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Fictive Motion in the Context of Mountaineering

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Abstract: Fictive motion in language (as in, "The ridge went north") is claimed to reflect the attention focus of the observer on the extension and spatial layout of an entity. This paper investigates fictive motion in alpine narratives, which describe the experience of moving in a very specifically structured space. We examine space properties that are highlighted through fictive motion in this specific context and describe how they go beyond spatial extension. We further report the communicative motivation behind the use of fictive motion, ranging from conveying the sense of place to encoding the full spatial footprint of a motion event.

Keywords: fictive motion, natural space, mountaineering, corpus-driven analysis

1. Introduction

The way we perceive and conceptualize spatial properties of the surrounding world depends on a constellation of contextual factors, such as scale and structure of space, activity at hand and experience (Montello, 2001). One way of accessing thought-related processes is through the analysis of language, since the particular linguistic choices a speaker makes convey the specifics of his or her conceptualization (Tenbrink, 2015). A number of phenomena, such as focus of attention, (switching between) granularity levels, conceptual perspectives and the like have been operationalized through linguistic structures and linked to contextual factors such as modes of travelling (Tenbrink & Winter, 2009),

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spatial experience (Hölscher, Tenbrink, & Wiener, 2011), familiarity with a specific route (Lovelace, Hegarty, & Montello, 1999), space structure (Brosset, Claramunt, & Saux, 2008; Kray, Fritze, Fechner, Schwering, Li, & Anacta, 2013), and wayfinding purpose (Hirtle, Timpf, & Tenbrink, 2011).

Most such studies are controlled, participatory experiments involving specific spatial tasks, where changes in linguistic outputs can be linked to certain variables. Parallel to such efforts is research using corpora of various sizes to study spatial language and concepts behind. Xu, Klippel, MacEachren and Mitra (2010) webcrawl a corpus of route directions and use corpus linguistics tools to study regional patterns in the use of cardinal and relative directions. Wallgrün, Klippel and Baldwin (2014) build up a corpus from hotel review webpages to examine proximity relations by looking at locations of the involved objects and their geometry. Derungs and Purves (2016) explore the concept of nearness through the spatial analysis of Microsoft web N-grams containing the term "near" and associated placenames. According to Xu, Klippel, MacEachren and Mitra (2010), large corpora enable researchers to answer a variety of questions related to space conceptualization using larger datasets than was traditionally the case.

This paper contributes to this line of corpus-based research by using a *space-specific* corpus – the digitized Alpine Journal (Bubenhofer, Volk, Leuenberger, & Wüest, 2015). Mountaineering is characterized by a close interaction with space in the process of navigation; till now, little research has looked into the way people experience and describe this unique type of space (Egorova, Tenbrink, & Purves, 2015). We examine the use of a linguistic structure that reflects a certain perspective on a spatial scene – fictive motion (henceforth FM). The use of FM reveals the conceptual primacy of spatially extended entities and their configuration in space (Matlock & Bergmann, 2014). Analysis of FM in alpine narratives contributes to our understanding of spatial properties that are highlighted as relevant through FM and strategies used for the description of spatial scenes. Methodologically, we rely on corpus linguistics tools to find FM in the corpus; further we analyse the resulting subcorpus of sentences containing FM qualitatively, applying cognitive discourse analysis (Tenbrink, 2015). Demonstrating this two-step process we add to the methodological toolkit of research dealing with spatial language and concepts.

Fictive motion in cognitive linguistics

Motion in physical space is one of the basic experiential domains of human everyday life, which accounts for our general "cognitive bias towards dynamism" (Talmy, 2000). In other words, moving around space provides us with a conceptual framework for describing static experiences (Matlock, Ramscar, & Boroditsky, 2003). One of the manifestations of this phenomenon in language is FM, the expression of a static entity through linguistic elements describing motion. Among different types of FM, the most commonly examined type represents the depiction of the location of a spatially extended object in

terms of a path over the object's extent, as in "The fence goes from the plateau to the valley" (Talmy, 2000; Taremaa, 2013).

Two uses of such FM are distinguished based on the presence of motion of the conceptualizer and cognitive processes involved (Langacker, 2005; Matsumoto, 1996). Global paths describe a spatial scene observable by a *static* viewer from a specific point in space. The motion component is motivated here by visual scanning along the spatial entity, and, thus, the global scope of attention (hence, *global* paths), as in example (1a). Local paths, in contrast, reflect the perspective of a viewer who is actually *moving* along a path-like entity. Thus, FIGURES[1] in local paths represent "travellable" entities (ordinarily associated with human locomotion, e.g., *road*) (Matsumoto, 1996). Here, a series of immediate fields of view of the moving observer are fictively construed[2] as a single entity, experienced as moving through space itself; this type of FM conveys the local scope of attention (hence, *local* paths), as in example (1b). The continuous nature of the movement is here reinforced through the progressive form of the verb ("is rising").

(1) a. *The path rises quickly near the top.* (Langacker, 2005)
b. *The path is rising quickly as we climb.* (Langacker, 2005)

The use of FM reflects a certain perspective in the scene conceptualization. On the one hand, it is the conceptual primacy of a linearly extended entity. The linearity condition can only be violated if the FIGURE has the potential to be conceptually extended (Matlock, 2004; Matlock & Bergmann, 2014), as in (2a), where the table is automatically conceptualized as narrow and long. Further, apart from being potentially linear, the FIGURE in FM has to represent a relatively large entity, which becomes apparent by the fact that example (2b) seems less acceptable or natural (as indicated by "??").

