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Varieties of Manner of Motion: A Frame-Semantic Account

Abstract This article introduces a fine-grained distinction of types of manners of motion in a frame-semantic setting. The frame-theoretical backdrop is provided by the FAMEu approach presented in Herweg (2020) and augmented with a theory of verbal types and dynamic interpretation in Herweg (2021). FAMEu features an extension of the Cognitive Grammar notion of profiling (Langacker, 2013). The enhanced profiling mechanism allows each type of motion verb to impose its characteristic profile on a basic *LOCOMOTION* frame, which provides an expressive structure that facilitates the representation of major elements of the linguistic description of motion events. The particular profile associated with a motion verb may select, deselect and augment substructures of this general frame, as well as elaborate on significant relations between different substructures. Frame representations for three forms of complex manner constructions and six basic types of manner-of-motion verbs are defined on this theoretical basis and illustrated with examples from German, French and English.

Keywords motion verbs; manners of motion; frame semantics; profiling

1 The FAMEu approach to the semantics of motion expressions

This article deals with some fine-grained distinctions we observe in the area of manner-of-motion verbs (MoMVs) and constructions. It proposes a system of types of manner of motion that is intended to cover some important characteristics of major classes of MoMVs. The propounded analyses are cast in a frame-semantic setting, namely the FAMEu (short for "A Frame-semantic Account of Motion Expressions with Underspecification") format, which was set forth in Herweg (2020) and which has been enhanced with a theory of verbal types in the motion domain in Herweg (2021). The core element of FAMEu is the *LOCOMOTION* frame, which provides an expressive structure that allows to represent major elements of the linguistic description of motion

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events. Rather than reiterating the details of the FAMEu *LOCOMOTION* frame, and to avoid redundancy, I will only briefly sketch the main elements of the approach and refer the reader to the above-mentioned papers, as well as to the explanations of the sample frames in the forthcoming sections of the present paper, for further details.

A crucial feature of the *LOCOMOTION* frame are the elaborate structures which represent the two fundamental event layers that are effective in motion descriptions, namely the path layer and the manner layer (cf. Gerwien & von Stutterheim, 2016; von Stutterheim et al., 2020). The path layer is represented by a PATH attribute,[1] which is an internally complex frame structure that covers different conceptual aspects of the path which the moving entity (i.e., the FIGURE in Talmy's terms; cf. Talmy, 1983) covers during its motion. These aspects of paths are represented under two main complex attributes: ROUTE and P_DIM. ROUTE stands for the path as a complex object comprising an initial (INIT), an intermediate (INTER) and a final (FIN) segment. These path segments may, for instance, be further described by directional complements such as 'source', 'route' and 'goal' PPs, which specify a local relation (L_REL) of the moving entity relative to a ground object (GROUND; cf. Talmy, 1983). The P_DIM attribute covers several types of dimensional properties of paths, namely their direction in three-dimensional space (attribute DIR), the gestalt / form properties of the pure spatial trace of a path (SHAPE), their velocity and throughput (VEL) and their spatial extent (EXTENT).

The MANNER attribute describes the manner in which the figure performs the motion. Motion verbs may express manifold manifestations of manners, particularly in languages with a rich inventory of MoMVs. Verbs like *to walk, to run*, *to jog, to stride* and *to strut* each mark a specific gait that the moving entity performs. By contrast, verbs like *to hurry, to rush, to hasten* and *to flee*, which also occur in genuine motion contexts *(to hurry / rush / hasten / flee into the great wide open*), are not inherently associated with any specific gait. These actions can in fact be executed in various modes of movement (by foot, bicyle, roller-skates, car, train, …). Intuitively, these verbs do not designate a motion that can primarily be characterized by specific bodily activities but rather focus on an expeditious change of location, often additionally associated with a presumed state of mind of the actor. In other words: While the first group of verbs designates manners which can to a large extent be characterized in terms of (the progression of) spatial configurations of particular body parts, the manners expressed by the second group of verbs have a predominantly

1 The proposed frames are formally represented as recursive typed attribute-value matrices (cf. Petersen, 2015). Attributes in FAMEu are written in upper case and values in lower case letters; types of values and frames, such as the *LOCOMOTION* type and its subtypes, are written in italic small caps.

temporal – and, as I will argue in section 3.3, often an intention-, emotion- or attitude-related – nature.

In the approach put forward in the present study, distinctions among manners are captured by the types of the frames associated with the respective verbs. The type *S_MOM* applies to verbs such as *to walk, to run, to limp*, i.e., verbs whose manner can be predominantly associated with the spatial dimension of the motion because they primarily describe specific gaits. If the manner is predominantly temporal in nature, the corresponding frame receives the type *T_MOM*. This type applies to verbs that do not focus on specific gaits but primarily highlight time-related features of a locomotion, such as a particularly fast (*to race, to rush, to dash)* or slow (*to ramble, to stroll*) movement. A third type of manner that will play a role in the representation of particular verbs is the exertion of a force (type *F_MOM*) against an overt or tacit object that serves as an antagonist in the activity, like in *to climb* (cf. Geuder & Weisgerber, 2008). Further types of manner that will be addressed in the present study are *I_MOM* for motion which relies on an instrument, like in the case of *to bike* and *to sail*, *M_MOM* for motion that is performed in a specific medium of localization, as with *to swim* and *to fly*, and *MC_MOM* for verbs like *to hasten* and *to hustle*, which allude to a particular mental constitution or state of mind of the moving entity. We leave it open to future research to determine if further semantically significant types of manners have to be assumed in the motion domain.

The FAMEu *LOCOMOTION* type furthermore includes means to represent and calculate the aspectual class, aspect, tense and situational (deictic) properties of motion expressions. The relevant information is collected under a separate EVENT_PROPERTIES attribute, with subattributes ASPECTUAL CLASS, ASPECT, TENSE and ORIGO. These attributes play a minor role in the present work, so I will elaborate on them only as needed to follow the examples discussed in subsequent sections.

The key concept of the frame-semantic analyses of motion expressions in typologically divergent languages (German, French, Russian, Korean, Thai) introduced in Herweg (2020) is an extension of the notion of profiling, as originally developed in Cognitive Grammar (see, e.g., Langacker, 1983, 1987, 2013). In the FAMEu approach, each motion verb imposes its characteristic profile on the *LOCOMOTION* frame as part of its lexical semantics. The particular profile associated with a motion verb – which will be marked via boldface font for ease of presentation[2] – may select, deselect and augment substructures of

2 I already used the simple boldface notation for profiled parts of frame representations in Herweg (2020). In a more elaborate formal representation, the profiled frame elements would be linked via indices to a dedicated attribute-value substructure of the frame.

the general frame, such as FIGURE, PATH, MANNER and subattributes thereof, as well as elaborate on significant relations between different substructures. This enhanced FAMEu notion of a verb's profile provides a close-up view of the relevant elements of a frame. It thereby allows for representing subtle differentiations within groups of verbs which otherwise look semantically akin from a broader point of view. Simplifying the analysis to coarse high-level distinctions such as – in the most extreme form – a simple dichotomy between path verbs (like *to approach*) and manner verbs (like *to tiptoe*) risks oversimplifying and potentially blurring these finely nuanced distinctions.

