS applies only to the temporal argument with the set of features [1d, +dir, -b] to map it onto a [0d] temporal point.

(13) CS of *te i-ru*

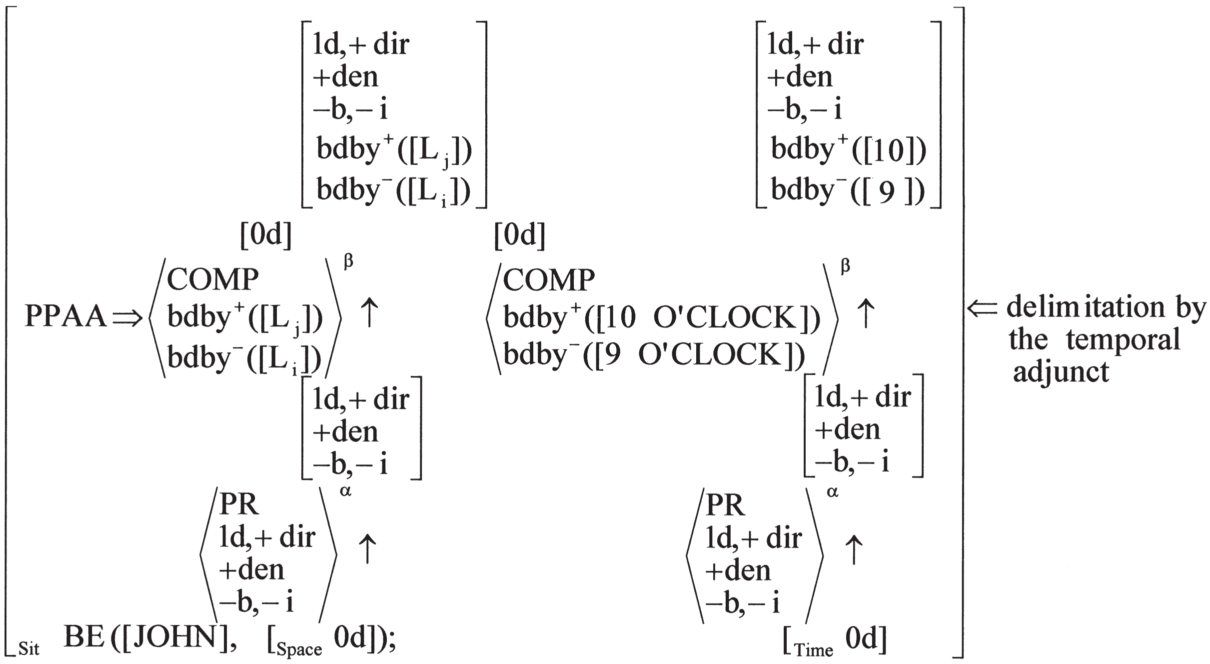
$$\left[\begin{array}{l} \qquad [0d] \\ \langle \mathrm{CRS} \rangle \uparrow \\ {}_{\mathrm{Time}}\begin{bmatrix} 1d, +dir \\ -b \end{bmatrix} \end{array}\right]$$

Notice that this claim does not mean that CRS does not apply to other arguments. But application of CRS to other arguments is conditioned by the Principle of Parallel Application of ATF.

(14) The Principle of Parallel Application of ATF (PPAA)
An ATF applying to an argument also applies to its sp-bound arguments unless there is a hindering factor (Iwamoto 2008).

PPAA is a central principle of sp-binding on which Jackendoff (1996) constructed the theory although he did not mention it explicitly. It conditions similarity transformation between two or more sp-bound arguments. When an ATF applies to one of sp-bound arguments, it also applies to the others unless its application is not prevented. Consider the projection structure of motion verbs whose Path or Time argument is delimited by COMP:

(15) a. John ran from 9 o'clock to 10 o'clock.