(2) a. *A table runs along the wall.* (Matlock & Bergmann, 2014)
b. ?? *The cell phone goes from the cup to the book.* (Matlock, 2004)

On the other hand, FM reflects a focus on the way the entity is configured in physical space and offers a way "to compute information about the layout of a scene" (Matlock & Richardson, 2004, p. 909). This focus on space dictates the necessary presence of the GROUND[3] in FM – otherwise, "the conceptualizer is unable to infer information about the configuration, position, or shape" of the FIGURE (Matlock, 2004, p. 7). This is also known as a path condition, which states that some property of the PATH[4] must be specified either in a prepositional

[1] We use uppercase to refer to the MOTION EVENT and its elements. "FIGURE" stands for the moving entity (Slobin, 2004; Talmy, 2000).
[2] We use the term "construal" in line with Langacker (2005), Matlock (2004), Talmy (2000) to refer to the ability of humans to view a scene in alternate ways – e.g., with a focus on a certain element.
[3] Spatial entity, with respect to which the motion occurs (Talmy, 2000).
[4] The course followed by the FIGURE with respect to the GROUND (Talmy, 2000).

phrase or in the verb semantics (Matsumoto, 1996), which is apparent in (3a-b) where the asterisk * indicates non-acceptability.

(3) a. * *The road began to run.* (Matsumoto, 1996)
b. *The road began to run {straight/along the shore}.* (Matsumoto, 1996)

Several sets of experiments have explored how people process FM. A drawing experiment showed that people tend to mentally extend the FIGURE when encountering FM (Matlock, 2006). Thus, participants would draw longer FIGURES when depicting a spatial scene described with fictive motion (e.g., "The tattoo runs along his spine") than its semantic analogue without FM (e.g., "The tattoo is next to his spine"). In case of two sentences with FM, they would draw longer FIGURES when the verb was the fast manner verb (e.g., *run* versus *crawl*), showing the ability of the verbs' semantics to highlight the unusual or salient properties of space. In an eye-tracking experiment by Matlock and Richardson (2004), participants were asked to view schematic drawings of spatial scenes while listening to their descriptions. As the authors report, participants spent more time looking at the element of the scene that was described using FM than its semantic analogue. Together, this evidence suggests that "linguistically induced mental simulations do indeed exhibit important differences as a result of the figurative use of motion verbs" (Matlock, 2010, p. 252).

Research Questions

In our preliminary study (Egorova, Boo, & Purves, 2016) we reported the first results of the extraction and classification of FM in a corpus consisting of 1,484 texts (6,356,455 words) from the digitized Alpine Journal between 1968 and 2008 (Bubenhofer et al., 2015). In this paper, we use this data to explore more closely the types of scenes described with FM and spatial properties that are highlighted as relevant in the description of mountaineering experience. In particular, we address the following questions:

1. What are the motion verbs participating in FM?

A motion verb's semantics used in a particular case of FM is very revealing with respect to the focus of attention in the description of a scene (Papafragou, Massey, & Gleitman, 2002; Slobin, 2004; Talmy, 2000). An answer to this question will provide insights about the properties of spatial scenes that are encoded in FM in our corpus.

2. What are the types of FIGURES found in FM?

FM is claimed to reflect attention focus on a spatially extended entity (Matlock & Bergmann, 2014). Addressing this question, we seek to see which landscape features are conceptualized as spatially extended and if verbs co-occurring with them highlight properties not typically associated with their dictionary meanings.

3. How much spatial information is encoded in FM?

With FM reflecting the focus on the configuration of an entity in space (Matlock & Bergmann, 2014), this question is targeted at exploring the way in which spatial layouts of scenes are encoded. In particular, we are interested to see if any particular spatial description strategies emerge from the data.

For each of the questions, we compare the results between local and global paths to see if the essential ontological difference between the two types of fictive motion (moving versus static observer) is reflected in the types of verbs, FIGURES and scope of spatial information encoded.

The rest of the paper is structured as follows. In Section 2, we describe in detail the process of extraction and classification of FM that is outlined in (Egorova et al., 2016), including interrater reliability measures. In Sections 3-5 we explore the three research questions separately; each section has its own description of methods, results and discussion. Finally, Section 6 concludes the paper by exploring the implications of our results in a broader context and introducing potential further work.

2. Extracting and classifying FM

Methods and Materials

FM can be searched in a corpus by using either a list of motion verbs or a list of nouns representing static entities that are frequently described as moving. In both cases, results are to a certain degree restricted (Taremaa, 2013). Since we are dealing with rich and very specific natural discourse and aim at examining FM in a bottom-up way, we chose the second option, which allows us to uncover the scope of verbs used in FM.

As a first step, we compiled a list of nouns referring to spatial entities in the context of mountaineering from mountaineering glossaries[5] (see Appendix 1). Although FM is generally associated with linearly extended entities in the literature, limiting the list to such features seemed inadequate, since the FM expression itself construes a feature as linearly extended as in example (2a) above (Matlock & Bergmann, 2014).

The corpus is available through the CQPWeb, a user interface for the CQP query processor which allows corpus querying (Hardie, 2012). We queried it for nouns either followed immediately by a verb (e.g., "the ridge runs") or linked by a determiner (e.g., "a ridge that runs") and restricted our query to the past and present tense of verbs, since the corpus mostly represents narratives of past

[5] https://en.wikipedia.org/wiki/Glossary_of_climbing_terms, http://climber.org/data/glossary.html, http://www.ukclimbing.com/articles/page.php?id=33, http://www.summitpost.org/glossary-summit-peak-etc/173401, http://www.sierradescents.com/glossary, http://www.mountainzone.com/glossary_a_l.html

ascents and overviews of routes and geographic areas. The query returned 6,530 phrases, among which we further identified cases of FM. Apart from verbs of motion, we included cases of causative verbs (*bring to, take to, get to, land*), as in (4a), since they convey dynamicity and directionality of a prototypical MOTION EVENT (although the continuity component is less pronounced in such cases). We discarded metaphoric sentences such as (4b).

(4) a. *...after some hours, a 70° section landed us on a col at ca 5000m...*
b. *It is a mountain that sticks in your mind and never disappears.*

Further, we examined the possibility of classifying FM into global and local types based on contextual information that would signal the presence or absence of actual motion of the observer. An interrater reliability analysis using Krippendorff's Alpha (Hayes & Krippendorff, 2007) was performed to determine consistency of the identified markers.

Results

In total, we found 70 types of verbs in 981 instances of FM in our corpus, demonstrating the rich inventory of language for encoding fictive motion. The frequency distribution is Zipfian (Zipf, 1935) with a small group of highly frequent verbs (*lead*, *rise*, *follow*) and a long tail (see Table 1). From the perspective of semantics, the scope of verbs is very broad; a more detailed analysis will be provided in Section 3.

