Symmetry and asymmetry in Italian caused-motion constructions.

An Embodied Construction Grammar approach[1]

Enrico Torre

Lancaster University
e.torre@lancaster.ac.uk

Abstract

The present article introduces Embodied Construction Grammar, a cognitive approach to the study of language which at present is not fully developed and established, but whose adoption has repeatedly proved adequate to provide explicit analyses of several grammatical phenomena observed in English and also some phenomena of other languages, especially German, Hebrew, and Mandarin Chinese. In this paper, after a brief introduction to cognitive approaches to grammar and a brief summary of the main properties of Embodied Construction Grammar (with a special focus on those which distinguish this model from other cognitive approaches), I will provide the reader with an illustration of this model at work. Since at present Romance languages (with the partial exception of Spanish) have been somewhat neglected by scholars who developed this approach, I will proceed to carefully analyze a circumscribed phenomenon of the Italian language, namely caused-motion constructions. The results of this case-study are remarkable for two reasons. First of all, they allow me to assert that Embodied Construction Grammar proves able to supply a detailed explanation of this phenomenon, thus being apt to be adopted in the analysis of Italian data. Second, and perhaps more interesting, the adoption of this particular model to carry out my investigation enables me to argue that Italian caused-motion constructions can be divided into two different categories, and to explain this distinction using the cognitive semantic notion of force-dynamics.

1. Introduction

The present contribution, which is partially based on the central part of the author's M.A. thesis (published as Torre 2011), is meant to provide a brief introduction to Embodied Construction Grammar (ECG henceforth), a specific model which belongs to the family of cognitive approaches to grammar, developed within the Neural Theory of Language (NTL from now on) research paradigm directed by Jerome A. Feldman, with the collaboration of George Lakoff. It will be argued that this model can prove useful to undertake an analysis of a specific grammatical phenomenon, since its both cognitive and computational nature permits the analyst to carry out an explicit analysis of the formal and semantic structures involved in the process of comprehension of a linguistic expression.

In order to support this assertion, I shall provide the reader with an illustration of the ECG model at work, focusing on **Italian caused-motion constructions** as my target phenomenon. Through a detailed step-by-step illustration of the analysis of a couple of example sentences, I shall demonstrate that an ECG analysis of this phenomenon allows the reader to capture a distinction between two different classes of caused-motion constructions in the Italian language, whose recognition seems to be less than obvious. This distinction will be then explained in cognitive linguistic terms, showing that the difference between these two classes can be adequately accounted for making use of the concept of **force-dynamics**.

In §2, I shall briefly introduce the world of cognitive approaches to grammar, addressing the main points on which these perspectives on grammar diverge from the mainstream generative model. Then, in §3, I shall provide the reader with an overview of the ECG model, also specifying the peculiarities which makes it a rather unique enterprise in the Cognitive Linguistics camp. Next, in §4 I shall embark on an analysis of two Italian active caused-motion constructions, in order to highlight the contribution of each schematic and concrete constituent to the overall meaning of each sentence. Furthermore, I will discuss the distinction between the two different types of Italian caused-motion constructions mentioned above. Finally, in §5 I shall offer a brief summary of the previous sections and proceed to draw some conclusions on the basis of the observations made in the present study.

2. Cognitive approaches to grammar

The label "cognitive approaches to grammar" covers a number of approaches to the scientific study of language which share some basic tenets. All of these models were developed within the Cognitive Linguistics enterprise, and represent a reaction against mainstream Generative

Grammar.[2] Scholars working on these approaches see language as an integrated branch of cognition rather than an autonomous faculty: language is considered to be governed by the same general principles which govern other facets of human cognition.[3]

While generative linguists posit the existence of an innate formal system that derives a well-formed grammatical structure without recourse to meaning, cognitive linguists see grammar as an inventory of symbolic units including schematic templates, which emerge as a result of regular use.