b. John ran from his house to the station

$$
\left[
\begin{array}{lcc}
 & \begin{bmatrix}\text{ld},+\text{dir}\\ +\text{den}\\ -\text{b},-\text{i}\\ \text{bdby}^{+}([\text{S}])\\ \text{bdby}^{-}([\text{H}])\end{bmatrix} & \begin{bmatrix}\text{ld},+\text{dir}\\ +\text{den}\\ -\text{b},-\text{i}\\ \text{bdby}^{+}([\text{T}_j])\\ \text{bdby}^{-}([\text{T}_i])\end{bmatrix} \\
\begin{array}{l}\text{delimitation}\\ \text{by the spatial}\\ \text{adjunct}\end{array} \Rightarrow & \left\langle\begin{array}{l}\text{COMP}\\ \text{bdby}^{+}([\text{STATION}])\\ \text{bdby}^{-}([\text{HOUSE}])\end{array}\right\rangle^{\beta}\uparrow & \left\langle\begin{array}{l}\text{COMP}\\ \text{bdby}^{+}([\text{T}_j])\\ \text{bdby}^{-}([\text{T}_i])\end{array}\right\rangle^{\beta}\uparrow \\
 & \begin{bmatrix}\text{ld},+\text{dir}\\ +\text{den}\\ -\text{b},-\text{i}\end{bmatrix} & \begin{bmatrix}\text{ld},+\text{dir}\\ +\text{den}\\ -\text{b},-\text{i}\end{bmatrix} \\
 & \left\langle\begin{array}{l}\text{PR}\\ \text{ld},+\text{dir}\\ +\text{den}\\ -\text{b},-\text{i}\end{array}\right\rangle^{\alpha}\uparrow & \left\langle\begin{array}{l}\text{PR}\\ \text{ld},+\text{dir}\\ +\text{den}\\ -\text{b},-\text{i}\end{array}\right\rangle^{\alpha}\uparrow \\
{}_{\text{Sit}}\ \text{BE}([\text{JOHN}], & [_{\text{Space}}\ 0\text{d}]); & [_{\text{Time}}\ 0\text{d}]
\end{array}
\right] \Leftarrow \text{PPAA}
$$

In (15a) the PP from *9 o'clock to 10 o'clock* delimits the time projection. But when the time projection is delimited, the space projection is also delimited since they are sp-bound and there is no hindering factor. The same holds for (15b) as well. PPAA is a fundamental principle of the SP-binding Theory.

Given PPAA, application of the CS of *-te i-ru* to motion and achievement will give rise to the following two distinct stative structures:

(16) a. *-te i-ru* form of motion

$$\left[\begin{array}{lcc} & \begin{array}{c}[0d]\\ \text{by PPAA} \Rightarrow \langle \text{CRS}\rangle^{\beta}\uparrow \\ \begin{bmatrix}\text{1d}, +\text{dir}\\ +\text{den}\\ -\text{b}, -\text{i}\end{bmatrix}\\ \left\langle\begin{matrix}\text{PR}\\ \text{1d}, +\text{dir}\\ +\text{den}\\ -\text{b}, -\text{i}\end{matrix}\right\rangle^{\alpha}\uparrow\end{array} & \begin{array}{c}[0d]\\ \langle \text{CRS}\rangle^{\beta}\uparrow \\ \begin{bmatrix}\text{1d}, +\text{dir}\\ +\text{den}\\ -\text{b}, -\text{i}\end{bmatrix}\\ \left\langle\begin{matrix}\text{PR}\\ \text{1d}, +\text{dir}\\ +\text{den}\\ -\text{b}, -\text{i}\end{matrix}\right\rangle^{\alpha}\uparrow\end{array}\\ {}_{\text{Sit}}\ \text{BE}([X], & [_{\text{Space}}\ 0d]); & [_{\text{Time}}\ 0d] \end{array}\right] \Leftarrow \textit{-te i-ru}$$

