

# Analyzing directionality: From paths to locations

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**Abstract.** This paper proposes an alternative to the currently prevalent analysis of directionality in terms of paths. It is argued that directionality should be understood as the temporal specification of locative modification in its stead. The proposal is compatible with both geometric and functional representations of space, is corroborated with typological findings, and meets the requirements for the careful development of a spatial ontology.

**Keywords:** directionality, locations, paths, event structure, motion

## 1 Against paths as the primitives of directionality

Spatial expressions are predicates that map a thing or event onto a location.<sup>1</sup> This location is specified by the configuration function in terms of a (geometrically or functionally defined) region with respect to a ground. In *The ball is under the table.*, *the ball* is said to be in the location specified by *under the table*. The predication of locations often is temporarily restricted (cf. [9]). Generally, an object is mapped to some region for a restricted interval of time only as its position may change at a later stage. In the present proposal, this change of configuration is the realm of the directionality function.

In the currently prevalent analysis of directionality, *viz.* the one by Jackendoff ([7]), directionality is a function that refers to ordered stretches of space, so-called *paths*. For example, the FROM path *off* refers to a path that has an ON configuration as its starting point. The first and most important objection to the analysis of Jackendoff concerns the methodology in the collection of the data that is said to constitute the directionality domain [7, 168–169]. There is no independent evidence that the used examples actually are examples of the same phenomenon, i.e. of directionality. Indeed, some of Jackendoff’s directionality expressions probably express something completely different. For example, TOWARD is said to belong to the type of paths called *directions*, which, unlike a *bounded* path such as TO, does not include (the region with respect to) the reference object but would do so if the path were extended by some unspecified distance. In a non-trivial sense, we probably only want to allow for extensions in approximately the same direction (otherwise, any direction could be turned

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into a TO path). Now, imagine an enclosure around point A with an opening at its south side and point B to its north. Because of the enclosure, one can only go from *A to B* going southwards, through the opening. To go from *A toward B*, however, one should go north. Crucially, the TOWARD path in this situation cannot be extended in the same direction to become a bounded *to B* path. Thus, instead of directionality, *toward* rather seems to express orientation. When modifying a motion event with this expression, the moving object of course ends up closer to the ground. And by continuing along this direction, one will generally end up at this ground too. But this need not be, as this example shows.

As a second objection, the path reference that is assumed by Jackendoff may follow from world knowledge instead of being part of the lexical semantics of directionality (cf. the procedure for the development of a spatial ontology in [1] and the *principle of conceptual abstraction* in [16, 595]). We know that it takes a path from A to B to go from A to B as we cannot but traverse all points in between when going there. Crucially, however, such paths are not necessarily what is referred to by directionality expressions. In fact, directionality expressions are probably better analyzed as predicates (cf. [16], [17]).

Finally, if directional PPs referred to paths, it should be possible to combine an expression of duration with the continuation along such a path. But this is not possible with Goal directionality as illustrated by the ungrammaticality of *He is walking into the building (\*for hours)*. (cf. also [18]). Note that this is not due to the semantics of the verb *to walk*: If explicit reference *is* made to a path, by substituting *through* for *into* in the example, it is possible to use an expression of duration. Thus, the contrast between these sentences shows that (Goal) directionality is probably *not* about paths.

## 2 Directionality in terms of locations

A more careful procedure than the one used by [7] can be followed in the collection of the data. It has been observed that more grammatical means of expression tend to make less idiosyncratic meaning distinctions ([14, 178], [6, 178], [1, 1035]). Also, it has been found that spatial cases primarily express directionality ([8], [13], [2]). Finally, cross-linguistic agreement is said to suggest relative uniformity in the way people conceptualize a domain [4]. So not only can we indeed expect directionality distinctions to be expressed by spatial case systems, also, we can expect whatever directionality distinctions that are made by spatial case to be of a more fundamental, conceptual type, especially when they show up in language after language. In a cross-linguistic study of spatial case inventories that is thus motivated, Lestrade [10] identifies three basic distinctions of directionality: Place, Goal, and Source.