With respect to the identification of the two types of FM, both global and local types could be identified, as well as distinct contexts in which they are used. The local type is used to encode the motion of the observer in (parts of) texts that typically report on the experience of an ascent, as in (5a). The global type is used in two different contexts. First, it can convey some spatial knowledge: this can be the setting of the scene at the beginning of the narrative, where, for example, the location and spatial configuration of mountain ranges and peaks are described, as in example (5b); alternatively, it can be found in route directions. Secondly, the global type is used to describe a scene encountered along the route, at a certain point during the climb, as in (5c), which can also encode the reflections or hypothesis of the alpinist as to where the route may go.

(5) a. *The second icefield led much more quickly than anticipated…*
b. *The range runs east west across the central part of the Tibet plateau.*
c. *Far off, a great red buttress rose steeply.*

We interpreted all cases in the present tense as representing global paths conveying general spatial knowledge. FM using past tense, on the other hand, can be either local (description of actual motion in the past) or global (description of a vista along the route in the past, or reflections on the potential route). In many cases, there are markers that further signal these distinctions. Local paths often include explicit references to the observer (e.g., "the ledge led us"), the difficulty of the segment (e.g., "the pitch went easily"), or the time the segment took (e.g., "the ridge went forever"). Global paths describing a vista are

often marked by locative phrases, referring to a specific location within the line of sight of the observer (e.g., "A couple of miles distant, rose Alberta"). Global paths referring to the reflections of the observers as to where the route goes are often marked by verbs of uncertainty such as *appear*, *seem* (e.g., "It looked like the route would follow the central gully"). Both can further be marked by verbs of vision such as *see*, *notice* (e.g., "At close quarters we could see that the lower part of the ridge rose in 4 steps").

In the absence of any clear markers, the context can provide further cues. Thus, in (6a) "route traversed" represents a global path since it describes a potential route, while the actual motion is not taking place (note the description of another action – lowering to the ledge). Since this type of information is not straightforwardly linked to specific linguistic markers, context-dependent analysis of this kind strongly depends on subjective interpretation and may well mark truly ambiguous instances of language use in the corpus.

(6) a. *Realizing our route traversed much further to the right, I left a nut and carabiner behind and lowered myself to the tiny ledge*.

To check the distinction between the types of FM for inter-annotator reliability, two raters were asked to independently classify a sample of 80 FM cases (40 global, 40 local) that included various verbs of motion. The raters were given clear definitions and linguistic markers along the lines just described, with examples. The reliability measure Krippendorff's Alpha was found to be 0.802, which represents substantial agreement. Disagreement between the raters occurred in cases of context-dependent analysis in the absence of clear linguistic markers. In total, 704 cases of FM were classified as global and 277 as local.

Discussion

According to our findings, the conceptual primacy of a spatial entity can manifest itself in the description of diverse situations, at various scales. On the one hand, we encountered the two types of FM (global and local) reported previously (Matsumoto, 1996). In our corpus, global paths represent two distinct types of spatial descriptions: a view from a specific point along the route, or general spatial information about the area. Applying the framework proposed by Montello (1993), local paths, encoding the actual motion of an observer, can be related to environmental space, apprehended through locomotion. Global paths encoding general information about the spatial layout of the area refer to geographic space that can only be apprehended through symbolic (in our case, captured in language) representation. Finally, global paths describing a view somewhere along the route refer to vista space that can be perceived visually from a single point in space. Thus by classifying fictive motion as global or local paths we not only access information about the two scenes (observer is moving versus observer is static) properties, but also scale and its comprehension, with the essential differences reflected in linguistic choices which are possible for human annotators to reliably identify.

3. Types of motion verbs in FM

Methods

Next, we examined the semantics and frequency of motion verbs in our corpus to gain insights about patterns of concepts underlying the use of FM. In particular, we categorized the verbs according to the generalized aspects of the MOTION EVENT they encode, analysed further semantic nuances, and compared the sets of verbs used in global and local paths. In this analysis we rely on the literal meaning of the verbs, as found in the Oxford English Dictionary[6].

Previous research suggests two categories of motion verbs (Papafragou et al., 2002; Slobin, 2004; Talmy, 2000). Path verbs convey a sense of directionality but remain neutral about MANNER (e.g., *leave*, *enter*). Manner verbs refer to the way locomotion is performed and can encode a motor pattern (e.g., *crawl*, *skip*), or point to the medium (e.g., *swim*, *fly*) or shape of the PATH (e.g., *wind*, *zig-zag*) (Rojo & Valenzuela, 2003).

Following Rojo and Valenzuela (2003), our working definition of a Path verb is the presence of a reference to one of the three elements: SOURCE (the starting point of motion), TRAJECTOR (the "via" element), or GOAL (the ending point of motion). Further, adopting a scheme proposed by Taremaa (2013), we classify Path verbs into trajectory and directional verbs. Trajectory verbs focus attention on the medial part of the PATH, that is, TRAJECTOR (e.g., *cross*, *traverse*). Directional verbs are represented by goal-oriented motion, including causative motion (e.g., *come*, *take to*), source-originated motion (e.g., *leave*), vertical motion (e.g., *ascend*, *descend*) and direction change (e.g., *turn*). Manner verbs are classified into those encoding the motion along a complex shape trajectory (e.g., *wind*, *twist*) and along a trajectory of non-specified shape – e.g., *run*, *walk* (Taremaa, 2013).

Results

Four groups of verbs clearly predominate in our corpus (see Table 2 for a type-token overview). Verbs expressing **vertical motion** (16 types, 279 tokens) are most frequent, reflecting the relevance (or saliency) of the vertical aspect of space in the context of mountaineering. Apart from general verbs encoding the upward or downward direction of motion and thus construing the FIGURE as vertically oriented (e.g., *descend*, *climb*) as in (7a), we encounter verbs that specify further aspects of the spatial scene. Thus, *drop* and *fall*, associated with motion caused by gravity, construe the FIGURE as sheer and spatially extended. A similar connotation is entailed in the rapid and precipitous character of motion referred to by *plunge*, *plummet* and *shoot up*, as in example (7b). The verb *soar*

[6] http://www.oed.com/

("rise majestically or imposingly to a great altitude"[7]) encodes the saliency of the vertically extended feature amongst the surrounding environment, as in (7c).