b. *-te iru* form of achievement

$$\left[\begin{array}{lcc} & & \begin{array}{c}[0d]\\ \langle \text{CRS}\rangle\uparrow \\ \begin{bmatrix}\text{1d}, +\text{dir}\\ +\text{den}\\ -\text{b}, -\text{i}\end{bmatrix}\\ \text{inserted by coercion} \Rightarrow \left\langle\begin{matrix}\text{PR}\\ \text{1d}, +\text{dir}\\ +\text{den}\\ -\text{b}, -\text{i}\end{matrix}\right\rangle\uparrow\end{array}\\ & \begin{array}{c}[\text{DEAD}]\\ \left\langle\begin{matrix}\text{PR}\\ \text{1d}, +\text{dir}\\ -\text{den}\\ +\text{b}, -\text{i}\\ \text{bdby}^{+}([\text{DEAD}])\end{matrix}\right\rangle^{\alpha}\uparrow\end{array} & \begin{array}{c}[0d]\\ \left\langle\begin{matrix}\text{PR}\\ \text{1d}, +\text{dir}\\ -\text{den}\\ +\text{b}, -\text{i}\\ \text{bdby}^{+}([t_i])\end{matrix}\right\rangle^{\alpha}\uparrow\end{array}\\ {}_{\text{Sit}}\ \text{BE}([X], & [_{\text{Prop}}\ 0d]); & [_{\text{Time}}\ 0d] \end{array}\right] \Leftarrow \textit{-te i-ru}$$

With the *-te i-ru* form of motion, since there is no hindering factor, CRS applying to the temporal argument also applies to the sp-bound second argument by PPAA, defining the CS of progressive, where both the space and time arguments are made zero dimensional, pertaining to a 'snapshot' interpretation of motion. With the *-te i-ru* form of achievement, on the other hand, CRS cannot be applied to the projected arguments directly since they are not [1d, +dir, -b]. In order to reconcile the conceptual discrepancy and apply CRS to the temporal projection, <PR| 1d, +dense, -b> is introduced by coercion (cf. Jackendoff 1997, 2002). But the same cannot be introduced to the second argument, since it is a constant state, which is not projectable. (16b) represents the meaning "remaining in the DEAD state", the structure of result state. The two basic meanings of *-te i-ru* are defined mechanically by the computational system of the present theory. For lack of space, I cannot present here how this analysis extends to define other stative meanings of *te i-ru* forms. In Iwamoto (2008) it is shown that the modified sp-binding theory gives a coherent account of the problems of *te i-ru* forms without ad hoc stipulations.

It also explains the difference between the Japanese *-te i-ru* forms and the progressive constructions of English type. In the latter, progressive interpretations are possible not only with motion but also with achievement of *die* and *break* type (Rothstein 2004). In the present theory, the difference is attributed to a single parameter: the types of arguments to which CRS is specified to apply. Japanese-*te i-ru* specifies that CRS apply only to the temporal argument. Application of CRS to other arguments is conditioned by PPAA. On the other hand, the progressive constructions of English type grammatically specify that CRS necessarily apply to both the temporal projection and the space or property projection so that the internal structure of the CSs of achievement verbs such as *die* and *break* are modified, to serve to render "internal view point" interpretations (cf. Comrie 1976, Smith 1997, Shirai 2000).[4]

(17) Progressive in English: CRS necessarily applies to both the Space and the Time arguments.

$$\left[_{\text{Sit}} \quad \cdots \quad \begin{array}{c}[0d]\\ \langle \mathrm{CRS}\rangle^{\alpha}\uparrow \\ \left[_{\text{Space/Prop}} \begin{array}{l}1d, +dir\\ -b\end{array}\right]\end{array} \quad \begin{array}{c}[0d]\\ \langle \mathrm{CRS}\rangle^{\alpha}\uparrow\\ \left[_{\text{Time}}\begin{array}{l}1d, +dir\\ -b\end{array}\right]\end{array}\right]$$

