

# The Principle of the Convergence of Eye Movements and Related Topics<sup>1</sup>

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## 1. Introduction

This article aims at clarifying (1) how the ideas of “source” and “goal”<sup>2</sup> are manifested in language, (2) linguistic manifestations concerning Kuno’s Empathy Hierarchy (Kuno 1987, 1989<sup>7</sup>) and (3) association of the idea of “source” with the concept of “minus” and of the idea of “goal” with the concept of “plus”. It is also argued that the manifestation is systematically motivated. The idea expressed in the paper goes against the traditional view of the lexicon as the set of the arbitrary and idiosyncratic, and consequently against the view of the lexicon as the mere repository of homonyms.

In this paper an experientialist view is adopted as a guiding principle, suggesting that certain spatial relations manifested in language are embodied in terms of our daily interactions with our surrounding environments. Thus considering commonality of our physical characters and environments, commonality of languages is foregrounded.

Beginning with Ikegami (1987), the article considers the concepts of cognitive psychology and applies them to linguistic manifestations. This paper focuses on psychological eye movements, and consequently the related concepts of divergence and convergence. I suggest that the ideas of “source” and “goal” manifested in language are best understood in the context of the principle of divergence or convergence of perspectives. This

principle is as follows: eye movements, whether concrete or abstract, are motivated to converge at one time at one scene. This will be called the principle of the convergence of eye movement. Looking at the outcomes of this research in the context of cognitive psychology, our linguistic ability is undoubtedly a product of our psychological activity.

In this paper my goal here is to discuss and elucidate the linguistic manifestations of the ideas of “source” and “goal”. Although there has been a certain amount of work concerning prepositions or postpositions, there have not been many pieces of work dealing with prepositions or postpositions from the perspectives of “source” and “goal”: some aspects of the concepts of “source” and “goal” need to be examined in more depth.

For instance, consider the following Japanese sentences:

- (1) a. *Taroo (Z) wa Hanako (Y) kara hon(X) o karita.*

Taro TOPIC Hanako FROM book ACC borrowed

‘Taro borrowed a book from Hanaka.’

- b. *Taroo (Z) wa Hanako (Y) ni hon(X) o karita.*

Taro TOPIC Hanako TO book ACC borrowed

‘Taro borrowed a book from Hanaka.’

In this sentence, Taro is a borrower of a book and Hanako is a lender. In a general sense a borrower is a receiver and a lender is a giver. In this article “receiver” in a broad sense is a person to whom something goes (categorized as Z) and a “giver” in a general sense is a person from whom something comes (categorized as Y). The thing received, borrowed, stolen etc. is indicated as X.

Here logically speaking, Y is the “source” and in every respect should be followed by *kara* ‘from’, but in fact *ni* ‘to’ is not only acceptable, but

preferred.<sup>3</sup> This is exemplified by the following figure.

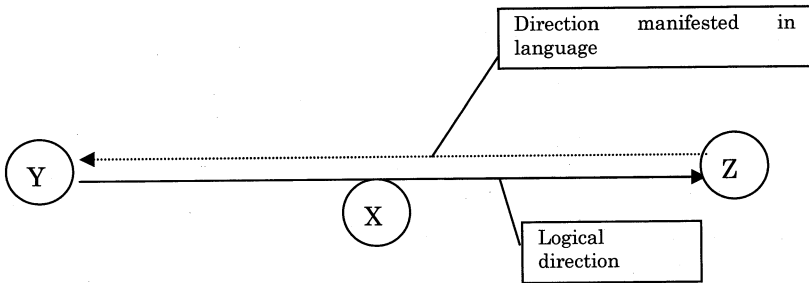


FIGURE 1

This paper attempts to explain the apparently ‘wrong’ choice of the postposition *ni* and related phenomena.