(7) a. *From Camp 1, the route ascends over steep rocks and ice couloirs*.
b. *...the route plunges precipitously into a deep gap.*
c. *...many unknown 6000 m peaks soar above the glacier heads.*

Goal-oriented verbs are represented by 12 types and 275 tokens. Here, we see general self-motion verbs (e.g., *enter*, *gain*), but also a number of causative verbs (e.g., *bring to*, *land*) that accentuate the significance of reaching the GOAL (8a). The way geometry can gain relevance in this specific context is visible in the use of *debouch*, which adds geometric properties of the GOAL in scene encoding ("wider place or space" in comparison to the TRAJECTOR) (8b).

(8) a. *...after some hours, a 70° section landed us on a col at 5000m.*
b. *Exactly five hours after starting from Echo Point, the couloir debouched us on to the flattened summit of the Seven Apostles of Olympus.*

Trajectory verbs, while frequent in number (207 tokens), are represented by only 7 types, with a clear dominance of *follow* and *take*. The set of verbs reflect various spatial properties of the TRAJECTOR, which can be construed as area-like (e.g., *cross*, *traverse*) as in (9a), extended and linear (e.g., *follow*) as in (9b), or dimensionally underspecified (or, arguably, point-like, in the case of *avoid*) as in (9c).

(9) a. *The latter part of the route crossed a steep snow slope.*
b. *A rough track followed the left bank...*
c. *Two short pitches and a 160 ft traverse avoided the first overhangs...*

Finally, **Manner verbs** encoding a trajectory of unspecified shape represent the fourth most frequent group (174 tokens), characterized by a large number of types (22). Apart from predominating general verbs (e.g., *run*, *go*) which only signal the spatial extension of the landscape feature, we find verbs associated with FIGURES possessing certain further properties. Thus, *roll* implies a round-shaped FIGURE (10a), and *flow*, *stream*, *spill*, *drain* are generally collocated with liquids (10b) – although none of the FIGURES represent water bodies (see also Section 4). Further, we encounter verbs encoding various aspects of locomotion of a potential moving observer, such as difficulty and speed – for example, *forge the way* and *edge* in (10c-d). In other cases, it is the geometry of landscape features that is construed in a variety of ways through verbs referring to the motor pattern – *buck* encodes the shape of glacier in (10e), *sneak* conveys the narrowness of the line in (10f).

(10) a. *...to the south, high mountains rolled on to blue horizons*.
b. *Beyond Ekar a large glacier spills directly across the main valley.*
c. *This landmark route forges its way up the right side of the face...*

[7] http://www.oed.com/view/Entry/183684?rskey=sC8Plt&result=2#eid

d. *The route edged up leftwards to the main summit ridge...*
e. *...from where the glacier bucked skywards in a series of broken ice-falls.*
f. *At the top, a ramp line sneaked right up through the big overhangs.*

Two main patterns are visible when juxtaposing the sets of verbs in global and local scenes. First, we see the difference between the sets of verbs dominating within the local and global types of paths; this reflects the crucial asymmetry in the essence of the two types of FM. In the global type, vertical motion is central. As global paths describe the vista along the way (or spatial knowledge), they reflect the cognitive saliency of the major space property of the alpine landscape: vertical orientation. In local paths, the most frequent type is goal-oriented verbs, which corresponds well with the conceptual task of piecing together the line of the route step-by-step out of the physical environment, associated with mountaineering. Secondly, some verbs occur in both types of FM, while others appear exclusively within one type. Due to the low frequency of most verbs in our corpus we cannot draw any conclusions as to the semantic compatibility of the latter with the other type of path. Nevertheless, it is worth noting that in the goal-oriented group, we find no causative verbs in global paths since they imply the presence of a second object, which is often lexicalized in text (*brought us*, *took me*); the exception is *lead to*, which is often conventionally used without a pronoun. Furthermore, in the vertical motion group, *shoot up*, *emerge*, *soar*, *rear* appear in global types only. Their semantics implies absolute verticality and construes the landscape feature as untravellable; thus, they can only be used in the descriptions of vistas.

Discussion

The scope of verbs found in FM in our corpus is very rich and reflects the wealth of spatial properties' nuances that are associated with FIGURES. We encounter verbs encoding various relations to the GROUND (e.g., *cross*, *pass*, *avoid*), those encoding the shape of the entity (e.g., *curve*, *curl*, *zigzag*, *roll*, *sneak*), as well as a set of verbs that hint at the specific structure of the entity (e.g., *drain*, *spill*, *flow*). The nature of our corpus is reflected by a rich set of verticality-related verbs (e.g., *rise*, *fall*, *drop*, *ascend*, *plunge*, *arise*, *mount*, *plummet*, *sink*, *shoot up*). Some of the latter can serve as a good example of the way a verb's semantics construes the spatial properties of a landscape feature. Thus, from a travellable entity in "The ridge descends for 2 miles", a ridge transforms into an untravellable entity in "The ridge plunges down". Further, some difference is visible in the set of verbs used in local and global paths. The former has goal-oriented motion as the most frequent group, which might reflect the focus on making progress. Global paths have vertical motion as the most frequent type, echoing the general saliency of this dimension in the context of alpine space.

4. Types of FIGURES in FM and their spatial properties

Methods

In this section, we first explore the variety of FIGURES from the perspective of scale and geometry based on their dictionary meaning. Secondly, to examine the construal of spatial properties through FM, we focus on the ten most frequent landscape terms and analyse verbs co-occurring with them. To do so, we operationalize four spatial properties relying on verb classes as outlined in Section 3: "vertical extension" through vertical motion verbs (e.g., *ascend*, *descend*), "linear complex shape" through complex shape trajectory verbs (e.g., *curl*, *snake*), "spatial extension" through trajectory verbs encoding a linear or polygon-like trajectory (e.g., *cross*, *traverse*) as well as a trajectory of unspecified shape (e.g., *run*, *go*), "complex nonlinear shape and structure" through trajectory of unspecified shape verbs encoding information related to the MANNER OF MOTION (e.g., *buck*) or the shape/structure of the FIGURE (e.g., *roll*, *spill*).

