Recycling Spatial Representations for Temporal Interpretations: Korean Verb Compounding Constructions

Introduction: It is known that there is a strong crosslinguistic tendency to use spatial expressions to explain temporal concepts, as in sentences like *"The meeting was pushed back an hour"* and *"This semester flew by so quickly"*. This paper explores a phenomenon of verb compounding constructions in Korean, where verbs of motion **o** (*come*)/**ka** (*go*) can form compounds with non-motion verbs, yielding a particular temporal interpretation. An analysis is given using a modified version of the path-algebraic approach to motion as outlined in Zwarts (2005, 2017).

Path Algebras: One approach to understanding the semantics of spatial configurations uses *Path Algebras*, which were introduced to understand the range of spatial properties of events (Hinrichs 1985; Krifka 1998; Zwarts 2005, 2017, a.o.). In a specific implementation of Zwarts 2005, directional prepositions in English can be characterized by specifying restrictions on an infinite set of concatenable paths in a given model of space, shown formally below in (1):

(1) a. A **path** p is defined as a continuous function from the real unit interval [0,1] (the 'indices') to positions in some model of space (say, 3-dim. Euclidean space $\mathbb{R}^3$):

$$p : [0, 1] \rightarrow D_s, \text{ where } D_s \text{ is a domain of spaces.}$$

b. A **Path Algebra** $\langle \mathbf{P}, + \rangle$ is the set of all possible paths in the space endowed with a path concatenation operator $+$.

c. The start of a path $p \in \mathbf{P}$ is $p(0)$, and the end is $p(1)$.

The following English example in (2) is analyzed as (3). The TRACE function associates an event e to a (unique) path p, similar to the spatial trace function in Link 1998. Thus, (3) describes an event where Alex runs a path ending within a subspace of the domain D_s that picks out "the house".

(2) Alex ran to the house.

(3) $\exists e[\text{run}(e) \wedge \text{AGENT}(\text{Alex}, e) \wedge \exists p \in \mathbf{P}[p = \text{TRACE}(e) \wedge p(1) \in \mathit{house}]]$

We observe that this mechanism can be extended to formalize the notion that some spatial facts are *inherent to individual lexical items*. The English *come* serves as a motivating example. Firstly, for an event instantiated by *come*, there must be a corrseponding path p (or, $\exists p[p = \text{TRACE}(e)]$). There must also be a contextually relevant subspace (denoted L_g here) that the motion ends in (or, $p(1) \in L_g$). Additionally, the relevant perspective holder of the utterance (denoted H_p here) is within the bounds of L_g. More explicitly, define a location function $Loc : D_e \rightarrow D_s$ that specifies a given individual's location in the model of space. Then, this last condition is stated as $Loc(H_p) \in L_g$. In this sense, rather than having a single $come(e)$ predicate, the lexical item *come* can be decomposed into these particular conditions imposed on a general `motion` event (similar decompositions can be defined for other motion predicates). Consider (4) below. These conditions are the colored conjuncts in the corresponding analysis of (4) below, where e is Jane's dancing event, e' is John's coming event, Jane is the H_p, and L_g is the space surrounding Jane's location.

(4) While Jane was dancing, John came. (narrated from Jane's perspective)

(5) $\exists e[\mathit{dance}(e) \wedge \text{AGENT}(e, \text{Jane})$
$\wedge \exists e'[\texttt{motion}(e') \wedge \text{AGENT}(e', \text{John}) \wedge \exists p[p = \text{TRACE}(e') \wedge p(1) \in L_g \wedge \mathit{Loc}(\text{Jane}) \in L_g]]]$

Changing the Domain: Krifka (1998) uses the notion of a one-dimensional directed path structure to represent temporal properties of events such as temporal adjacency, precedence, and run time of

events. We make a novel observation that in Korean, non-motion verbs can form compounds with motion verbs **o** (*come*) and **ka** (*go*) to receive temporal interpretations. We show that if one reduces the 3-dimensional domain of *spaces* to the 1-dimensional real number line of *times* as suggested in Krifka 1998, the analysis based on spatial paths can be applied directly to the temporal domain and provide compatible representations of these constructions.

Korean Verb Compounding Constructions: In Korean, path-indicating verbs **o** (*come*)/**ka** (*go*) can productively combine with a motion verb as in (7) to indicate path of the motion (Suh 2000; Choi and Bowerman 1991, a.o.). Our analysis of decomposing *come* into path-hood and location in (5) can apply directly here, with the only difference being that the manner of the `motion` predicate is further specified to *enter* as in (6).