(18) X is dying

$$\left[_{\text{Sit}} \ \mathrm{BE}([X], \begin{array}{c}
\text{be}-\text{ing} \Rightarrow \begin{array}{c}[0d]\\ \langle \mathrm{CRS}\rangle\uparrow\end{array}\\
\left[\begin{array}{l}1d, +dir\\ +den\\ -b, -i\end{array}\right]\\
\langle \mathrm{GR}\rangle^{\gamma}\uparrow\\
\left[\begin{array}{l}1d, +dir\\ +den\\ +b, -i\\ bdby^{+}([\beta])\end{array}\right]\\
\left\langle\begin{array}{l}PR\\ 1d, +dir\\ +den\\ +b, -i\\ bdby^{+}([DEAD]^{\beta})\end{array}\right\rangle^{\alpha}\uparrow\\
[_{\text{Prop}}\ 0d]
\end{array}); \begin{array}{c}
\begin{array}{c}[0d]\\ \langle \mathrm{CRS}\rangle\uparrow\end{array}\\
\left[\begin{array}{l}1d, +dir\\ +den\\ -b, -i\end{array}\right]\\
\langle \mathrm{GR}\rangle^{\gamma}\uparrow\\
\left[\begin{array}{l}d, +dir\\ +den\\ +b, -i\\ bdby^{+}([t_i])\end{array}\right]\\
\left\langle\begin{array}{l}PR\\ 1d, +dir\\ +den\\ +b, -i\\ bdby^{+}([t_i]^{\beta})\end{array}\right\rangle^{\alpha}\uparrow\\
[_{\text{Time}}\ 0d]
\end{array}\right] \begin{array}{l}
\Leftarrow \textit{-be-ing}\\
\\
\Leftarrow \text{introduced by coercion}\\
\\
\Leftarrow \text{modified by coercion}\\
\quad [-den] \rightarrow [+den]
\end{array}$$

When the CS of progressive (17) applies to (12b), coercion makes two modifications. Since CRS applies only to [1d, -b], it cannot apply to (12b) directly. In order to reconcile the conceptual discrepancy, the [-dense] features in the PR functions are modified as plus to make the change gradual. And coercion introduces GR to make the projected event nonbounded, since CRS applies only to nonbounded entities. Thus introduction of GR eliminates the implication *X is dead*, which *X died* has, a conceptual semantic solution to the imperpective paradox.[5] The above is the conceptual semantic mechanism how progressives of both activities and achievements in English have internal view point interpretations while the *te i-ru* forms of achievements do not in Japanese (cf. Shirai 2000).

The present theory gives a coherent account of the difference between the English type progressive and Japanese *te i-ru* by a single parameter without an ad hoc stipulation.

4. Conclusion: Toward the Typology of Stativization

Stativization is not a label to a set of unrelated aspectual categories: they are structurally related. When a specific morpho-syntactic form is responsible for several aspectual categories, they must be treated as polysemy. The above discussion has shown that progressive and result state interpretations of *te i-ru* forms are polysemous in that they are structurally defined on the basis of the sole unambiguous conceptual meaning of the formative *te i-ru*. Although I could not have presented here the whole picture of the interpretations of the *te i-ru* forms, in Iwamoto 2008 it is shown that other interpretations of *te i-ru* forms, that is, iterative, habitual, maintenance, perfect and simple state, are also defined generatively by the same theoretical device. They are polysemous in the sense of Pustejovsky (1995). Languages usually have more than one morpho-syntactic form that indicate stativity. But the fact that the versatile stative interpretations of the *te i-ru* forms are conceptual semantically related as polysemous indicates that the present framework may be able to serve as a theoretical device to explicate the typology of stativization. Also, the fact that the difference between *te i-ru* and progressive of the English type is attributed to a single parameter suggests that it is a direction to be pursued.

Notes

[1] Beside these four functions, Jackendoff (1991) also discusses PART and CONT. We do not consider them here since they do not involve change of values of the aspectual features.

[2] Although Jackendoff (1996) discusses multiple layered projections for the structure of the flow of river and multiple quantification, the input-output relations remain unarticulated.

[3] The type of change that involves a process is called degree achievement (Dowty 1979). More recently Scale Structure Theory has been developing theoretical devices that explicate the internal aspectual structure of degree achievement (Hay 1998, Hay et. al. 1999, Kennedy and McNally 2005, Levin and Kennedy 2008, Kearns 2008). Also see Iwamoto (2008) for an SP-binding analysis of degree achievement.

[4] A potential problem of this analysis is that it cannot define the CS of the progressive aspect of activities without motion such as *X is pushing the wall and X is holding a bag,* where CRS applies only to the time argument since other arguments do not project. Thus it should be modified with a conditional phrase such as 'if the CS of the clause involves more than one projection including the time projection.'

[5] Jackendoff (1991) suggests that the CS of progressive of accomplishment involves GR but does not explicate what induces its introduction. The present analysis gives an coherent account of this problem by assuming that progressive involves application of CRS, which induces GR to the bounded argument, which it cannot directly apply.

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