Finally, we compare terms appearing as FIGURES in global and local paths. In doing so, we rely on the dichotomy of structural and functional entities which accounts for concepts of space relative to specific activities through a two-level space conceptualization (Klippel, 2003; Richter & Klippel, 2005). Structural entities belong to physical reality (e.g., *ridge*, *gulley*, *crack*), whereas functional entities pertain to the ways in which the physical landscape is demarcated through wayfinding actions (e.g., *route*, *pitch*, *approach*).

Results

Several types of FIGURES are found in FM structures in our corpus. In the vast majority of cases, these are functional and structural entities encoded by nouns in singular and plural forms (e.g., *approach, glaciers*). In 79 cases of FM (8%), FIGURES represent spatial parts of the former (e.g., "tongue of glacier", "section of the route"), as well as several landscape features construed as a single entity through a collective noun, which often additionally encodes shape-related information (e.g., "jumble of peaks", "maze of cracks"), with linearity being the most common of these (e.g., "line of cracks", "line of gullies").

Structural entities in FM are represented by a wide variety of terms (59 types)[8] and are very diverse from the perspective of scale and geometry. We encounter large-scale landscape features (e.g., *mountain(s), range(s)*, *massif(s)*, *hill(s)*), as well as those of smaller scale (e.g., *couloir, crack, shelf*, *gully*, *groove*). From a geometric perspective, they can represent features associated with linearity (e.g., *ramp*, *dihedral*), both vertical (e.g., *couloir*) and horizontal (e.g., *canyon*), or polygon-like, vertically (e.g., *wall*, *face*, *pedestal*) and horizontally oriented

[8] Here, we are interested in nouns representing landscape features and thus exclude noun phrases from the analysis.

features (e.g., *valley*, *lake*). Interestingly, we also find entities of a still finer level of granularity – objects making up the type of terrain as *boulders* in (11a) as well as properties of the terrain surface such as *snow* in (11b).

(11) a. *...easy boulders lead up to the summit ridge…*
b. *...on the far side new snow led easily to the long trudge...*

To examine the way FM further construes the spatial properties of landscape features, we focus on the 10 most frequent types represented in Figure 1.

Each of these landscape terms gains a certain profile through the types of verbs that collocate with it, and several tendencies are visible when comparing those. First, there are landscape features that are mostly used with verbs that do not construe their properties in any specific way (e.g., *slope*, *gully*); these landscape features typically represent route segments in local paths. FM here appears to focus on their spatial layout. Other landscape features, on the contrary, are used exclusively with verbs encoding some spatial property (see *mountain*, *range*, *face*); this can be explained by the fact that they are mostly large-scale features appearing in global paths, where the focus of attention is on their shape and extension.

Second, there is a difference in the number of properties that are associated with different landscape features. Thus, *glacier* is very rich in terms of the types of properties associated with it, with a prevalence of verbs associated with fluid-like properties: *flow*, *drain*, *spill* (12a). Interestingly, these verbs are collocated exclusively with *glacier* and *icefall* in our corpus, likely indicating reference to both physical and metaphorical understandings of the behaviour of these landscape features. Other verbs collocating with *glacier* can encode linearity and complex shape, as *snake* in (12b) or vertical orientation (e.g., *drop*, *emerge*, *fall*, *rise*), as in (12c).

(12) a. *...this glacier flows down both to the north and to the south.*
b. *Down below us the glacier snaked away to the S…*
c. *...large glaciers fall directly into the sea.*

Ridge is associated with vertical motion in half of the cases, both upward and downward, with various degrees of steepness: from moderate (e.g., *descend*), as in example (13a) to abrupt (e.g., *soar*), as in (13b). Further, it is often construed as being linear and having a complex shape (e.g., *curl*, *curve*, *wind*), as in (13c). Finally, when used with Manner verbs of a non-specified trajectory (e.g., *follow*, *go*, *run*) *ridge* is construed as spatially extended, see (13d).

(13) a. *On the right side of the face a ridge descends through the serac band.*
b. *Glancing above, the ridge soared in a series of ice towers…*
c. *A slender scimitar-shaped ridge curved upwards…*
d. *To the north an almost horizontal ridge runs west over Whymper, Croz…*

Peak, *wall*, *mountain*, *face* have similar profiles, being mostly construed as vertically extended landscape features through verbs such as *rise*, *soar*, *fall*, *drop*. Interestingly, *peak* is used exclusively with upward motion verbs (14a), while *wall*, *face*, *mountain* collocate with downward motion as well, depending on the position of the observer (14b-c). *Peak* and *mountain*, when used in the plural, are transformed into a horizontal entity construed as whole but made up of individual peaks/mountains, with the focus shifting to the spatial extension (e.g., *run*, *sweep*) as in (14d); the shape can also be further encoded, as by *roll* in (14e).

(14) a. *Between Anntind and Najalvarre a prominent sharp peak rose, isolated and lonely.*
b. *The wall drops away steeply to a cold emptiness.*
c. *The mountain fell away steeply on all sides down to the clouds.*
d. *As the mountains run N they keep dropping and eventually sink into the desert rocks.*
e. *I stood and watched the silent icy peaks roll northward…*

A good example of the way a verb can enrich the semantics of a landscape feature is the case of *valley*, which is typically associated with linearity and horizontal extension ("a long depression or hollow lying between hills or stretches of high ground"[9]) but can also be construed as vertically extended when used with *plunge* and *drop*, as in (15a).