## 2. Previous studies

The pioneering research paper on this issue is Ikegami (1987) who suggests that although “source” and “goal” are, from the logical point of view, on an equal footing, they do not constitute an equal pair of concepts in some cases. Ikegami (1987) indicates that language manifests an asymmetry in terms of the markedness of the concepts of “source and “goal”. He summarized his idea as the ‘goal-over-source’ principle, in which the substitution of the “goal” for the “source” takes place in some linguistic representations, but the reverse substitution is never observed. He claims that the ‘goal-over-source’ principle is based on reciprocity: an act of giving is made in a situation in which it is taken that the act of giving must be reciprocal. If Z gets X from Y, then Z is expected to give back an equivalent of X to Y. In this context, the receiving of some gift from Y should imply the giving of something to Y. The position of Y with respect to Z should change from that of the giver to that of the supposedly future

receiver.

Ikegami (1987) concludes that as far as the psychological motivation goes, the act of giving is reciprocal. A similar idea that is related to the idea of reciprocity is expressed in Cialdini (2009: Ch.2). Cialdini (2009) uses the word “reciprocation”. He perceives reciprocation as a rule which says that people have to try to repay, in kind, what other people have provided them. He then suggests that reciprocation is one of the basic norms of human culture and notices that the members of a society must abide by the rule or they suffer social sanctions.

### 3. Problems

Ikegami (1987) solves the question of the ‘goal-over-source’ principle through the idea of reciprocity. This idea is quite convincing if we apply the idea to such words as ‘to borrow’ or the Japanese equivalent *kariru* ‘to borrow’, or ‘to learn’ or Japanese equivalent *narau* ‘to learn’ as in (1) above.

But at least one problem remains still to be accounted for: one cannot explain why the Japanese expression *yuraisuru* ‘to derive from’ must take *ni* ‘to or at’ as opposed to *kara* ‘from’. One cannot apply the idea of reciprocation to the word *yuraisuru* since *yuraisuru* does not imply reciprocation. Neither can we apply the idea of reciprocation to the word *kitaisuru* ‘expect’; it takes *ni* and never takes *kara* as in *Taroo wa Hanako ni / \*kara kitaisuru* ‘(Literally) Taroo expects to/\*from Hanako’. Also, in Japanese passives we cannot explain why the agent is marked by *ni* rather than *kara*.

Moreover in English, too, people are not *born from their mothers*, but they are *born to their mothers*; logically speaking one’s body should be delivered from their mothers. Mothers do not give anything to their pre-born children; the relationship is not reciprocal.

Therefore, one must take into consideration another factor that affects the choice of *ni* when *kara* is expected. I now focus on the idea of psychological eye movements and related concepts. They are in my framework categorized as divergence and convergence.

#### 4. Divergence

Divergence in my framework is a divergence in the sense of psychological eye movement. In this paper it is assumed that when people think of something, they look at them in their mind. Also it is presupposed that thinking can be subconscious as well as conscious. Smith and Kossly (2007: Ch.2) claim that perceptual processes though brain and visual systems can lead people to see things that are not in fact in space. They also suggest that neurons in the brain respond to illusory lines in a way close to the way they respond to a real line.

First, suppose that you are in a room with two doors. The doors are located in the two opposite corners and pretty far apart. If one person opens one door and another person opens the other door at the same time, you have trouble concentrating on the choice of the person coming through the door. Your eye movement tends to split between the two doors and accordingly you may experience some discomfort.

By the same token Smith and Kossly (2007: 112) assert that studies concerning divided attention demonstrate that human perception is impeded when people must attend to two separate entities.

In short, observers would naturally like to focus their eye movements on one thing at one time. In the field of linguistics a similar idea has already been adopted in Kuno (1978, 1989<sup>7</sup>:129), although he uses the term 'camera angle'.