Moreover, generative linguists make use of derivational rules, which precede and thus determine the specific expressions that instantiate them. As pointed out by Evans and Green (2006), in this view words are stored in the lexicon, together with information about their phonology, semantics, and core syntactic properties (e.g. word class). Interacting with generalized syntactic principles, this information gives rise to deep structures, i.e. syntactic structures in which the core requirements of the lexical items are satisfied in accordance with the syntactic principles. Deep structures typically correspond to unmarked active declarative sentences, which are often viewed as the basic syntactic structures within a given language. Less basic clause types, such as interrogatives, are then derived from deep structures by means of syntactic transformation, giving rise to surface structures. Consider the following simple examples of an interrogative and a declarative sentence, respectively.

(1) (a) Is Penny dating someone?
(b) Penny is dating someone.

Generative linguists consider the structure in (1a) as a surface structure derived from the deep structure in (1b) by means of the application of a rule which raises the auxiliary verb in front of the subject (see e.g. Graffi 1994), which might be formulated in (2a), given the deep structure in (2b):

(2) (a) Derive interrogative from declarative: Move Aux in front of Subj
(b) Subj Aux V-ing Obj

On the other hand, cognitive linguists conceive language as a structured inventory of conventional pairs of form and meaning ("constructions" or "symbolic assemblies"). These symbolic units are monostratal and they include information regarding all aspects of language. Virtually all cognitive approaches to grammar subscribe to the **usage-based thesis**, claiming that language is learned by the abstraction of constructions from real instances of language (see e.g. Tomasello 2003; Goldberg 2006). As a consequence, from a cognitive perspective, the two sentences in (1) above are seen as instantiating two different schematic patterns previously stored whole as an effect of repeated use, each of which is associated with different semantic and pragmatic functions and neither one is derived from the other. These emergent patterns are illustrated in (3) below:

(3) (a) Interrogative pattern: Aux Subj V-ing Obj
(b) Declarative pattern: Subj Aux V-ing Obj

Another important aspect in which generative and cognitive linguists hold diverging views regards their different views of redundancy, which is stigmatized in the Chomskyan tradition, while it is taken to be an essential feature of language in Cognitive Linguistics.[4] Indeed, scholars working within a generative framework distinguish between regular forms, which can be derived by the application of a rule, and irregular forms, which need to be explicitly listed in the grammar. Cognitive linguists, on the contrary, replace the notion of rule with that of schema, which embodies patterns emerged from entrenched units as a consequence of usage. Therefore, generalizations are the outcome of recurring patterns of usage which allow the speaker to infer a higher-order schema. Consequently, both the schema and instances of that schema are listed in the grammar, and the schema represents an expression of the generalization which emerges from patterns of usage. Thus, with regard to the example sentences seen above, it is possible to say that generative linguists will consider the deep structure in (1b) as stored in the grammar, while the surface structure in (1a) will be derived by the application of the rule in (2a). On the other hand, cognitive linguists will argue that both sentences in (1) will be stored in the grammar, together with the schematic patterns they instantiate.

A further, related difference regards the fact that generative linguists focus on the statement of general rules that account for well-formedness in language. As a consequence, generative grammarians are usually not concerned with speech formulae, since they often fail to conform to general patterns of syntactic structures (at least as traditionally recognized). On the contrary, cognitive linguists consider conventional expressions as a central part of language knowledge and use: all regular and irregular expressions are part of the speaker's inventory of symbolic units and so deserve to be accounted for (and surely expressions can emerge in speaking that are not stored). The difference between the two kinds of units rests on the fact that while the entrenchment of regular expressions is followed by the rise of a higher, more schematic pattern which will be productively used to create novel expressions, irregular expressions (e.g. idioms) are stored but do not give rise to any schematization.[5]

Finally, generative linguists view linguistic elements as having a componential structure: elements are seen as having a complex internal structure and being built from scratch. On the contrary, cognitive linguists assert that entrenched instances give rise to schemas. Nevertheless, this does not mean that they reject the view that speakers recognize complex structures as having a compositional structure. Simply, they follow Langacker proposing that component structures are immanent in the complex grammatical construction, regardless of whether the compositionality is recognized by the speaker.