(15) a. *Southeast of the col a valley plunged away into the unseen depths of the Robagorzana…*

The difference between local and global paths is visible in the difference between the proportions of structural and functional FIGURES: local paths are predominantly represented by functional entities as FIGURES, while structural entities prevail in global paths (Table 3). The Chi-square test (commonly used for testing relations between categorical variables, the null hypothesis being that the populations are independent) revealed a significant difference in proportions of structural and functional entities used with global and local paths with a moderate effect size: $\chi^2(1, N = 981) = 89.660$, $p < 0.00001$, Cramér's V = 0.30210. This supports the profound differences between the two types of scenes represented by local and global paths.

Discussion

The scope of landscape features occurring in FM is very diverse from the perspective of shape, orientation and scale. The representation of a landscape feature appears to be the synthesis of its concept (derived from world knowledge

[9] http://www.oed.com/view/Entry/221220?rskey=fkE4x2&result=1#eid
[10] The effect sizes were interpreted as 0.1 to represent a small, 0.3 a moderate, and 0.5 a large effect size, as in Cohen (1988: 224–225).

and experience) and a particular linguistic choice that further construes one of the spatial properties. Thus, as we have seen in case of *ridge* (defined as "a long and narrow stretch of elevated ground"[11]), generally associated with a linearly extended landscape feature, further linguistic contexts can construe it as vertically extended (e.g., "ridge falls"), or having a complex shape (e.g., "ridge curls"), depending on the saliency or relevance of a specific property in a particular case. Another observation is the fact that certain verbs of motion are used with specific landscape features. Thus, *flow*, *drain*, and *spill* are used exclusively with *glacier* and *icefall*, reflecting the association of the latter with the flow of water. This might relate to the "sensing of structural history", one of the parameters that pertain to general "fictivity" in the conceptualization domain (Talmy, 2000). Finally, the difference between global and local paths in terms of proportions of structural and functional entities once again reflects the difference in the two types of FM.

5. Encoding space in FM

Methods

Here, we aimed to examine how much spatial information is encoded in FM based on the number of the verb's arguments. In other words, how many of the "spatial" elements of a motion event – the SOURCE, TRAJECTOR/LOCATION, and GOAL/DIRECTION – are encoded? We operationalized and annotated these elements based on the literature (Beavers, Levin, & Tham, 2010; Lakusta & Landau, 2005; Slobin, 2004).

The SOURCE is marked by a preposition of the type *from*, *out of* or a source-oriented verb (e.g., *leave*). TRAJECTOR is signalled by a trajectory verb (e.g., *cross*, *pass*) or a spatial preposition of the type *across*, *via*, *through*. LOCATION can be encoded by a variety of linguistic structures answering the question "Where?" (e.g., "below", "a little higher up", "far off", "above the Lepinev hut"). GOAL is marked by a preposition of the type *to*, *on(to)*, *in(to)*, as well as a goal-oriented verb (e.g., *reach*, *gain*). DIRECTION can be marked by an adverb or a preposition of the type *towards*, *up(wards)*, *down*, *forward*, *left*, *east*.

In case of presence of several elements of the same type, we record the frequency of the type: for example, (16a) is annotated as having two elements of the TRAJECTOR/LOCATION type.

(16) a. *<u>Opposite base camp</u>, <u>on the other side of the glacier</u>, massive cliffs rise 1000 meters.*

Following annotation, we analysed the number of motion event elements in each instance of FM.

[11] http://www.oed.com/view/Entry/165673?rskey=06aHbZ&result=1#eid

Results

The number of spatial elements encoded in FM varies from zero to five in our corpus. FM with one, as in (17a), and two elements, as in (17b), prevail, being represented by 382 and 346 cases respectively. These are followed by FM with three elements – 150 cases of the type (17c). Interestingly, we also find 44 cases with zero elements (17d), as well as 52 cases with four elements, as in example (17e). Moreover, we encounter 7 cases of FM with five elements, as in (17f).

(17) a. *The W face of the mountain dropped before me.*
b. *From here a heavily cornice arête led easily to an airy summit.*
c. *From there the crack led upwards for 40 ft to a tiny stance.*
d. *The ridge went on forever.*
e. *The Zulumart ridge runs southwards from the centre of the Trans-Altai ridge, near Pik Lenin, to the Kokuibel pass.*
f. *From a rocky perch, a platform jutting from the ice, the route leads up and leftwards into the back of the rift and so onto the face of the serac.*

Among cases with zero spatial elements, around half are represented by the path-neutral verbs *go* and *run*, most of them found in local FM. A closer inspection unveils a systematic presence of another type of information that bears a relation to the PATH: reference to the time a route segment takes (18a), and its difficulty, both in qualitative (18b) and in quantitative terms (18c). The remaining instances are mostly represented by vertical motion verbs and systematically encode MANNER OF MOTION conveying the shape of the landscape features, as in (18d). These cases do not really allow to compute the spatial layout of the scene, but rather represent the description of a feature, with the focus on its shape and/or extension, and convey the sensation of being exposed to verticality.

(18) a. *Easy-angled fields of loose rock, ice and snow ran and ran…*
b. *The ridge went easily…*
c. *…the pitches went at 7a…*
d. *The cliffs soared steeply and without compromise…*

The rest of cases are very diverse in terms of combinations of elements. Generally, we see relatively few SOURCE elements in comparison to the TRAJECTOR and the GOAL. Interestingly, among those cases that have three and more spatial elements, only few encode all three elements (SOURCE, TRAJECTOR and GOAL). Instead, we often encounter two (and more) instances of the same (two) elements, as in (16a) above.

The presence of two and more elements of the TRAJECTOR/LOCATION type is motivated by one of three distinct spatial description strategies. First, it can be a result of a sequential description of the route on the same level of granularity. Here, several route segments, following each other in space and time, are united into one segment through a single verb (19a). Second, the presence of two or more such elements can represent a zooming-in or zooming-out operation into the same spatial region (19b). Third, we encounter the strategy of completing the

spatial "jigsaw puzzle", where several (not linked by containment relations) spatial regions are added up to the description of the layout, as in (19c):

(19) a. *Above the barrier the route goes across very steep icefields and over a huge cornice… on to an easy ridge.*
b. *The route follows a narrow ridge through the forest and moorland.*
c. *The route takes the left buttress of a shallow couloir below an obvious 100-m wall near the top of the south-east side of the peak.*

The presence of two and more elements of the GOAL/DIRECTION type are mostly related to the encoding of DIRECTION together with the GOAL. In local paths, the DIRECTION is often related to the vertical axis (20a). Absolute reference frame DIRECTIONS are mostly encountered in global paths, describing large-scale spatial regions as in (20b).

