Marking aspect along a scale: The semantics of *-te iku* and *-te kuru* in Japanese

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The aspect markers *-te iku* and *-te kuru* in Japanese (where the verbs *iku* and *kuru*, when used as main verbs, mean 'go' and 'come', respectively) exhibit somewhat puzzling entailment patterns with open-scale and closed-scale change of state predicates. Specifically, as shown in (1)–(3), while the two markers behave in the same way with closed-scale predicates in inducing an entailment to the positive form only with minimally closed-scale predicates, with open-scale predicates they contrast with one another in that only *-te kuru* has an entailment to the positive form.

(1) Oyu-ga   **same-te** it-ta/ki-ta. $\models$ The water was cool (in the end).
     hot.water-NOM cool-TE IKU-PAST/KURU-PAST   [entailment present only with *-te kuru*]

     'The (hot) water came to be cool(er).'   **(open-scale)**

(2) Too-ga   **katamui-te** it-ta/ki-ta. $\models$ The tower was slanted (in the end).
     tower-NOM lean-TE   IKU-PAST/KURU-PAST

     'The tower came to be slanted.'   **(minimally closed-scale)**

(3) Ana-ga   **husagat-te** ki-ta/it-ta. $\not\models$ The hole was closed (in the end).
     hole-NOM close-TE   IKU-PAST/KURU-PAST

     'The hole came to be closed.'   **(maximally closed-scale)**

This paper shows that these facts can be explained uniformly by analyzing *-te iku* and *-te kuru* as aspectual operators that are sensitive to the scale structures of verbal predicates. The central idea is that both markers entail movement along a scale associated with the verb, but that they refer to different points on the scale (specifically, the initial point and the endpoint, respectively) in characterizing the relevant movement (cf., e.g., Imani 1990). The analysis is formalized by building on Kennedy and Levin's (2008) (K&L) scale-based analysis of degree achievements. As will become clear below, the basis for this choice is two-fold: first, it enables a transparent implementation of the basic idea outlined above; second, the proposed analysis turns out to involve complex interactions between conventional and contextual meanings in how the *standard of comparison* is set, an issue that has general implications to scale-based semantics (cf. especially Kennedy (2007)).

In K&L's approach, a change of state verb denotes a *measure of change* function that takes as its arguments an individual and an event and returns a degree that the individual has at the end state of the event. Crucially, the scale involved in measuring out the change of state has a minimum endpoint (indicated by '$\mathbf{cool}(x)(init(e))$' in (4)) corresponding to the degree that the object has at the initial state. In this setup, the lexical entry for the verb *same* 'cool' is defined as follows:

(4) $[\![\text{same}]\!] = \lambda x \lambda e.\mathbf{cool}^{\uparrow}_{\mathbf{cool}(x)(init(e))}(fin(e))$

With this assumption, the meanings of *-te iku* and *-te kuru* can be defined as aspectual operators that apply to measure of change functions and return truth conditions along the following lines:

(5)   a. $[\![\text{-te iku}]\!] = \lambda g \lambda x.\forall e[g(x)(e) > \mathbf{min}(g) \rightarrow \exists e'[e' \sqsubset e \wedge g(x)(e') \lessapprox g(x)(e)]]$
      b. $[\![\text{-te kuru}]\!] = \lambda g \lambda x.\forall e[g(x)(e) > \mathbf{min}(g) \rightarrow \exists e'[e \sqsubseteq e' \wedge g(x)(e') \lessapprox \mathbf{stnd}(g)]]$

-Te iku in (5a) represents a continuous movement *from* the initial point since it says that all events of which the predicate is true have smaller subparts terminating at a slightly shorter endpoint. By contrast, *-te kuru* in (5b) represents a movement *toward* some endpoint (specifically, the 'standard point') since it says that all events of which the predicate is true are part of a larger event that ends up in a degree that is slightly below that endpoint (this reference to the standard point is what crucially distinguishes *-te kuru* from *-te iku*, as will become clear below).