While this brief characterization can just represent a concise (and by no means complete) list of the main properties shared by the members of cognitive approaches to grammar, it should be sufficient to provide the reader with an idea of the common assumptions which underlie the approaches developed within the Cognitive Linguistics framework and distinguish them from mainstream Generative Grammar. The identification of shared assumptions between different models within the world of cognitive approaches to grammar is important because this reality is rather fragmented and variegated. Indeed, it is possible to find several cognitive models of grammar, most of which are broadly compatible, but differ from each other by small differences in the perspective from which they deal with grammatical phenomena. In the remainder of the present paper, I am going to introduce one of the most recent and least well-known among these models, ECG, and then to illustrate how this approach can be fruitfully applied to the analysis of specific grammatical phenomena attested in real instances of language use. To be more precise, I shall be dealing with caused-motion constructions in the Italian language, showing that it is possible to distinguish between two different kinds of these sentence-level constructions, and illustrating how an ECG approach can prove useful to explain the difference between them combining a reliable computational formalism with a robust Cognitive Linguistics background.

3. Embodied Construction Grammar

The present section is divided into two subsections. In §3.1 I shall provide the reader with an outline of the ECG model, focusing in particular on the two primitives of the ECG formalism, schemas and constructions. In §3.2 I shall underline the main points of divergence between ECG and other cognitive approaches to grammar.

3.1. Overview

ECG is a linguistic formalism for simulation-based language understanding, developed in recent years within the NTL paradigm.[6] The ECG approach considers the comprehension of an utterance as the internal activation of schemas (i.e. cognitive structures generalized over recurrent perceptual and motor experiences) and their mental simulation in context, which is meant to produce the richest set of inferences possible. In order to provide a dynamic inferential semantics, ECG makes use of the so-called "simulation-based language understanding model", i.e. constructions express generalizations linking phonological and conceptual schemas. Together with the communicative context, the existence of a structured repository of constructions triggers a process of **constructional analysis**, which determines which particular constructions are instantiated in an actual utterance. The product of the analysis process is the **semantic specification** (SemSpec henceforth), which specifies the conceptual schemas evoked by the constructions involved and how they are related. Taking the SemSpec as an input, an **enactment** process is then run, which consists in the internal recreation of previous perceptual, motor, social, and affective experiences, even though the original stimuli are not contextually present. The enactment process results in open-ended inferences,[7] which influence the language user's response and shapes later processing.

As underlined in several papers, the ECG formalism needs both to provide an interface between constructional analysis and enactment and to be defined with sufficient precision to be implemented in a computational model (in particular, this issue is addressed briefly in Chang et al. 2004; Bergen and Chang 2005; and more incisively in Chang 2008; Feldman et al. 2009). In order to meet these requirements, ECG makes use of two basic primitives: **schemas** and **constructions**. As will be shown clearly later, these primitives play a crucial role in the process of analysis. ECG schemas define meaning constraints: relations between schemas are defined in terms of roles, subcases, evoked structures and constraints,[8] in order to create a coherent lattice of interrelated schemas. **Roles** are structured relationships between a set of participants and can be instantiated by particular values, called “fillers”. **Subcases** are specific cases of more general schemas. The **subcases of** key word connects a schema to its type lattice, allowing for structure sharing through inheritance. **Evoked structures** are schemas against which the schema under consideration can be defined. Evoking a structure makes it locally available without imposing a part-of or subtype relation between the evoking and the evoked structure.[9] Finally, ECG posits several **constraints** on roles. **Type constraints** (indicated with a colon, as a:b) restrict a role to be filled by a specific kind of filler. **Identification constraints** (indicated with a double-headed arrow, as a ↔ b) cause fillers to be shared between a and b. Slot-chain notation is exploited to refer to a role b of a structure a (as a.b). Additionally, the ECG formalism makes use of **filler constraints** (expressed using a single-headed arrow, as a ← b), to specify that the role a is filled by the constant value b. Finally, the keyword **self** is used to refer to the structure being defined. The self-reference faculty allows constraints to be established at the level of the entire structure. Even though in this brief explanation this may seem a rigid mechanism, as Bergen and Chang (2005: 153) emphasize, "Overall, the ECG schema formalism provides precise but flexible means of expressing schematic meanings, ranging from individual schemas to structured scenarios in which multiple schemas interact."