(6) $\exists e[enter(e) \wedge \textsc{Agent}(e, \text{Jin}) \wedge \exists p[p = \textsc{Trace}(e) \wedge p(1) \in L_g \wedge Loc(H_p) \in L_g]]$

Beyond spatial interpretations, we make a novel observation that Korean motion-path verbs can also combine with *non-motion* verbs such as *live* and have the spatial interpretation of the path verb temporally reinterpreted as in (8):

(7) Jin-i pang-ey tule-{a. **o** / b. **ka**}-ass-ta
Jin-NOM room-DAT enter-{a.**come** / b.**go**}-PAST-DECL
'Jin {a.came / b. went} into the room.' [standard motion verbs]

(8) Jin-un kulehkey sala-{a. **o** / b. **ka**}-ass-ta
Jin-TOP like.that live-{a.**come** / b.**go**}-PAST-DECL
a. 'Jin has lived that way.' / b. 'Jin went on living that way.' [non-motion verbs]

These constructions are productive and can combine with a wide range of non-motion verbs and phrases such as *eat various foods*, *buy expensive clothes* and specify the temporal path of these activities (e.g. 'I had eaten various foods until 2020'). We argue that examples like (8) can receive a parallel analysis to (6) if the domain of *spaces* is reduced to a real domain of *times*, with the following temporal parallels to the three spatial conditions: (i) there is a *temporal* path related to that event, (ii) there is a contextually salient *time* where this temporal path ends, (iii) the perspectival *time* (t_p) of the utterance is included within that time. We can posit the corresponding event structures (9) and (10) for (8a) and (8b), respectively (see fig. 1 and 2):

(9) $\exists e[live(e) \wedge \textsc{Agent}(e, \text{Jin}) \wedge \exists p[p = \textsc{Trace}(e) \wedge p(1) \in T_g \wedge t_p \in T_g]]$

(10) $\exists e[live(e) \wedge \textsc{Agent}(e, \text{Jin}) \wedge \exists p[p = \textsc{Trace}(e) \wedge p(0) \in T_g \wedge t_p \in T_g]]$

The denotation in (9) correctly requires that Jin has lived a certain way up until some contextually relevant *time* (T_g), and (10) necessitates specifying that the *source* of the temporal path is within some contextually relevant time (T_g) as opposed to the *goal*. Examples such as *eat various foods* suggest that multiple events and occasions of the same type can be part of a path and that the predicates can be distributive or collective. In all of these cases, the underlying spatial representations are recycled to be interpreted temporally, the only change being D_s, the domain of evaluation.

Discussion: The overt morphology showing the use of spatial motion verbs in Korean motivates a path-based analysis of temporal interpretations of events and highlights the flexibility with which temporal interpretations are applied to default interpretations of lexical items. This flexibility also aligns with work showing that a goal-bias in spatial terms can be extended to other domains such as change in state/possession such as 'John went from happy to sad' (Lakusta and Landau, 2005).

Figures

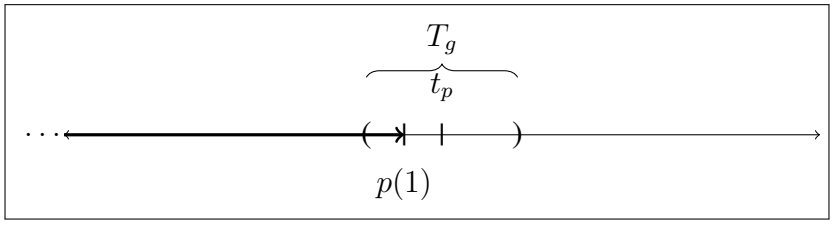

Figure 1: Pictorial Representation of (9)

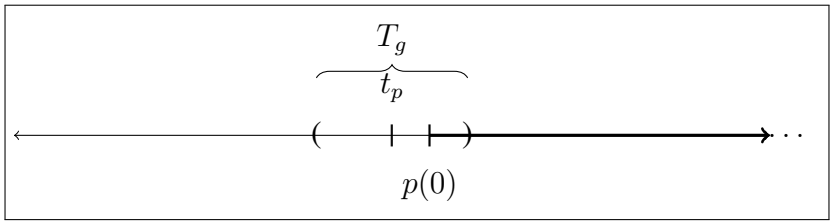

Figure 2: Pictorial Representation of (10)

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