Herweg (2021) complements this approach with a fine-grained system of verbal types which are defined in terms of a variant of dynamic logic, namely the Dynamic Interval Temporal Logic (DITL) of Mani & Pustejovsky (2012). The primary focus of the type system, as explored in Herweg (2020) utilizing the profiling mechanism, lies in distinguishing between path-generating and non-path-generating motion verbs. This differentiation only partially intersects with the standard distinction between path and manner verbs. The path-generating class comprises verbs which designate a motion that conceptually incorporates the incremental composition of a structured path, defined by the changing regions occupied by the moving entity. The verbs of this type may express the notion of directedness (e.g., *to approach, to come, to sink*; type *MOVE_PD*), or they may be unspecific about any directedness of the path (e.g., MoMVs in languages like English, such as *to walk, to run, to creep*; type *MOVE_P*). Pronounced representatives of the class of non-path-generating motion verbs (verbs of the negative type *~MOVE_PD*) are MoMVs in languages such as Korean (e.g., *tallida* 'run', *kelda* 'walk') and Thai (e.g., *dəən* 'walk', *wîng* 'run'), which express nothing but the pure activity of executing a particular manner of motion and which need to be accompanied by an obligatory path-generating verb, such as a deictic motion verb, in a serial verb construction.

The present study is a sequel to both Herweg (2020) and Herweg (2021) that is mainly concerned with type distinctions among the values in the MANNER attribute of the *LOCOMOTION* frame. It enhances the FAMEu formalism with additional elements that shall serve to capture the characteristics of the subclasses of MoMVs outlined above. However, before we turn to the varieties of MoMVs as such, we need to look at different manifestations of external manner specifications, i.e., manner specifications which are not expressed by the head verbs of the motion constructions themselves but rather by additional adjuncts that modify the respective verbal heads. This preparatory step serves to introduce some pertinent distinctions and formal devices, which will prove beneficial for the subsequent elaborations on the MoMVs themselves.

2 Head-verb external specification of manner

2.1 Manifestations of head-verb external manner specification

It is a well-known fact that path-dominant languages such as Romance languages typically (but not always, cf. the recap in Hendriks et al., 2021, p. 2) express the manner of a motion not in the main verb but rather in an adjunct to the path verb (or the VP headed by the path verb), which is composed of an infinite verb form like the French gérondif and the Spanish and Italian gerundio:

(1) a. [Fr.] Il sortit de la maison en courant.
'he exited the house walking / running'
b. [Sp.] La botella entró a la cueva flotando.
'the bottle entered the cave floating'
c. [It.] La barca passò sotto il ponte galleggiando.
'the boat passed under the bridge swimming / floating'

Similar manner specifications external to the finite head verb can be found in non-path-dominant languages such as German. The following examples show a variety of mode and manner specifications by means of participles (participle I), adverbs and adverbial phrases, ranging from detailed characteristics of the gait to concurrent autonomous activities:

(2) Er ging < … > aus dem Haus. 'He went / walked out of the house …'
a. hinkend / schwankend 'limping / wobbling'
b. schnell 'quickly'
c. leise 'quietly'
d. mit festem Schritt 'with a firm step'
e. auf Zehenspitzen 'on tiptoe / tiptoeing'
f. in Pantoffeln 'in slippers'
g. kopfschüttelnd / pfeifend 'shaking his head / whistling'

(2.a) describes specific gaits by means of the participle I form of manner-of-motion verbs that could also occur as the head verbs of the motion description (*Er hinkte / schwankte aus dem Haus*. 'He limped / wobbled out of the house'). (2.a) closely corresponds to the Romance constructions in (1). (2.b) characterises the speed with which the motion is executed and (2.c) describes a particular mode that serves to avoid noise. (2.d) and (2.e) further narrow down the gait of the figure, whereas (2.f) does so only implicitly by means of referring to the figure's particular footwear. And finally, the

participles in (2.g) describe additional actions which the figure performs while executing the motion.

The specifications in (2.a)–(2.f) are all directly (as in [2.a]–[2.e]) or indirectly (as in [2.f]) related to the way the motion is performed by the figure. By contrast, (2.g) describes concurrent accompanying activities which are in principle independent from the motion itself. It does so, however, by the same linguistic means as the additional manner descriptions in (2.a). (2.a) and (2.g) will therefore be represented in a structurally similar way, i.e., under the same core attribute in the *LOCOMOTION* frame – the FIGURE attribute –, differentiated only by specific subattributes which expand this attribute. In general, the differences between the various forms of mode and manner characterizations observed in (2) will be reflected by the particular types of attributes that are profiled by the expressions under consideration and how these attributes are related to the core attributes of the *LOCOMOTION* frame. The different mode and manner characterizations will either be represented as additional contributions to the MANNER and PATH attributes or will be treated as independent thereof, more specifically as attributes directly linked to the figure of the motion.

2.2 Infinite manner verbs and structure sharing

The participle I verb forms in (2.a) and (2.g) receive structurally similar representations, distinguished by specific subattributes. The attributes of the figure in the *LOCOMOTION* frame will be expanded beyond those needed for the nominal head and its immediate modifiers. The meanings of the head noun and its immediate modifiers (like in *black cat, cat on a hot tin roof*) will be presented under an attribute PROPERTIES that expands the FIGURE attribute. For mode and manner specifications like *hinkend* 'limping' and *pfeifend* 'whistling' we will utilize an additional FIGURE-related attribute BEHAVIOUR. We thus assume the basic expansion of the FIGURE attribute shown in figure 1, where PROPERTIES is meant to record static (persistent or transient) features assigned to the figure, while BEHAVIOUR serves to capture the figure's dynamic manifestations, most notably qualities of or linked to the activities in which the figure is engaged.

Subattributes of the PROPERTIES and BEHAVIOUR attributes will be introduced in the following sections. Section 2.4 on depictive manner predicates will deal with further expansions of the PROPERTIES attribute. The content of verb-external manner-of-motion specifications like *hinkend* 'limping' and *schwankend* 'wobbling' will be represented under the BEHAVIOUR attribute by means of an additional subattribute MOM_SPEC, which is short for "manner-of-motion specification" and whose value will be transferred via structure sharing – as defined for feature-structure formalisms with

LOCOMOTION	
FIGURE	| PROPERTIES
	| BEHAVIOUR

Figure 1. The basic structure of the FIGURE attribute

GEHEN			
FIGURE	**| BEHAVIOUR**	**| MOM_SPEC**	**| ① hinken_gait**
EVENT_LAYERS	| MANNER	| gehen_gait ⊔ ①	

Figure 2. The relevant frame extract for *hinkend (gehen)* '(go / walk) limping'

GEHEN			
FIGURE	**| BEHAVIOUR**	**| CONC_ACT**	**| pfeifen**
EVENT_LAYERS	| MANNER	| gehen_gait	

Figure 3. The relevant frame extract for *pfeifend (gehen)* '(go / walk) whistling'

unification (cf. Carpenter, 1992, p. 37; Müller, 2013, pp. 145 f.) and indicated by coindexing the respective values with '①' – to the main MANNER attribute of the *LOCOMOTION* frame; see figure 2. Verb-external specifications of concurrent but not manner-of-motion related activities like *pfeifend* 'whistling' and *kopfschüttelnd* 'shaking one's head' will also be represented under the BEHAVIOUR attribute, though by means of a special subattribute CONC_ACT (short for "concurrent activity"). Note that there is no transfer of the content of this supplemental attribute to any of the core attributes MANNER or PATH; see figure 3.

Only the profiles of the participle verbs are marked in boldface in these partial frames. The MANNER value 'gehen_gait' in figure 2 represents the gait in which some part of the foot is always in contact with the ground (cf. Diersch, 1972, p. 55).[3] For the purpose of the present study it suffices to assume that 'gehen_gait' represents the minimum set of properties which distinguishes this particular gait from other gaits such as running, which involves a short aerial phase. The merging of 'gehen_gait' with 'hinken_gait' by means of the merge operation ⊔, 'gehen_gait ⊔ ①' – or rather, after resolving the reference of ①, 'gehen_gait ⊔ hinken_gait' – further constrains this general gait to an

3 There are uses of *gehen* which do not refer to a specific gait, like in *zum Arzt gehen* 'go to the doctor', where no particular manner of motion is expressed. In these cases, *gehen* 'go' could rather be represented by a general motion predicate type *MOVE*.