(20) a. *The route edged up leftwards to the main summit ridge.*
b. *From here the valley runs north-west to the 14 km-long Daoge glacier.*

Finally, we compared proportions of cases with different numbers of spatial elements in global and local paths. Although cases with one spatial element slightly prevail in global paths, while FM with two and three elements have a larger proportion in local paths, the difference is not significant: $\chi^2(4, N = 981) = 6.3615$, $p = 0.17$.

Discussion

In this section, we examined the encoding of spatial elements in FM and described a number of strategies used for producing spatial descriptions in out corpus, some of which have been previously discussed in the literature. For instance, combining several route segments into one bears strong resemblance to landmark-based chunking (Klippel & Winter, 2005; Klippel, Tappe, & Habel, 2002) which makes further route instructions irrelevant and allows several landmark-based segments to be encoded through one verb of motion. Inclusion of two TRAJECTORS is the outcome of the relevance of two levels of granularity of the MOTION EVENT (Tenbrink & Winter, 2008). Finally, we encounter more complex descriptions, where the LOCATION of the MOTION EVENT is anchored by references to spatial relations with salient features in the surrounding environment (Richter, Vasardini, Stirling, & Richter, 2013). However, FM can also be used to convey a *sense of place* (Purves & Derungs, 2015), the sensation of being exposed to properties such as verticality through verbs with strong semantics (e.g., *soar*, *rear*, *sink*).

An interesting finding is the presence of structures with path-neutral verbs and no spatial elements. Directly contradicting the path condition (Matsumoto, 1996; Rojo & Valenzuela, 2003; Takemoto, 2010) at first glance, such cases actually do contain path information, albeit in a very non-prototypical way, namely, by encoding information relevant for locomotion (e.g., difficulty or time). This intrinsic link between space (PATH) and type of locomotion appears to be one of the triggers for the use of FM. At least theoretically, FM conveys

more spatial information at the expense of information on the way locomotion of the observer is performed. However, this may not imply the irrelevance of the latter; rather, the type of locomotion can be inferred from the spatial information, such as a description of the FIGURE ("easier-angled fields of loose rock, ice and snow fields"). Mountaineering, characterised by close interaction with surfaces, substances and objects, may not leave much choice as to the type of action. Thus, the activation of the concept "easier-angled fields of loose rock" in the mental representation of the reader may suffice for the communication of the corresponding action. This is reflected in the use of FM, encoding space rather than locomotion.

6. Concluding discussion

Fictive motion in language is claimed to reflect the conceptual primacy of an entity – in particular, its spatial configuration and linear extension. We set out to explore the use of FM in a corpus of alpine narratives and were able to demonstrate which properties are highlighted as relevant through FM and which strategies are applied in describing spatial layouts in this unique context. Our results can be explored at multiple levels, allowing insights into the use of fictive motion with more general implications.

Specifically, the types of fictive motion we encountered in our corpus map well onto the psychological spaces of Montello's (1993) framework. Local paths represent environmental space; global paths, encoding a view along the route, refer to vista space; global paths, encoding the spatial layout of a vast area point to geographic space. The differences are systematically reflected in linguistic choices, and, consequently, substantial inter-annotator agreement. Further, statistically significant is the difference between the types of FIGURES (functional entities, such as "line", are mostly found in local paths), which can be used for the automatic classification of FM in text.

Secondly, we showed that spatial properties highlighted by FM as relevant in our corpus are not limited to linear extension and include, for example, vertical orientation or complex shape. We also uncovered interpretations of landforms which go beyond those typically derived through introspection, for example in terms of the potential verticality of valleys. This can be seen as an initial corpus-based contribution to the line of work investigating what a mountain is (Smith & Mark, 2003) or what constitutes "peakness" or "ridgeness" (Fisher, Wood, & Cheng, 2004).

Thirdly, based on the analysis of the amount of spatial information encoded in fictive motion, we discovered that FM goes beyond the description of the spatial layout of a scene and can also convey the sense of place (Purves & Derungs, 2015). Those cases that do focus on the spatial layout, display the spatial descriptions strategies noted in previous literature, such as zooming-in and -out (Tenbrink & Winter, 2008) or complex descriptions referring to spatial relations with salient features in the environment (Richter et al., 2013).

Methodologically, we have demonstrated the benefits of a corpus-based approach to studying a particular phenomenon of spatial language. This is particularly important as existing and newly available corpora offer still mainly untapped opportunities to explore the way people experience and describe spaces that are ill-suited to empirical or lab-based methods, thus overcoming certain limitations of controlled studies which are inherently bounded to specific environments (Denis, 1997). On the other hand, although our corpus is representative of a *type of space*, the actual spatial layouts being described remain absent in this type of analysis. A cross-corpus study (e.g., urban versus natural space descriptions), would allow us to transfer the analysis from the realm of description to inference.

The second stage of the analysis, firmly grounded in cognitive discourse analysis methodology (Tenbrink, 2015) requires the iterative development of rules to achieve good inter-annotator agreement. The associated need for human annotators and the time-consuming nature of the annotation process can be regarded as a limitation, especially in an era of big data and machine learning. Furthermore, the results are valid only for English, and more specifically apply to a corpus focusing on mountaineering. However, the detailed findings obtained by our in-depth analysis can now be taken as a basis for further large-scale investigations.

In future work, we aim to examine the possibility of automatic identification and classification of FM into global and local types in text. This will, on the one hand, allow us to examine the scope and utility of systematic linguistic markers in a larger sample and, on the other hand, pave the way towards extensive exploration of semantic ambiguity in the linguistic representation of motion events. Given the predominance of the latter in language, understanding fictive motion is central to any efforts aiming to explore (motion in) space using text as a source.