A similar concept can be applied to the idea of "source"; "source" can be

associated with divided attention. When some entity (in the figure below, a person) departs from some “source” (in the figure below, represented as Y),<sup>4</sup> people naturally try to keep sight of it (in a metaphorical sense too) since a moving object should be interesting to any animal, whether carnivore or herbivore.<sup>5</sup> This idea can be applied to abstract concepts as well. Even though people trace the trajectory of a moving object, when they talk about or even think about the “source” of the object, they naturally have to capture both the concepts of “source” and the object. In other words psychological eye movements towards the “source” are implied in talking about or even thinking about the “source”. Also the idea of “source” must be accompanied by the existence of an entity that departs from the “source”. The two eye movements towards the “source” and towards the entity (in a metaphorical sense too) divide into two attentions. This is illustrated in Figure 2 below.

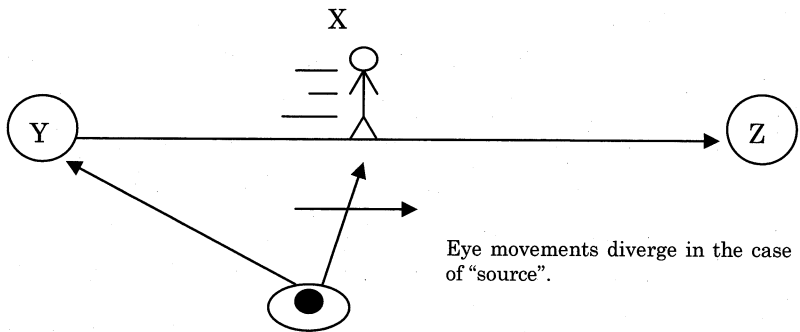


FIGURE 2

In short the observer’s eye movement diverges. When such divergence occurs, people are placed under more processing load, so experience more stress (Smith and Kosslyn 2007: 112). As a result, concepts associated with divergence are not as stable as not-diverged concepts. Split eye movements

are obviously more complicated and take more effort to capture than one eye movement. Accordingly there is a motivation to break complex concepts into more simple ones. Here the basic idea is that the more simple, the more natural to human beings.

### 5. Convergence

Convergence is categorized as more than one entity being combined to form one conceptual unit. In this paper different eye movements come together and become one eye movement as in Figure 3 below. Look at the following figure. This figure represents the processing of a “goal”.

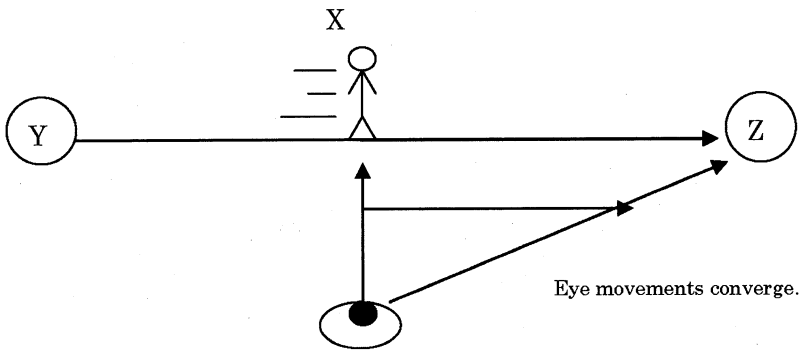


FIGURE 3

Unlike divergence, when convergence occurs, people tend not to be under as much processing load and concepts associated with convergence are more stable than diverged concepts. Such converged eye movement is obviously simpler and takes less effort to capture than two eye movements. Simple eye movements should be more preferred means of perceiving things.

Given this preference for reducing or processing load, there is one

obvious way that the concept of “source” could be made simpler. This is to reanalyze the “source” as a “goal” or end. In this vein at the level of discourse the cause or reason can be re-constructed as the end or “goal”. Consider the following figure.