SORTIR					
FIGURE	| ***AGENT***				
EVENT_LAYERS	| **PATH**	| **ROUTE**	| **INIT**	| **L_REL**	| **in**
				| GROUND	| house
			| **INTER**	| **L_REL**	| **~in**
				| GROUND	| house
EVENT_PROPERTIES	| ASPECTUAL_CLASS		| ...		
	| ORIGO		| ...		
	| TENSE		| ...		
	| ASPECT		| ...		

Figure 4. The representation of French *sortir de la maison* in the (simplified) *LOCOMOTION* frame

impaired and unbalanced manner of motion. The representation of this specific gait will be revisited in the discussion of verbs like *to limp* in section 3.1.

The fact that the activities represented as MOM_SPEC and CONC_ACT are concurrent with the main motion activity, i.e., the activity that determines the type of the frame itself, does not have to be represented separately by specific attribute structures. The concurrence rather follows from the fact that there is one unique temporal anchoring of the entire frame, which is represented under the EVENT_PROPERTIES attribute structure. In conjunction with an appropriate interpretation of the MOM_SPEC and CONC_ACT attributes, the EVENT_PROPERTIES structure properly determines the temporal interpretation of the entire frame and all of its components (cf. Herweg, 2020, 2021).

The approach in figure 2 can be carried over to verb-external manner-of-motion specifications by means of the gérondif or gerundio in Romance languages like in (1). Assuming that the frame representation of French *sortir* profiles the initial and intermediate segments of the path and declares for them a simple change-of-state in terms of two contrary predications "being inside / at the ground" vs. "not being inside / at the ground" (cf. Herweg, 2020), the relevant extract of the frame representation of *sortir de la maison* looks as shown in figure 4.[4]

Adding a gérondif manner-of-motion specification like *en courant* yields the (partial) frame representation in figure 5, which is similar to the one in figure 2. The frame reflects the assumption that the gérondif activates the

4 '**~**' indicates negation. The referential mode of the NP *la maison* is not captured in the frame in figure 4, since the frame-representation of (in)definiteness and quantification is not in the scope of this study. Note that all sample frames in the present article will only show the parts relevant to the respective examples.

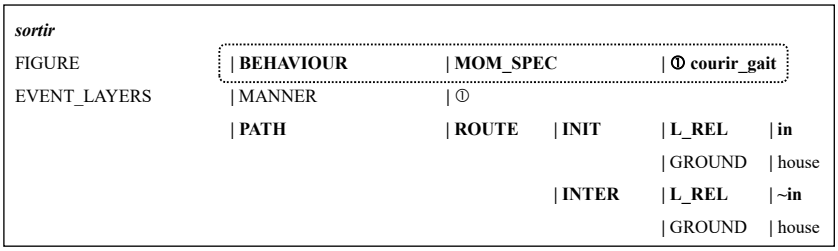

Figure 5. The representation of French *sortir de la maison en courant* (the profile of the gérondif is visualized by a dotted box)

manner layer of the locomotion event concept by means of structure sharing (again indicated by means of coindexing the attributes' values) between the attribute MOM_SPEC, which is related to the behaviour of the figure, and the EVENT_LAYERS | MANNER attribute.

Manner modifiers like *mit festem Schritt* 'with a firm step' in (2.d) and *auf Zehenspitzen* 'on tiptoe, tiptoeing' in (2.e) can also be treated as values of the MOM_SPEC attribute, albeit ones with a more elaborate internal structure, due to their complex set-up as PPs. Both PPs contribute to the manner event layer and hence require appropriate structure sharing between the MOM_SPEC and the MANNER attributes. I will not go into the details here and leave it at this short note.

2.3 VP level manner adverbs and dependency constraints

This chapter so far dealt with additional manner-of-motion characterizations and the expression of concurrent activities which are independent from the motion itself. In order to top off the considerations on mode-and-manner specifications expressed externally to the finite verb, I will now discuss adverbs like *schnell / quickly, fast* and *leise / quietly*, like in (2.b) and (2.c) above. The analysis of *schnell / quickly* and other velocity adverbs will induce us to establish an additional representational device, so-called dependency constraints, which will allow us to represent systematic dependencies between distinct but related values of different attributes in a frame.

Velocity adverbs like *schnell, langsam, quickly, fast, slowly* etc. can in principle be applied to any kind of activity. By their very nature, activities occur in time, and the adverbs of velocity in question express an indefinite measure on the time-related mode of execution of an activity by the actor; see (3.a). Adverbs like *leise, laut, quietly, loudly* – henceforth called "audibility adverbs" – are applicable to any activity whose execution may emit a sound. They express an indefinite measure on the acoustic properties of the execution of an activity by the actor; see (3.b):

(3) a. walk / act / play / work / eat / drink / speak / write / think …
quickly / slowly
b. walk / act / play / work / eat / drink / speak / write / ?think …
quietly / loudly

When applied to activities like those in (2.a) and (2.b), I represent the meaning contribution of both velocity adverbs and audibility adverbs by a subattribute EXEC_MODE (for "mode of execution") of the agentive figure's BEHAVIOUR attribute.[5] The two types of adverbs differ as follows: On the one hand, when a velocity adverb is applied to a motion verb, the value of this attribute affects the value of the path's VEL(ocitiy) attribute profiled by the verb. In the case of *walk quickly / slowly*, the behaviourial characterization as 'quick' or 'slow' causes the dimensional velocity attribute of the path to assume the values 'high' or 'low', respectively. In the case of audibility adverbs, on the other hand, there is no such impact on any property of the path and hence no dependency between the EXEC_MODE attribute associated with the figure's behaviour and the PATH attribute in the frame representation.

The kind of dependency between the values of different attributes in a frame which we observe for velocity adverbs is different from the ones that we have seen so far and that were captured by means of structure sharing between attributes, as represented by co-indexed attribute values. In the case of velocity adverbs, which in combination with a motion expression characterize a behaviour of the figure that has an impact on a dimensional property of the path, the values of the different attributes are not identical. Rather, they are distinct but systematically related. We capture their relatedness by means of an additional representational device in frames, namely so-called dependency constraints (DepCs). The notion of a DepC is inspired by Barsalou's (1992) concept of contextual constraints. According to Barsalou (1992, p. 39), contextual constraints occur when one aspect of a situation constrains another, like the speed of a transportation which constrains its duration over a fixed time.

In the present case, I will introduce specific DepCs in order to express systematic dependencies between values of attributes in a frame. I will mark the determining element in a DepC by '↓©$_n$' and the determined element by '↑©$_n$'. The index 'n' ranges over integers and serves as a unique identifier for

5 Note that both types of adverbs may also be applied to non-agentive processes where the subject has the role of a theme rather than an agent, like in *flow / drip / seep … quickly / slowly / quietly / loudly*. It may be more appropriate to use an attribute like OCC_MODE (for 'mode of occurrence'), rather than EXEC_MODE, in the case of thematic subjects.

WALK				
FIGURE	**| BEHAVIOUR**	**| EXEC_MODE**		**| ↓©$_1$ quick**
EVENT_LAYERS	| MANNER	| walking_gait		
	| PATH	| ROUTE	| ...	
		| P_DIM	| VEL	**| ↑©$_1$ high**

Figure 6: The representation of *walk quickly*

WALK			
FIGURE	**| BEHAVIOUR**	**| EXEC_MODE**	**| quiet**
EVENT_LAYERS	| MANNER	| walking_gait	
	| PATH	| ...	

Figure 7: The representation of *walk quietly*

determining and determined elements in DepCs. The dependency will be indicated by the relation '↦' between attribute structures.