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Table 1. Motion verbs occurring in FM in "Text+Berg"

Motion verbs	FM sentences per verb
lead	197
rRise	128
follow	95
take	65
go	64
run	63
take (causative)	35
drop, fall	31
bring, climb	24
cross	18
traverse	17
descend, flow	16
ascend	13
plunge, turn	9
soar	8
curve, sweep	7
avoid, come, emerge, wind	6
pass, reach, snake	5
curl	4
drain, leave, rear, shoot up, take a turn	3
enter, float, head, mount, move, plummet, progress, roll, sink, spill	2
buck, debouche, depart, dip, edge, encroach, exit, forge the way, gain, get to, land, loop, make a dog-leg, proceed, return, rush, sneak, sprawl, stop, stream, surge, swing, travel, veer, weave, take a loop	1

Table 2. Types of verbs and number of tokens (N) in global and local FM. Underlined verbs are found only in local or global FM

Types of motion verbs			Verbs in local FM	N	Verbs in global FM	N
PATH	Directional verbs	Goal-oriented	bring, come, debouch, enter, gain, get, head, land, lead, reach, return to, take to	133	come, enter, head, lead to, reach, take to	142
		Source-originated	exit, leave	3	depart, leave	2
		Vertical	ascend, climb, descend, dip, drop, mount, rise	20	ascend, climb, descend, drop, emerge, fall, mount, plummet, plunge, rear, rise, sink, soar, shoot up	259
		Change in direction	take a turn, turn	4	make a dog-leg, take a turn, turn, veer	11
	Trajectory verbs		avoid, cross, follow, take, traverse	55	avoid, cross, encroach, follow, pass, take, traverse	152
MANNER	Complex shape trajectory		curl, loop, snake, take a loop, weave, wind	11	curl, curve, snake, sprawl, wind	15
	Trajectory of unspecified shape		edge, flow, go, move, proceed, progress, run, sneak, stop	51	buck, drain, float, flow, forge the way, go, roll, run, rush, spill, stream, surge, sweep, swing, travel	123
	TOTAL			**277**		**704**

Table 3. Types of FIGURES in local and global FM

	Structural FIGURES	Functional FIGURES	Total
Local paths	30.32% (84)	69.68% (193)	100% (277)
Global paths	63.87% (449)	36.13% (255)	100% (704)

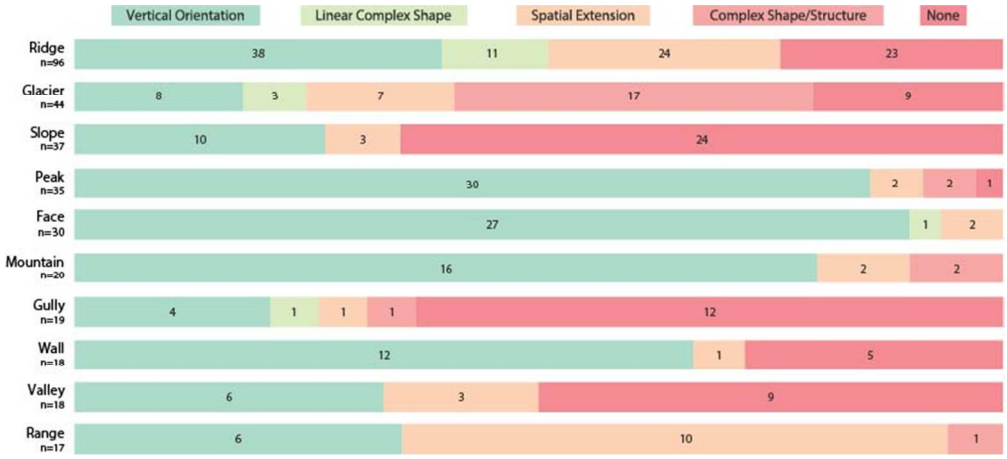

Figure 1. Spatial properties of 10 most frequent landscape terms based on collocating verbs

Appendix 1. Nouns representing structural and functional entities in the alpine context, compiled from online mountaineering dictionaries and used for FM extraction

1. aiguille
2. alcove
3. arête
4. approach
5. bergschrund
6. 'schrund
7. bollard
8. boulder
9. bald
10. barchan
11. butte
12. break
13. buttress
14. cairn
15. canyon
16. ceiling
17. chain
18. channel
19. chimney
20. chockstones
21. chute
22. cirque
23. cliff
24. cleft
25. col
26. comer
27. corner
28. cornice
29. couloir
30. crack
31. crag
32. crest
33. crevasse
34. cwm
35. debris
36. dièdre
37. dihedral
38. ditch
39. dune

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FICTIVE MOTION IN THE CONTEXT OF MOUNTAINEERING 2

40. dome
41. drumlin
42. edge
43. face
44. field
45. fin
46. firn
47. flake
48. flared
49. flute
50. friable
51. gendarme
52. glacier
53. gorge
54. graunchy
55. gravel
56. groove
57. gully
58. headwall
59. hill
60. horn
61. ice
62. icefield
63. ice-cap
64. icefall
65. inselberg
66. knob
67. knoll
68. lake
69. ledge
70. line
71. massif
72. mesa
73. moat
74. monadnock
75. moraine
76. mountain
77. mountainside
78. munge
79. needle
80. névé
81. nose
82. notch
83. nunatak

84. nubbin
85. overhang
86. pass
87. passage
88. peak
89. pedestal
90. penitentes
91. pillar
92. pitch
93. plateau
94. pocket
95. prominence
96. ramp
97. range
98. ravine
99. rib
100. ridge
101. rime
102. rock
103. roof
104. route
105. runnel
106. saddle
107. scree
108. seam
109. section
110. serac
111. shelf
112. sinker
113. slab
114. slope
115. snow
116. snowfield
117. spindrift
118. spike
119. spire
120. spur
121. stone
122. summit
123. talus
124. tarn
125. terrain
126. thread
127. trail

FICTIVE MOTION IN THE CONTEXT OF MOUNTAINEERING 4

128. traverse
129. valley
130. Via Ferrata
131. verglas
132. wall
133. zawn