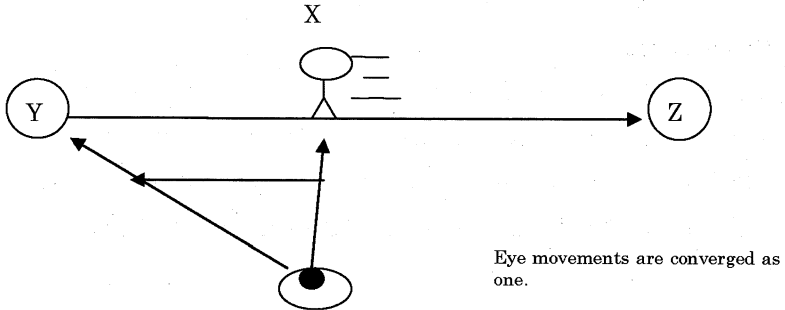


FIGURE 4

In this figure even when X is transferred from Y to Z, in some Japanese expressions X's transfer is expressed in a way such that it happens as if X is moved from Z to Y. In other words although from a logical point of view X (in Figure 2, 3 and 4 a person and in (lab) a book) is transferred FROM Y (in (lab) lender) TO Z (in (lab) borrower), the situation is manifested in Japanese in such a way that X is moved TO Y. This reanalysis has two subcategories, namely 5.1 and 5.2.

### 5.1 “Source” (reason) Y reanalyzed as “goal”

The reversal of eye movement may very well be a manifestation of the principle of convergence of eye movement. When this reversal occurs, the “source” Y can be reanalyzed as the “goal” (purpose). This type of manifestation is exemplified by the following:



- (2) a. *Because management wants to reduce the duplication of work, Radack Manufacturing's processing and shipping departments will be merged.*
- b. *In an effort to reduce the duplication of work, Radack Manufacturing's processing and shipping departments will be merged.*

In (2a) *Because management wants to reduce the duplication of work* represents the reason. From its conception, the reason is obviously associated with the concept of the “source”. The reason is the starting point of the line of thought, always potentially leading to an outcome. But consider (2b). The reason that is the beginning phase of thought is manifested as the “goal” (or purpose on semantic grounds); *to* infinitive (i.e. *to reduce*) is used. This is exactly applicable to the Japanese equivalent.

- (3) a. *Keiei sha tati wa shigoto no juuhuku wo herashi tai*  
 Management people PL TOP work GEN duplication ACC reduce want  
*to iu koto kara, Radack seizou gaisha no kakou*  
 and saying thing FROM Radack manufacturing company GEN processing  
*bumon to haisou bumon ga tougou sareru*  
 department and shipping department NOM merge PASSIVE  
*yotei desu.*  
 plan POLITE
- b. *Shigoto no juuhuku wo herasu tame ni, Radack*  
 work GEN duplication ACC reduce sake TO Radack  
*seizou gaisha no kakou bumon to haisou*  
 manufacturing company GEN | processing department and shipping  
*bumon ga tougou sareru yotei desu.*  
 department NOM merge PASSIVE plan POLITE

In (3a) the Japanese conjunction *kara* 'from', which is formally identical with, and derives from the postposition *kara* (Kitahara et al 2000: 1048) is used to mark the reason. Such a choice, in which the the postposition *kara* is obviously a source marker, is quite natural to a native speaker of Japanese.

Clearly the concept of the reason is naturally associated with the idea of "source" as is the concept of purpose with the concept of "goal". In (3b), however, against expectation, the reason is expressed as the "goal", since it is coded as *ni*, i.e. the "goal" marker. It may be said that even a reason which should be coded as a starting point (i.e. as the "source") has a clear motivation to be psychologically felt as the "goal" and thus linguistically manifested as the "goal", too. This is also exemplified by the word *reason* itself. When one wants to express the idea of a reason, it should naturally be coded as [some starting point expression + reason]; the natural consequence should be the expression *from the reason*. But in reality a sort of "goal" marker *for* is in use; *from the reason* is not acceptable whereas *for the reason* is. By contrast, Japanese allows expressions corresponding either *from the reason* (4) or *by for the reason* (5).