The DepCs in (4) for the adverbs *quickly* and *slowly* convey that 'quick' and 'slow' as the corresponding values of EXEC_MODE express certain energy levels in the execution of the activity that have an impact on the velocity with which the path is traversed in the course of the motion, indicated by the values 'high' and 'low', respectively:

(4) a. $DepC_{quickly}$: FIGURE | BEHAVIOUR | EXEC_MODE | ↓©$_1$ quick ↦
EVENT_LAYERS | PATH | P_DIM | VEL | ↑©$_1$ high

b. $DepC_{slowly}$: FIGURE | BEHAVIOUR | EXEC_MODE | ↓©$_2$ slow ↦
EVENT_LAYERS | PATH | P_DIM | VEL | ↑©$_2$ low

The crucial difference between velocity and audibility adverbs is shown in figures 6 and 7. For reasons of perspicuity, only the profiles of the adverbs are marked in boldface.

Figure 6 shows the impact of a velocity adverb like *quickly* on the dimensional properties of the path. This is accomplished by a DepC between the value of the EXEC_MODE attribute of the figure, where the meaning contribution of the adverb is represented, and the VEL attribute of the path. By contrast, an acoustic quality adverb like *quietly* does not have any such impact. Figure 7 hence does not involve any DepC.

Figure 6 shows a dependency contraint between the BEHAVIOUR attribute of the figure and a subattribute of PATH, i.e., a dependency between dynamic elements of the motion event, namely the execution mode of an activity and the speed with which an evolving path is traversed. However, we also need to

provide for the possibility of dependencies between static (including, e.g., the figure's PROPERTY attribute), as well as between static and dynamic, elements of a situation. As a matter of fact, in section 3.6. I will propose to account for the connection between the intrinsic orientation of a ground object – i.e., a static, even persistent property of an entity – and the preferred interpretation of the vertical direction of movement (upward vs. downward), like in the case of *to climb* and its German counterparts, in terms of a dependency constraint.

2.4 Depictive manner predicates

The last type of manner modification that will be considered here is exemplified in (2.f) by the PP *in Pantoffeln* 'in slippers'. Other instances of this sort of modifier are *barfuß* 'barefooted' and *mit Schirm* 'with one's umbrella'. I call this sort of modifier a depictive predicate, following, *inter alia*, the nomenclature in Maienborn (1996, pp. 161 ff.) and Dolińska (2012, pp. 115 ff.) (who however discuss different instances of depictive predicates than the ones in focus here).

In the present approach, I treat depictive predicates as additional predications that pertain to the figure but are not immediately linked to the situation designated by the verb: After all, one cannot only walk, shuffle, sneak away or amble, but also read, cook, eat or play the piano in one's slippers or barefooted. This is different in the case of manner modifiers like *mit festem Schritt* 'with a firm step' and *auf Zehenspitzen* 'on tiptoe, tiptoeing' mentioned in section 2.2, which are related to the motion itself and are thus treated as values of the MOM_SPEC attribute, which represents additional characterizations of the manner of motion (note that if you read, cook, eat or play the piano on your tiptoes, this refers to your posture or movement while you carry out the particular activities).

Depictive predicates like *in Pantoffeln* 'in slippers' and *barfuß* 'barefooted' will thus be represented under the PROPERTIES attribute of the figure, which was briefly introduced in section 2.2, figure 1. Being concerned here with the overall direction of the analysis rather than the subtleties of the choice of adequate frame attributes, I will content myself in the present context with the tentative representation in figure 8.

Similarly to figures 2 and 3, the fact that the property of wearing slippers holds for the time occupied by the main motion activity of *walking* is not represented separately by specific attribute structures. The concurrence again follows from the unique temporal interpretation of the entire frame and all of its components (which in the full-fledged version of the frame would be determined by the unique EVENT_PROPERTIES attribute structure; cf. Herweg, 2020). Although the value of the PROPERTIES attribute complex in figure 8 does not have any explicit impact on other frame attributes, there may well be some

WALK				
FIGURE	**| PROPERTIES**	**| DRESS**	**| FOOTWEAR**	**| slippers**
EVENT_LAYERS	**| MANNER**	**| walking_gait**		
	| PATH	| ...		

Figure 8. The representation of *walk in slippers*

valid commonsense assumptions about the mode of execution as well as about the manner and the velocity of the motion. So, the motion will probably be executed quietly and slowly when the moving entity wears slippers, and walking, shuffling, ambling or sneaking away are more likely manners than running, racing or rushing. But these are defeasible inferences at best, whose explanation has to be delegated to a theory of non-monotonic reasoning which is not in scope of the present study.

3 Varieties of manner of motion

In section 1 I already gave a brief overview of the types of manner verbs that will be addressed in the present study, namely:

1. verbs of type *S_MOM*, which describe manners that are predominantly associated with the spatial dimension of a motion (e.g., *to walk*);
2. verbs of type *T_MOM*, which describe manners that are distinctly temporal in nature (*to dash, to ramble)*;
3. verbs of type *MC_MOM*, which point to a mental constitution or state of mind that goes along with the motion (e.g., *to hasten*);
4. verbs of type *M_MOM*, which describe a motion that is performed in a specific medium of localization (e.g., *to swim*);
5. *v*erbs of type *I_MOM*, which describe a motion that relies on an instrument (e.g., *to bike*);
6. and finally verbs of type *F_MOM*, which describe manners that involve the exertion of a force against an object (e.g., *to climb*).

Each of these types defines which attributes and profiles are constitutive for the respective frame within or in addition to those of the general *LOCOMOTION* frame. We will see that a number of MoMVs show characteristics of more than one basic manner type. Formally, this is captured by assigning compound types T_1 & T_2 to the verbs in question.[6]

6 The underlying logic of verbal types is explained in Herweg (2020, 2021). In short, a complex type T_1 & T_2 adds the two profiles associated with T_1 and T_2, including

I consider the proposed type-specific profiles on the basic locomotion frame first and foremost as an articulation of the potential that the verbs in question offer for the concrete interpretation of a motion construction in a given context. This means that contextual and situational factors may prevent this semantic potential from being used to full capacity in a given occurence of a verb. In other words, depending on the context, individual components of the proposed frame representations may be more or less pronounced in the final interpretation of a motion construction. In this sense, the proposed profiled frames may well be understood as being prototypical. This applies in particular to those verbal types which add meaning elements that go beyond the primarily spatial aspects of motion events (i.e., direct specifications of the core attributes MANNER and PATH). The types *MC_MOM* and *T_MOM* are particularly noteworthy in this respect: Especially these types, which often appear as components in complex types T_1 *&* T_2, can bring in their specific aspects of meaning more strongly (up to dominance) or more weakly (possibly present only in vestiges) in such type combinations, depending on the context of use.

The present chapter will only present some short sample analyses of the different types of MoMVs in order to give an idea of the general approach put forward here.[7] The proposed informal meaning descriptions and formal representations should be taken *cum grano salis*. A more in-depth study of this widespread field which goes beyond a mere collection of simplifying illustrations has to be deferred to separate work.

3.1 Space-dominant manner of motion: the type *S_MOM*

The type *S_MOM*, which is short for 'space-dominant manner of motion', is intended to cover motion activities whose characteristics can to a large extent be described in terms of spatial configurations of (parts of) the figure in relation to (parts of) the ground. Examples of this type of motion are the basic human gaits of walking and running. Wikipedia (en.wikipedia.org/wiki/Walking, 2023/3/1) summarizes the standard physiological distinction between these gaits (see also Diersch, 1972, pp. 65, 135 for similar definitions) in terms of the contact between the feet of the figure and the ground:

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their corresponding attributes, to the frame. The denotation of a frame of type T_1 *&* T_2 can be thought of as the intersection of the two sets of situations described individually by T_1 and T_2.