This kernel of directionality could be described in terms of paths, but, arguably, it is preferable to use locations only as we need these anyway for the configuration function. Then, Goal and Source directionality denote a change of location, and Place denotes an absence of such a change. To define Goal and

Source, we need some ordered dimension: Goal directionality denotes a change into some location, Source does the opposite.

An ordered dimension can be provided for free by the extended event structure of the verb. Pustejovsky ([12]) argues that Davidsonian event arguments may have internal structure. For our present purposes, only the structure in which there is a strict partial order between the two subevents is relevant:

- (1) a.  $[e_3 \ e_1 <_\alpha \ e_2] =_{def} <_\alpha (\{e_1, e_2\}, e_3)$
- b.  $\forall e_1, e_2, e_3 [ <_\alpha (\{e_1, e_2\}, e_3) \leftrightarrow e_1 \preceq e_3 \wedge e_2 \preceq e_3 \wedge e_1 < e_2 \wedge \forall e [e \preceq e_3 \rightarrow e = e_1 \vee e = e_2] ]$

In this definition, event  $e_3$  is a complex event structure that consists of two subevents,  $e_1$  and  $e_2$ , where  $e_1$  and  $e_2$  are temporally ordered such that each is a logical part of  $e_3$ , the first subevent precedes the second, and there is no other event that is part of  $e_3$  [12, 69]. For example, the verb *build* is analyzed into a development process and a resulting state.

Pustejovsky [12, 74] explicitly allows for adverbial phrases to take scope over both the entire event and over individual subevents. Thus, we have three logical possibilities for spatial modification of motion verbs, which nicely corresponds to the empirically established kernel: the spatial modification of the entire event is called *Place* directionality (note the different use of this term here from the one by Jackendoff in the above); the modification of the first subevent is called *Source*, and the modification of the second subevent is called *Goal*. For example, depending on the type of directionality that is imposed by the spatial modifier and assuming the structure in (1), a walking event  $e_3$  of subject  $x$  modified by location  $y$  can be decomposed as follows:  $[walk(e_3, x) \wedge loc(e_3, x, y)]$  for Place,  $[walk(e_1, x) \wedge loc(e_2, x, y)]$  for Goal, and  $[loc(e_1, x, y) \wedge walk(e_2, x)]$  for Source.

In principle, the explicit spatial modification of one subevent by location  $y$  does not exclude the additional implicit modification of the second subevent by this same location. Following a suggestion of Hendriks et al. [5, chapter 8], we can ensure a change of location in a system of pragmatic contrasts (cf. also [15]): The speaker would have modified the whole event if the location had scope over the whole event, so if she only modifies the first subevent, we know that the locative function does not apply to the second one by pragmatic implicature.

By only using existing structures that have been established independently from present purposes, the proposal meets the criterion of Bateman et al. [1] to exclude the contribution of world knowledge in the development of a spatial ontology. Also, the account straightforwardly accounts for syncretism patterns in directionality systems. It has been observed that such syncretisms occur between Place and Source, between Place and Goal, or between all three distinctions, but not between Source and Goal to the exclusion of Place (cf. [2], [10], [11]). This naturally follows from the present proposal: If a language has a special marker for the spatial modification of the first subevent, the second subevent and the entire event will be treated uniformly as its complement (and the other way around), but taking together the two subevents would render the entire event

(cf. (1-b)) and therefore could not be distinguished from it. Finally, the temporal specification of a spatial modification does not impose any specific ontological category to this modification and is thus compatible with both geometrical and functional representations of space [3].

In conclusion, it was argued that directionality is best analyzed as the locative modification of an extended event structure. This accounts for the empirically established kernel of directionality, correctly predicts attested syncretism patterns, and does not stipulate any additional machinery.

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