The entailment patterns observed above can now be explained as follows. First, the difference between minimally and maximally closed-scale predicates is essentially due to the fact that these predicates have asymmetrical entailment patterns in comparatives (cf., e.g., Kennedy and McNally

2005). Change of state predicates are comparative-like in that they assert that the degree at the end state is larger than the one at the initial state (Hay et al. 1999, K&L). Since both of the two aspectual markers do entail change of state along the relevant scale, it follows that, just as with ordinary comparatives, having an increased degree on the scale entails possessing a degree satisfying the positive form with minimally closed-scale predicates but not with maximally closed-scale ones.

The present analysis also captures subtle differences between the two aspectual markers in (2) and (3). First, (3) with *-te kuru* is predicted to mean that the hole was not completely closed. This prediction is borne out by the fact that (3) can be felicitously followed by the sentence 'And indeed the hole got completely closed just a few hours ago' only with *-te iku*. Second, (2) with *-te kuru* is of itself slightly awkward and becomes much more natural with the help of some degree expression (such as *daibu* 'quite') which indicates that some substantial change of state is involved (whereas (2) with *-te iku* comes with no such constraint). Now, it might initially appear as if the present analysis would simply predict (2) with *-te kuru* to be false (or infelicitous), since the scale for change of state is minimally closed (cf. (4)) and it is generally known that the standard is identified with the minimum endpoint for such scales (cf., e.g., Kennedy and McNally 2005). However, upon careful consideration of Kennedy's (2007) Interpretive Economy (a principle responsible for standard setting and one which dictates minimizing contextual dependence in calculating the meanings of sentences), this pseudo-problem goes away. Note first that Interpretive Economy is a processing-oriented (rather than a purely semantic) constraint. It is then naturally expected that its effect will be overridden if minimizing contextual dependence inevitably leads to semantic anomaly. This is in fact exactly what happens when *-te kuru* occurs with a minimally closed-scale predicate: if the standard were set to the minimum endpoint in (5b), there would be no way to make the sentence true simply because there is no degree below that standard. Thus, with minimally closed-scale predicates, the vague standard is instead chosen in interpreting the meaning of *-te kuru*. (I speculate that the difficulty in choosing the vague standard over the fixed minimum endpoint is the cause of the awkwardness of such sentence without degree modifiers.)

Finally, the contrasting entailment patterns that the two markers exhibit with open-scale predicates in (1) is explained due to the fact that only *-te kuru* makes reference to the standard point. The fact that *-te iku* doesn't induce the relevant entailment is straightforward. Again, this is because of the comparative-like nature of change of state predicates: asserting an increase in degree between the initial and end states of the event doesn't ensure that the final degree is above the standard. Now, strictly speaking, purely from the logical translation, the entailment doesn't go through with *-te kuru* either. I argue here that the entailment to the positive form nevertheless effectively arises due to the fact that the predication is vague. Note first that, here, just as with minimally closed-scale predicates, the standard is set to a contextually determined one, since setting it to the minimum endpoint leads to semantic anomaly. But then, a degree 'approximating' that vague standard is, for all practical purposes, one that satisfies the standard, given that the exact location of the standard on the scale is inherently unstable. Thus, the relevant entailment is felt to be present.

To summarize, the different entailment patterns of *-te iku* and *-te kuru* with open-scale and closed-scale predicates can be uniformly accounted for by analyzing them as aspectual markers that refer to scale structures of verbs. In doing so, the present analysis also brought out a case where Interpretive Economy forces a choice of a contextually determined standard for closed-scale predicates, thus providing further support for a general constraint along the lines formulated by Kennedy (2007), rather than hard-wiring standard setting for each type of gradable predicate.

References Hay, J., C. Kennedy & B. Levin. 1999. Scalar structure underlies telicity in 'degree achievements'. In *SALT IX*. **Imani, I.** 1990. *V-te kuru* to *V-te iku* ni tuite (On *V-te kuru* and *V-te iku*). *Nihongo-gaku* 9:54–66. **Kennedy, C.** 2007. Vagueness and grammar. *L&P* 30(1):1–45. **Kennedy, C. & B. Levin.** 2008. Measure of change. In C. Kennedy & L. McNally, eds., *Adjectives and Adverbs,* 156–183. Oxford: OUP. **Kennedy, C. & L. McNally.** 2005. Scale structure, degree modification, and the semantics of gradable predicates. *Language* 81(2):345–381.