(4) *sono youna riyuu kara*  
the like reason FROM

*For the reason* will be translated into the following:

(5) *sono youna riyuu ni yotte*  
The like reason TO (or FOR) by

More generally (or crosslinguistically between Japanese and English

to different degrees) when a “source” expression is expected, a “goal” expression is occasionally acceptable, but not vice versa.

## 5.2 “Source” (cause) Y reanalyzed as “goal”

Consider the following example:

(6) *You’ll be happy to know that she’s just had a baby boy.*

In this example, the state of knowing this fact is something that causes happiness. In this sense knowledge is a cause. The causation should logically be coded as the “source”. But in reality it is coded by *to*, an obvious “goal” marker. One Japanese translation of (6) could be the following:

(7) *Kanojo ni otoko no ko ga dekita no o shiru koto ni*  
she LOC man GEN child NOM happen.PAST GEN ACC know thing TO  
*yotte, anata wa ureshiku omou deshoo ne.*  
by you TOP happy think POLITE right

In this example the Japanese translation is slightly awkward, but still the “goal” marker *to* can be expressed by *ni*.

## 6. Principle of convergence of perspectives

As already argued in Umemoto (2010), such examples show that the concepts of “source” and “goal” are not on an equal footing. Instead the “goal” interpretation (and so a “goal” coding) is preferred over a “source” construal (and “source” coding). In practice, a linguistic coding consistent with “goal” often occurs where a “source” coding might be expected on

logical or semantics grounds; but I have yet to find a single clear example of the reverse substitution.

At this moment I cannot offer an incontrovertible proof that this is the correct explanation, but this line of thinking does have the advantage (over obvious alternatives) of being applicable to a broader range of actual linguistic practices.

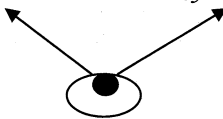
## 7. Related topics

To understand the principle in depth, we must look at related topics. The following sections examine two topics: Kuno's (1987: 206) empathy hierarchy, and association of the "goal" with the concept of a positive or "plus" or that of the "source" with the concept of a negative or "minus".

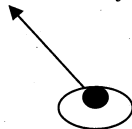
### 7.1 Empathy hierarchy

Kuno (1987: 206) uses the term "empathy" for the concept of camera angle he discusses. He suggests that his empathy hierarchy principle explains the relative (in)felicity of such sentences as the following:

(8) a. ? *John was scolded by me.* (Cf. Kuno (1987: 230; 1989<sup>7</sup>:146))



b. *I scolded John.*



According to his explanation (1987: 230-231), sentences like (8a) are

unacceptable since while the Surface Structure Empathy Hierarchy dictates that  $E(\text{John}) > E(\text{me})$  holds,<sup>6</sup> the Speech Act Empathy Hierarchy requires that  $E(\text{me}) > E(\text{John})$  be true; these two empathy relationships are at odds with each other.

Here I am inclined to argue that the adjudged awkwardness of (8a) may derive from the fact that there are two foci of eye movements instead of one. By contrast, (8b) sounds more felicitous, and this may be explained on the basis that there is only one line of eye movement. According to Kuno (1989<sup>7</sup>: 147), however, sentences like (8a) sound more acceptable if the speaker is forced to be treated in the third person as in a scientific paper. Kuno (1989<sup>7</sup>: 315) also argues that sentences like (8a) will be more felicitous if the speaker thinks back to the past and perceives his or her behavior as a third person's and when the speaker utters *No, John was hit by me, not by Bill* after he says *Then, John was hit by Bill*.