7 Other manner classifications have been proposed in the literature, such as the one in Slobin et al. (2014). See Cifuentes Ferez (2007) for an overview of other classification systems; cf. also, e.g., the classification of Thai manner-of-motion verbs in Takahashi (1997). I consider the manner categories suggested in these works to be subtypes of the general types put forward here.

Walking requires that there is always one foot in contact with the ground and that there is a short period of double-support, i.e., a period where the body is supported by both feet. By contrast, running means that the body is supported only by one foot at a time and that there is a short period where both feet are off the ground (i.e., an aerial phase).

Mani & Pustejovsky (2012, p. 105), in their seminal work towards a logical foundation of the semantics of motion expressions, suggest that quite a few manner-of-motion verbs can be differentiated on the basis of topological and mereotopological constraints concerning the figure and the ground during the movement. As a matter of fact, the examples they discuss are mostly verbs that are treated as predicates of type *S_MOM* in the present approach. Mani & Pustejovsky use notions from RCC-8, the Region Connection Calculus (Randell et al., 1992), a calculus which basically extends Allen's (1983) temporal Interval Calculus into two-dimensional space in order to facilitate representing, as well as reasoning about, qualitative spatial relations. Employing the RCC-8 relations of two regions being externally connected or disconnected, Mani & Pustejovsky characterize the basic gaits of walking and running by the fact that throughout the movement there is a continuous alternation between a state where a proper part of the figure is externally connected with the ground and a state where this part of the figure and the ground are disconnected. By contrast, hopping and bouncing imply that the entire figure, rather than just one of its proper parts, alternates between being externally connected with and being disconnected from the ground. Manners such as sliding and rolling are characterized by the fact that there is an uninterrupted external connection between figure and ground.

A straighforward way to incorporate elements of the (mereo-)topological analysis into the present framework amounts largely to a direct translation of the Mani & Pustejovsky approach into the account of dynamic verbal predicates in Herweg (2021), which utilizes a variant of the Dynamic Interval Temporal Logic of Pustejovsky & Moszkowicz (2011) and Mani & Pustejovsky (2012). This means that the logical formalism that underlies the dynamic interpretation of the relevant verbal predicates in the FAMEu *LOCOMOTION* frame would be enhanced with (mereo-)topological concepts along the lines of those employed by Mani & Pustejovsky (2012), yielding frames of verbal types *RUN*, *WALK*, *BOUNCE*, *HOP*, *SLIDE*, *ROLL* etc. (for an outline of the general approach see Herweg, 2021).

Mani's & Pustejovsky's approach can, however, be considered only as a first approximation of a differentiation of manners of (our) type *S_MOM*, for the following reasons: First, further refinement of the characteristic sequence of (mereo-)topological relations is necessary in order to distinguish, e.g., walking and running, as informally described above, as well as other gaits. This also requires further specification of the involved parts of the figure's body and

LIMP			
FIGURE	| **BEHAVIOUR**	| **EXEC_MODE**	| **laborious & unbalanced**
EVENT_LAYERS	| **MANNER**	| **walking_gait**	
	| PATH	| ...	

Figure 9. The representation of *to limp*

a much more differentiated view of their relations to the ground in order to express, e.g., how human running differs from *to hop*, *to bounce, to skip* etc. – all these manners include a short period when figure and ground are disconnected – in that running involves an alternation between the feet which are connected and disconnected with the ground. Second, it is doubtful that the approach carries over to manners such as striding and limping, i.e., specific subgaits of walking which involve some peculiarity or even impediment, features which apparently cannot be primarily captured in terms of temporal sequences of (mereo-)topological relations.

In conclusion, even though (mereo-)topological concepts, embedded in a dynamic logic, provide a compelling formal framework for the semantic analysis of MoMVs, the specific gaits which cannot be captured with these means alone rather call for enriching the basic *LOCOMOTION* frame with additional attributes, so that we eventually arrive at a mixture of a dynamic plus (mereo-)topological foundation of verbal predicate types and the use of explicit attributes in frames. As an empirically well-studied example illustrating this approach, consider the manner-of-motion verb *to limp* and its German counterpart *hinken*. In her contrastive corpus-based in-depth study of English and German verbs, Snell-Hornby (1983, pp. 137 ff.) assigns to these verbs the class 'clumsy, unsteady motion', which covers deviant or impeded modes of walking that are conditioned by the physical or mental state of the figure. More specifically, according to this study, *to limp* and *hinken* describe an irregular and labourious walking caused by lameness which can even indicate a permanent disability.

The partial frame in figure 9 serves as a rough approximation of the representation of *to limp / hinken* in order to illustrate the general approach. The frame's overall type is the verbal predicate *LIMP*, which designates a specific subgait of walking and of the general type *S_MOM*. This predicate puts additional constraints on the basic walking gait, for whose representation we again make use of the "mode of execution" attribute EXEC_MODE already employed in section 2.3. The profile of the verb thus expands the figure's attribute structure accordingly, as indicated in figure 9. The value 'laborious & unbalanced' of EXEC_MODE should simply be considered to be short for Snell-Hornby-like feature complexes and just serves to illustrate the general approach.

As a final example, which shows that the type *S_MOM* may be conflated with other manner types such as a manner related to the figure's state of mind (which is covered by our type *MC_MOM*, see below, section 3.3), consider the verb *to stride* and its close German relative *schreiten*. Snell-Hornby (1983, pp. 135 f.) assigns to both verbs the class 'measured, labourious motion'. More specifically, Snell-Hornby describes striding as an energetic and purposeful mode of walking, executed with long, swift steps, whereas the German verb *schreiten* focuses on conscious dignity in walking, with regular and measured steps, an upright posture and a controlled execution, but without affectation. Similarly, in her in-depth study of German motion verbs, Diersch (1972, pp. 122 ff.) characterizes the meaning of *schreiten* as a subgait of walking with a controlled body, an upright posture, an even step rate, plus an at the same time elated and controlled state of mind.

In the present approach, the manners associated with *to stride* and *schreiten* will be assigned the compound manner type *S_MOM & MC_MOM*. The verbs' profiles again augment the FIGURE attribute in a specific way that will be briefly dealt with in section 3.3, which elaborates on the type *MC_MOM* and will show that manifestations of the figure's state of mind may play a significant role in manners of motion (as also witnessed by Zlatev et al., 2021).

3.2 Time-dominant manner of motion: the type *T_MOM*

The type *T_MOM*, which is short for 'time-dominant manner of motion', is intended to cover motion activities whose primary characteristics are temporal in nature. Examples are activities designated by verbs like *to race, to dash, to sweep*, which refer to movements that are (judged to be) particularly fast, and verbs like *to ramble, to stroll, to dander*, *to saunter*, which rather refer to movements that are (judged to be) slow. Being movements, the designated activities of course still have a spatial dimension, but their distinctive features are related to time rather than space. In contrast to verbs of type *S_MOM*, the characteristics of verbs of type *T_MOM* cannot – at least not significantly – be described in terms of spatial configurations of (parts of) the figure in relation to (parts of) the ground. Some of the verbs are not at all associated with any particular gait (*to rush, to dash, to sweep*), while others may be weakly associated with a specific bodily behaviour (*to ramble, to dander,* also *to amble*). However, I consider these associations to be highly indeterminate and subject to a great deal of situational variation and therefore do not include them in the primary information these verbs convey. All the verbs in question rather highlight the amount of time that the agent spends or intends to spend on moving from one place to another, up to a point where any notion of changing locations is almost completely obscured by time-related aspects.

DASH				
FIGURE	**| BEHAVIOUR**	**| EXEC_MODE**		**| ↓©$_1$ high_rate**
EVENT_LAYERS	**| MANNER**	**| dashing**		
	| PATH	| ROUTE	| ...	
		| P_DIM	**| VEL**	**| ↑©$_1$ high**

Figure 10. The representation of *to dash*

SAUNTER				
FIGURE	**| BEHAVIOUR**	**| EXEC_MODE**		**| ↓©$_1$ leisurely**
EVENT_LAYERS	**| MANNER**	**| sauntering**		
	| PATH	| ROUTE	| ...	
		| P_DIM	**| VEL**	**| ↑©$_1$ low**

Figure 11. The representation of *to saunter*

The profiles that we propose for verbs of type *T_MOM* in figures 10 and 11 again make use of the 'mode of execution' attribute EXEC_MODE in the figure's BEHAVIOUR structure. The frame also employs Dependency Constraints (DepCs), as introduced in section 2.3, in order to represent the impact of the value of the figure's EXEC_MODE on the value of the VEL(ocity) attribute in the path's dimensional representation. The values of EXEC_MODE are borrowed from some vivid informal meaning characterizations that can be found in Snell-Hornby (1983, pp. 133, 142) and Cifuentes Ferez (2007, p. 120). They only serve to illustrate the general approach, which also holds for the value of the MANNER attribute, whose specifics are not relevant in the present context. The sample frames are just intended to show that the verbs' profiles are still those of manner-of-motion verbs; the manner attribute is therefore not suppressed but remains silent about any specific gait.

The (partial) frames in figures 10 and 11 exhibit two characteristic principles of the profiling mechanism: The basic FIGURE attribute of the *LOCOMOTION* frame is augmented with a complex BEHAVIOUR attribute, and the dependency constraint establishes a relation between separate substructures of the frame (cf. section 1).

Even more pronounced than in the case of verbs of type *T_MOM*, many verbs of type *S_MOM* exhibit a distinct intentional, emotional or attitudinal element. Meaning components that refer to characteristics of the state of mind of the moving entity have been pointed out notably by Diersch (1972) and Snell-Hornby (1983) in their corpus-based studies of verb meanings. Diersch (1972, pp. 130 ff.) cites evidence from text collections that German *schlendern* 'saunter, stroll, amble' is often associated with a placid, calm and purposeless state-of-mind of the agent, whereas German *eilen* 'rush, hurry' (Diersch, 1972,

pp. 151 ff.) usually comes with an active and exerted attitude. Similar results are reported in Snell-Hornby (1983, p. 133) for English *to amble, to saunter, to stroll* etc., as well as for German *schlendern,* which are in general associated with a leisurely, easy-going attitude of the agent, whereas a verb like *to rush* expresses the agent's inner impetus of urgency (Snell-Hornby, 1983, p. 144). In a similar vein, Cifuentes Ferez (2007) characterizes *to roam* and *to saunter* as aimless motion without any special purpose.

Observations like these lead us to the next type of manners of motion, namely those which exhibit a strong intentional, emotional or attitudinal component.

3.3 Mental-constitution – dominant manner of motion: the type *MC_MOM*

The type *MC_MOM* covers motion verbs that suggest a pronounced mental constitution or state of mind of the moving figure which represents the figure's intentions, emotions, attitudes etc. Some examples were already given in the previous sections. In the present section I will focus on two German verbs which have been extensively studied by Diersch (1972), namely *eilen* 'rush, hurry' and *hasten* 'hasten, hustle'. These verbs are semantically quite close but reveal some interesting differences. In both cases, the described motions are independent from any specific gait and can be performed in different ways, e.g., by walking, running, driving, biking etc. Both verbs primarily express that the agent strives for a fast motion in order to quickly pass some distance, like in the following examples:

(5) a. Er eilte von der Bibliothek über den Korridor in den Hörsaal.
'he rushed / hurried from the library across the corridor into the lecture hall'
b. Er hastete aus dem Büro durch die Altstadt zum Theater.
'he hustled / hastened out of the office through the old town to the theatre'

There is, however, an important difference: While *eilen* is – apart from the agent's endeavour for speed – neutral with regard to the state of mind of the agent, *hasten* attributes to the agent a tense, driven and agitated state of mind (cf. Diersch, 1972, p. 156). This difference can be tracked down in the contexts in which these verbs typically appear: According to Diersch's corpus studies (cf. Diersch, 1972, pp. 151 f.), *eilen* appears equally with characterizations of the velocity of motion (e.g., *so schnell wie möglich* 'as quickly as possible'), of the figure's gait and posture (e.g., *mit langen Schritten* 'with long steps'), of accompanying activities (e.g., *flüchtend* 'fleeing') as well as

EILEN				
FIGURE	| **PROPERTIES**	| **SOM**	| **INT**	| **perform_quick_motion**
EVENT_LAYERS	| **MANNER**	| **eilend**		
	| PATH	| ...		

Figure 12. The representation of German *eilen* 'rush, hurry'

HASTEN				
FIGURE	| **PROPERTIES**	| **SOM**	| **INT**	| **perform_quick_motion**
			| **EMO**	| **agitated**
EVENT_LAYERS	| **MANNER**	| **hastend**		
	| PATH	| ...		

Figure 13. The representation of German *hasten* 'hasten, hustle'

his / her mood, which can be positive or negative (e.g., *zielbewusst* 'purposeful', *erschreckt* 'appalled'). In contrast, *hasten* predominantly appears with descriptions of the figure's mood – which is mostly negative (e.g., *wütend* 'angry') – and accompanying activities, which mostly indicate a substantial effort (e.g., *schnaufend* 'panting'). However, specifications of velocity, gait and posture are rare (cf. Diersch, 1972, p. 155).[8]

In the representations shown in figure 12 and figure 13, the profiles associated with these verbs expand the FIGURE attribute with state-of-mind related properties (attribute SOM), such as the figure's intention (INT) and – in the case of *hasten* – his / her emotion or affect (EMO).[9] The representations show that *hasten* essentially adds a particular state of mind to the intention to perform a motion with high speed.

Neither representation explicitly refers to the VEL(ocity) of the motion because the verbs seem to focus more on the (ascribed) intention of the agent than on the actual execution of the motion (which actually does not have to

8 Queries by the author in the German corpora 'DeReKo' and 'Wortschatz Leipzig' [www.ids-mannheim.de/digspra/kl/projekte/korpora, www.wortschatz.uni-leipzig.de/de; accessed November 2022] produced a substantial (though not yet exactly quantified) number of cases where *hasten* occurred with final clauses (e.g., *um den Zug zu erreichen* 'in order to catch the train') and PPs like *auf dem Weg zur Arbeit* 'on the way to work' or *in panischer Angst* 'petrified' (lit.: *in panic fear*). These adverbial modifications can be unterstood as state-of-mind related, often intentional patterns of explanation.

9 I would like to emphasise again that the proposed representations are only meant to show the general direction of the analyses and that the designations of intentions, emotions etc. (i.e., the values of the corresponding attributes) are only for illustration. In a further stage of elaboration, these designations would have to be underpinned by corresponding psychological theories, such as Ekman's (1992) theory of emotions (or its later enhancements; cf. Hofmann et al., 2020).

be particularly fast). If corroborated by additional evidence, the value of the path's VEL attribute could be adjusted accordingly by means of a dependency constraint between the figure's intention value and the path's velocity value.[10]

It appears that in the majority of cases the type *MC_MOM* is not the sole manner type associated with a verb but rather serves as an additional condition on other types like *T_MOM* or *S_MOM*. The verbs in question can thus be assigned complex types such as *T_MOM & MC_MOM* (e.g., *to rush, to hurry; eilen*) or *S_MOM & MC_MOM* (see section 3.1 on *to stride* and German *schreiten*).