I am inclined to argue that (8a) sounds more acceptable if we see the scene of John being scolded by me from far away, keeping a distance between the speaker and the conceived situation;<sup>7</sup> in other words, if we think back to that scene or if we see the scene more objectively (e.g. describing the scene in detail in a court). Consider the following:

(9) *John was scolded by me.*



After all, the unacceptability of (8a) is lessened for example by changing it into an active form, thus having the perception of a whole, or by strengthening (or weakening) the eye movement either for John or me, or by lengthening the distance between the conceptualizer and the situation that the sentence designates. This fact must indicate that to the extent to which the lines of eye movement converge, sentences gain more acceptability.

## 7.2 Association of “source” with “minus” and vice versa

I already argued in Umemoto (2006) that the “source” is associated with the idea of “minus” and the “goal” with the concept of “plus”.<sup>8</sup> This is clearly exemplified by the following pairs:

- (10) a. *John persuaded her to get married.*  
b. *John dissuaded her from getting married.*

The sentence (10a) implies that the person represented by *her* really got married and that in (10b) the person identified as *her* did not get married. Verbs associated with the negation of an action, e.g. *refrain*, *discourage*, or *prohibit*, are often followed by *from*, as one naturally might expect.

Therefore, it may be assumed that the concept of the convergence of eye movements is inherently related to the idea of a collection, or accumulation; it naturally leads to the idea of the “plus”. In other words, plusness is immanent in the conceptualization of convergence. On the other hand, the concept of divergence is naturally related to that of the subtraction, splitting; minusness is immanent in the conceptualization of divergence.

Equally parallel examples are *absent from* and *late for* in which nonexistence is exemplified by *from* and existence by *for*. Another

interesting case is that in English the adverbs and the like implying the conception of an addition are found (e.g. *besides*, “*plus*”, *in addition to*, *along with*, etc.), but those implying the idea of a subtraction are hard to find. This is also true in Japanese; *sore-ni-kuwaete* (lit. that-to-adding) ‘besides’ is a natural adverb, but the imaginable opposite adverb *soko-kara-hiite* (lit. there-from-subtracting) is not.

## 8. Manifestations of the principle

The principle seems fanciful, whimsical and tenuous at first, but one can find its manifestations in several specific cases. Consider the 17 divisions of professional boxing weights. From the heaviest the list is as follows: heavyweight, cruiser weight, light heavy weight, super middle weight, middle weight, super welter weight, welter weight, super light weight, light weight, super feather weight, feather weight, super bantam weight, bantam weight, super fly weight, fly weight, light fly weight, minimum weight.

The cruiser weight may more easily be categorized as the second heaviest weight rather than the 16th lightest weight. In the same vein, for instance, the fly weight is more easily regarded as the third lightest weight rather than fifteenth heaviest weight. The principle of the convergence of eye movements is involved here as well: taking the cruiser weight as the 16th lightest weight needs more effort to process since it involves a considerable divergence of eye movement. It is thought that one eye movement goes to the lightest division (i.e. the minimum weight) and the other eye movement goes to one of the heaviest weight, which makes the distance of two eye movements fairly large. Thus it is easier to describe an entity in terms of the closer reference point because this involves less distance of eye movement. From another perspective, one might say that the descriptive polarity chosen is the one minimizing the amount of

information needing to be stored for processing.

Another well known phenomenon that is in some way related to the principle is the idea of a prototype. A prototype emerges from the principle of the convergence of eye movements as the collective way of seeing things: it involves many people's convergences of eye movements, so to speak, rather than one individual's eye movements.

Still another phenomenon which is connected to the principle is the coherence of discourse: discourse does not exist per se unless there is a common thread throughout the discourse. From a different perspective, as long as the conceptualizers find coherence, any given collection of sentences can form a discourse.

Another obvious example is the way addresses are manifested: addresses are normally posited as zooming out or zooming in respectively as in (11) or (12). In these examples addresses are mental paths that can be traced in one direction or the other; if two directions are involved at the same time, the conceptualizer has a hard time scanning mentally along the paths.