3.4 Medium-related manner of motion: the type *M_MOM*

The type *M_MOM* serves to represent those kinds of motion that are performed in a specific medium of localization (cf. Kaufmann, 1995), as in the case of *to swim* and *to fly.* The medium of localization can be identical with or directly be determined by the explicit ground object, like in *to fly through the air* and *to swim through the English Channel*, resp., or it can be semantically detached from the ground object, like in *to fly across the English Channel* or *to swim from Cap Gris-Nez to Dover*, where the medium needs to be established by additional inference (neither is the English Channel an airspace, nor are the sites Cap Gris-Nez or Dover waterways). We will hence make use of a separate attribute MED for 'medium of localization' that is independent from the ground. The profiles of the verbs in question expand the figure's PROPERTIES attribute (see above, figure 1 and section 2.4) with a localization property LOC which specifies a relation L_REL – the same localization relation that is used in the attribute structures of the different route segments – between the figure and the medium. In the case of *to swim* in figure 6, the type of the medium is '*liquid*'. In the case of *to fly*, the type of the medium is '*air*'. The spatial relations 'in' and 'at' are deliberately left vague and are intended to cover the ranges of interpretations of the corresponding prepositions. The

10 If at all, I consider such a relation between intention and velocity to be more appropriate for *eilen* than for *hasten*. However, I would prefer to assume a weak constraint at best – a relation for which I propose the concept of weighted dependency contraints in Herweg (forthcoming). It is instructive for the study of these two verbs to look at the corresponding nouns. DUDEN describes their meanings as follows: (a) *Eile: Bestreben, Gedrängtsein, etwas so schnell wie möglich zu erledigen* ['hurry, rush: striving, being in a push to get something done as quickly as possible']; (b) *Hast: große, überstürzte Eile; (oft von innerer Unruhe oder der Angst, nicht rechtzeitig fertig zu werden, verursachtes) planloses, aufgeregtes Handeln* ['haste: great, hurried rush; (often caused by inner restlessness or fear of not finishing in time) haphazard, agitated action'] (www.duden.de/rechtschreibung/Eile#bedeutung and www.duden.de/rechtschreibung/Hast#bedeutung, accessed on March 5th, 2023; translations by www.deepl.com/translate). Both definitions emphasize the agent's state of mind and do not address the actual velocity of the motion.

SWIM					
FIGURE	**| PROPERTIES**	**| LOC**	**| L_REL**	**| in**	
			| MEDIUM	***| LIQUID***	
EVENT_LAYERS	**| MANNER**	**| swimming**			
	| PATH	| ROUTE	| INIT	| L_REL	| at
				| GROUND	| cap_gris_nez
			| INTER	| L_REL	*| LOC_REL*
				| GROUND	*| PHYSICAL_OBJECT*
			| FIN	| L_REL	| at
				| GROUND	| dover

Figure 14. The representation of *to swim from Cap Gris-Nez to Dover*

representation in figure 14 shows that the medium and the ground object(s) are independent from each other.

A verb of type *M_MOM* like *to swim* thus profiles a complex attribute structure according to which the figure performs a specific motion activity in a medium of a particular sort. The manner in which the motion is executed – in the present case represented by the general type 'swimming' – comprises a family of bodily activities which could be described more specifically as crawl, backstroke, breaststroke, dolphin butterfly stroke or (at least in the case of German *schwimmen*) even simple floating. These activities involve particular spatial configurations of (parts of) the figure in relation to the medium, so that we should assume for the verbs in question also a discernible spatial manner component, which can be captured by the compound type *M_MOM & S_MOM.*

3.5 Instrument-related manner of motion: the type *I_MOM*

The type *I_MOM* comprises manners of motion whose execution relies on a separate device, in addition to the human body, which serves as an instrument in the motion activity. This includes activities such as cycling, rowing, sailing, skating, skiing, sledding etc. (cf. Kaufmann, 1995; Pourcel, 2004). For a simple representation of this manner type we can work with the frame inventory that is already available and again utilize the EXEC_MODE attribute in the figure's BEHAVIOUR structure, like we did for the types *T_MOM* and *S_MOM*. In the proposed frame, verbs of type *I_MOM* augment the EXEC_MODE with an instrument whose sort is represented by the type of the value of the associated attribute INSTR. Figure 15 shows the sample profile of the verb *to cycle*.

Similar to the type *M_MOM*, verbs of type *I_MOM* profile frame structures which reflect that the figure performs a specific motion activity in relation to a separate entity – here: the instrument – which is an intrinsic ingredient of the respective manner of motion. The manner in which the motion is executed consists in specific bodily activities like stepping onto the pedals, pulling and

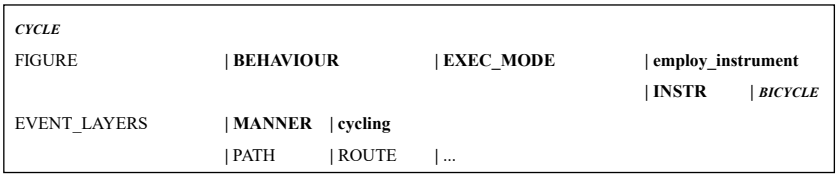

Figure 15. The representation of *to cycle*

pushing the oar blades, navigating a sailing boat etc. These activities again involve a spatial manner component which calls for assigning to the verbs in question the compound type *M_MOM & S_MOM*, plus possibly the type described in the next section.

3.6 Force-exerting manner of motion: the type *F_MOM*

The manner type *F_MOM,* which is short for 'force-dominant manner of motion', is used for verbs which designate a motion that involves the exertion of a force against an overt or tacit object. This object serves as an antagonist in the activity, like in vertical movements as designated by *to climb*, as well as by German *klettern* and (the manner-of-motion reading of) *steigen*[11] (cf. Geuder & Weisgerber, 2008). In the account put forward by Geuder & Weisgerber (2008), whose core elements are adopted in the present study, these verbs of vertical movement describe a manner of motion that specifies force configurations on a path, namely the manner 'upward force exertion (against the ground)'. This manner implies a direction ('upward'), which, however, applies only to the force exerted against a ground object, such as (the steps of) a ladder. The examples (6.a–c) show that the overall direction of the motion is in principle independent of this force-related direction and can be upward as well as downward. Only with certain types of ground objects does a preferred interpretation of direction emerge, such as downward in (6.d) and upward in (6.e):

(6) a. to climb up / down a mountain
b. auf das / vom Dach klettern 'to climb onto / from the roof'
c. in ein Auto steigen 'to climb into a car'
d. in einen Schacht steigen / klettern 'to climb into a manhole'
e. in eine Baumkrone steigen / klettern 'to climb into a treetop'

11 The restriction to the manner-of-motion sense of *steigen* excludes the pure directional reading of *steigen* like in *Der Ballon steigt* 'the balloon rises', which involves reference to a freely suspended entity and excludes downward movement (cf. Gamerschlag et al., 2014).

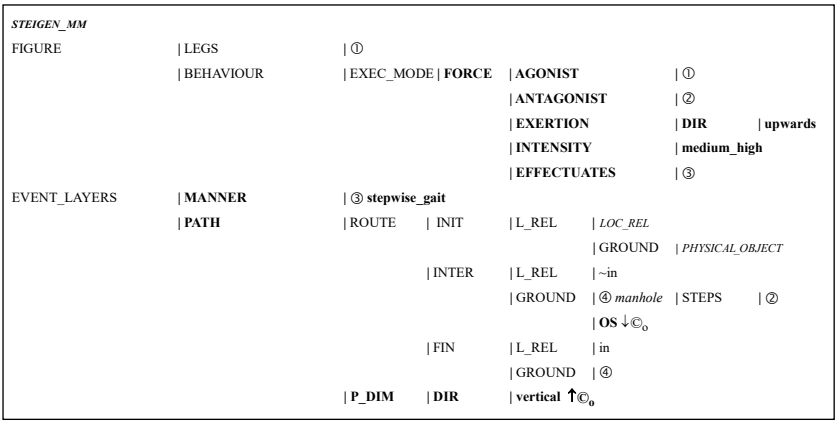

Figure 16. Frame for the force expression *in einen Schacht steigen* 'climb into a manhole'

Figure 16, which shows the FAMEu frame for *in einen Schacht steigen* 'to climb into a manhole', incorporates the crucial elements of the frame-semantic analysis of the manner-of-motion reading of German *steigen* 'to climb' – henceforth represented by the verbal type *STEIGEN_MM* – as suggested in Gamerschlag et al. (2014), which in turn elaborates on the ideas in Geuder & Weisgerber (2008). In terms of the present approach, the profile associated with *STEIGEN_MM* expands the figure's BEHAVIOUR attribute with the representation of a specific force configuration. The general picture is that the exertion of a force effectuates the execution of a particular manner of motion that causes a change of location. In the present example, the manner is executed with medium-to-high intensity in a stepwise fashion. The figure's legs constitute the agonist of the force, whose antagonist is provided by a suitable object associated with the manhole. Just for the purpose of illustration we assume that some steps attached to the manhole form the antagonist.