(11) Street number→Itabashi Ward→Tokyo→Japan (zooming out)

(12) Japan→Tokyo→Itabashi Ward→street number (zooming in)

## 9. Concluding remarks

In this paper my objective is to present a linguistic manifestation of a particular conception, i.e. the "source" and the "goal" in terms of the principle of the convergence of eye movements. The manifestations emerge from cognitive processing of conceptualizers' construal of their surroundings. The manifestations vary: the "goal" over the "source", the empathy hierarchy, the conception of the "plus" and the "minus", the



prototype and the discourse. After all they claim the inseparability of cognitive processing and its linguistic manifestations. Since cognitive processing is rather often tenuous and unstable, it should be concluded that linguistic structures may well be at odds with rigorous formalization, which is difficult to bring about at best in cognitive linguistics.

### Notes

1. This is an extended version of Umemoto (2010).
2. In this paper “source” is defined as a concrete or abstract place from which something originates, and “goal” as a concrete or abstract destination.
3. The Japanese preposition *ni* is categorized either as ‘to’ or ‘at’ depending on context but in this paper *ni* is treated basically as ‘to’ since it is obviously felt as a “goal” marker when it is presented in parallel with *kara* ‘from’.
4. The term ‘entity’ is adopted as defined in Langacker (2008: 98). ‘Entity’ is maximally general in its application. The term can apply to anything that might be conceived of or referred to in describing conceptual structure. It is important here that it is not required that an entity be discrete, separately recognized, or cognitively salient. The term can include things, relations, quantities, sensations, changes, locations, dimensions, and so on.
5. For carnivores moving objects can be their food, and for herbivores moving entities can often be predators.
6. E obviously stands for Empathy. Kuno’s own sentence and judgment is “*Then John was hit on the head by me* (1987: 230). At least one native speaker, however, suggested to me that this sentence does not sound very good even when *me* is replaced by some other pronoun, so that I adapted the sentence as (8a).
7. Kuno (19897: 315) mentions that referring to the past makes the sentence *Then, John was hit by me* more felicitous, but he does not explicitly observe the distance between the conceived situation and the speaker. I argue that the (subjective) distance between the speaker and the conceived situation is one of the most important keys to gain the convergence of the eye movements, which has often to do with acceptability judgments of some sentences. In short, Kuno (1987: chap.5) took considerations of camera angles and developed a theory of empathy but did not consider the implications of the concept of distance in depth. In my framework, however, the idea of distance is crucial to

perceive the idea of the principle of the eye movements.

8. “minus” in this paper is equal to the absence or negativity, whether concrete or abstract while “plus” is equivalent to presence or positivity, whether concrete or abstract.

### References

- Cialdini, Robert B. 2009<sup>5</sup>. *Influence: science and practice*. Boston: Pearson Education, Inc.
- Ikegami, Yoshihiko. 1987. ““source” vs. “goal” : a case of linguistic dissymmetry”. In Dirven, R. & Radden, G. (eds.) *Concepts of case*. Tübingen: Gunter Narr. 122-146.
- Kitahara et. al. (eds.) 2000<sup>2</sup>. *Nihon kokugo dai jiten dai nihan* [Japanese language big dictionary second edition]. Tokyo: Shougakkan.
- Kuno, Susumu. 1978, 1989<sup>7</sup>. *Danwa no bunpo* [The grammar of discourse]. Tokyo: Taishukan.
- Smith, Edward, and M. Stephen Kosslyn. 2007. *Cognitive psychology: mind and brain*. New Jersey: Pearson Education, Inc.
- Umemoto, Takashi. 2006. “Kiten to chakuten [“source” and “goal”].” *Kankyo to Keiei* (Environment and Management) School of Management, Shizuoka Sangyo University. 12-1: 51-63.
- Umemoto, Takashi. 2010. “On “source” and “goal” manifested in language”, *Journal of Shizuoka Sanyo University* vol. 12. School of Information Studies, Shizuoka Sangyo University. 295-304.