Over and above the approximate translation of the account in Gamerschlag et al. (2014) into the present framework, the proposal in figure 16 incorporates a frame attribute OS for object schemes. Object schemes in the sense of Lang (1989) cover the dimensional properties of physical objects and primarily serve to determine which dimension of an object counts as its height, width, length, depth or thickness in a given context. The idea in the case at hand is that the verb *steigen* is neutral with regard to upward or downward movement – hence P_DIM | DIR | *vertical* by virtue of its profile – and that the orientation of the ground object may further constrain the interpretation of the direction of the movement. The vertical orientation of an object can be intrinsically determined (downward in the case of manholes, canyons etc.; upward in the case of towers, treetops, helicopters etc.), or it can very much depend

on the particular situation (think of climbing into a cave, a tube or a pipe; see also [6.c]). In order to account for the fact that the orientation of an object in many cases needs to be calculated from its OS and the circumstances of the respective situation, I propose to represent the impact of the orientation of the ground object in a particular situation on the interpretation of the overall direction of the motion – here: the climbing – again by a dependency constraint (cf. section 2.3). This $DepC_{orient}$ (which I can only hint at here and whose details I will have to leave open for reasons of complexity) further constrains the value of the path's direction, which the verb only (under-)determines as *vertical*, to a more specific upward or downward verticality. Amended with a suitable account of defeasible interpretation preferences (which again will be subject to a separate study on weight assignments in frames; see Herweg, forthcoming), this device is designed to capture the preferred interpretation of the direction of the motion, i.e., a downward motion in (6.d) *in einen Schacht steigen / klettern* 'to climb into a manhole', as opposed to an upward motion in (6.e) *in eine Baumkrone steigen / klettern* 'climb into a treetop'.

Since manner-of-motion verbs of vertical movement expand both the MANNER and the PATH attribute (plus the figure's BEHAVIOUR attribute), they concurrently profile the two event layers manner and path, rather than just a single event layer.

It needs further consideration to determine whether or not all locomotion verbs are uniformly assigned a FORCE attribute, or if there rather is a clear distinction between force-related and non-force-related verbs. Some strong candidates for force-related verbs were already mentioned in the previous section on verbs of type *I_MOM*. In case of a pervasive FORCE attribute, the concept of weighted frame elements may again be useful in order to differentiate among verbs in terms of the weights assigned to the FORCE attribute, depending on the role that forces play in their semantics. As mentioned before, this topic will be revisited in a forthcoming study (Herweg, forthcoming).

4 By way of conclusion: Cognitive verb clusters as evidence for the microstructure of the MANNER attribute

This article put forward some additional pieces of equipment that will be beneficial on our journey towards a comprehensive frame-semantic account of motion expressions in typologically different languages, the principles of which have been outlined in Herweg (2020, 2021). Our point of departure is the FAMEu *LOCOMOTION* frame, which provides an expressive structure that allows to represent major elements of the linguistic description of motion events. Most importantly, the *LOCOMOTION* frame features elaborate

representations of the two fundamental event layers that are effective in motion descriptions, namely the manner layer and the path layer.

The crucial theoretical concept used for a fine-grained differentiation among the semantics of intransitive motion verbs is the characteristic profile that a motion verb imposes on the *LOCOMOTION* frame. The particular profiles of motion verbs may select, deselect and augment substructures of the general frame, as well as elaborate on significant relations between different substructures. We saw instances of each of these mechanisms at work in the suggested differentiations in the multi-faceted expression of manner of motion.

The FAMEu approach is intended to be applied not only to the semantic analysis of motion verbs, but also to modelling some of the cognitive aspects of the interpretation of motion expressions, as identified in psycholinguistic research. And there are indeed further empirical observations in favour of some of the proposed distinctions from a pilot experiment that was targeted on the identification of semantic factors that determine preferences in the aspectual class interpretation of motion expressions in German (cf. Herweg & Gerwien, 2016). In order to isolate the contribution of verb meanings to aspectual class preferences, subjects were presented with motion descriptions in which the linguistic context of the motion verb had been reduced to a minimum, namely a directional goal PP (*in* + NP[acc]), which creates a telic context, and its locative variant (*in* + NP[dat]), which creates an atelic context. Subjects were asked to judge the acceptability of about 80 German motion verbs complemented by either a directional or a locative PP on a continuous scale supplied via a slider on a computer screen. The expected outcome was that subjects would produce acceptability judgements that provide a clue to identify verbs with different degrees of preference for telic and atelic interpretations.

The acceptability judgements produced different clusters of verbs. A notable result in the context of the present study is the fact that the German equivalents of the above mentioned verbs with a predominantly space-related manner (verbs of type *S_MOM*, in terms of the FAMEu type system) showed no discernible preference for either a telic (directional) or atelic (locative) context, whereas the German equivalents of the verbs that designate a predominantly time-related manner (type *T_MOM*) with a high velocity value showed a significant preference for a telic (directional) context; atelic (locative) contexts were more or less completely rejected.

Quite interestingly, the experiment also revealed a group of verbs with remarkably low ratings in telic directional contexts, namely verbs like *bummeln* 'amble, saunter', *flanieren* 'dander, stroll', *streunen* 'stray' and *stromern* 'roam'. While these findings can to some extent be explained by the aspectual class of the verbs – there is good reason to assume that the latter two verbs are lexically atelic (cf. Maienborn, 1990; Herweg, 2020) –, this does not account for the

entire group in question, as the former two verbs' aspectual class is lexically underspecified, rather than atelic.[12] A promising move towards an explanation of these judgements, on top of considerations about aspectual classes, could be built upon the system of manner types proposed in the present paper. I hence conjecture that the verbs of this group share relevant semantic properties with several of the manner-of-motion verb types introduced in section 3: First, they inherit features from the predominantly time-related type *T_MOM*, on whose P_DIM | VEL frame component their profile imposes a low velocity value. At the same time, the verbs in question still exhibit some characteristics of the space-dominant type *S_MOM*, as they also evoke a certain impression of a characteristic gait, although this is not their predominant interpretation. And finally, the verbs convey the idea of an aimless motion that primarily serves as a pastime, rather than a movement firmly aiming at a given goal – a trait which can be modelled utilizing the *MC_MOM* type and verb-specific profiles imposed on the corresponding intention attribute. This conflation of particular type characteristics might give us a clue why these verbs do not completely resist, but strongly disfavour a decidedly telic context.

I have to leave it open to future experimental research to further investigate the principles that guide the cognitive construal of motion event representations and to shed more light on the interaction of (more or less) stable lexical semantics with defeasible standard assumptions and interpretation preferences.

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12 Herweg (forthcoming) cites some examples from German corpora that corroborate this claim.

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Web Resources

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