Schemas are used to represent a variety of conceptual structures, including some conceptual configurations described in the Cognitive Linguistics literature,[10] and they are defined as a sort of gestalt figures with a narrow number of internal parts, represented as roles. Schemas are also defined as being part of a larger schema-lattice, with each of these schemas having various types of specified connections to other schemas in the lattice. As Dodge and Bryant (forthcoming) point out, "This reflects the complexity and interconnectivity of the conceptual network these schemas are being used to (partially) represent." Dodge and Bryant posit that there are several primitive schemas forming a crucial part of this lattice, and that such supposed primitives reflect recurrent schematic shared features in basic experience (see e.g. Johnson 1987). As Dodge and Bryant highlight,

> Such experiences are presumably shared by people, all of whom process them using some of the same basic functional networks in the brain. Therefore, these schemas are likely to be universally-available to speakers of all languages, though they may of course be utilized in different ways by different languages. A fully defined grammar will also include schemas that represent commonalities in more culturally-specific experiences. These schemas, akin to frames, will also specify relations to other schemas in the lattice.
> (Dodge and Bryant forthcoming)

The lines quoted above underline the importance of working on different languages in order to find out the way in which the supposedly universal schema-lattices are organized in each of them. At present, some ECG analyses on various languages have been carried out (see e.g. Mok and Bryant's 2006 study of argument omission in Chinese, or Schneider's 2010 paper on Hebrew morphology), but the bulk of work has dealt with English (see e.g. Dodge and Wright 2002; Feldman 2002; Bergen et al. 2004; Bergen and Chang 2005; Ettlinger 2005; Feldman et al. 2009; Dodge 2010a, Dodge 2010b; Dodge and Bryant forthcoming). This issue indirectly makes a case for the analysis of non-English data I am going to illustrate in §4.[11]

With reference to constructions, as mentioned above this label applies to pairings of form and meaning of various sizes and levels of concreteness. Their potential forms are not as open-ended as potential meanings, but they can include different kinds of information, ranging from phonological schemas to prosodic patterns (past orthographic forms, gestures, and so on). For the sake of both clarity and space, studies generally refer to the phonological or orthographic aspects, only.[12] The construction formalism derives from the schema formalism, so it comprises all the elements outlined for schemas (i.e. roles, subcases, evoked structures, and constraints), and it also adds two devices standing for their linked poles, **form** and **meaning**. These poles provide a list of the elements and constraints (if any) within each domain, but (as highlighted in Bergen and Chang 2005) they should also be viewed as special components of the construction that can be referred to and constrained, similarly to schema roles. Finally, I must specify that, like schemas, constructions are organized in a construction-lattice.

3.2. The distinguishing features of ECG in the family of cognitive approaches to grammar

ECG is strictly related to other cognitive and constructionist models of grammar (see Lakoff 1987; Langacker 1987; Fillmore et al. 1988; Goldberg 1995, 2006; Croft 2001). First of all, it shares with them the basic assumptions mentioned in §2. Moreover, it also exploits notions and concepts developed and commonly used in the cognitive semantics tradition (see e.g. Croft and Cruse 2004: part I; Evans and Green 2006: part II). Furthermore, ECG directly borrows and applies ideas and structures from the most prominent cognitive approaches to grammar.[13]

On the other hand, there are also several points of divergence between ECG and the other cognitive models of grammar, and it is these that I am going to illustrate in the present subsection. I shall not engage in a comparison between ECG and other cognitive approaches to grammar. Actually, I shall not even try to persuade the reader that ECG is better than any other cognitive model, since I do not feel in the position to make such a statement. Indeed, from my perspective, the various cognitive models of grammar should be seen as mutually informative projects which represent different facets of a unified enterprise aiming at a characterization of language as an emergent system based on the interaction between domain-general cognitive principles and everyday experience in the (physical as well as sociocultural) environment. However, I do not mean to disregard the differences which can be found between these different approaches. Focusing on ECG, in the following lines I shall be summarizing a few aspects which can be considered peculiar to this model.

The first peculiarity of ECG regards the fact that this approach is more deeply connected to the principles of the fast-growing paradigm in cognitive science labeled Embodied Cognition (e.g. Varela et al. 1991; Lakoff and Johnson 1999; Gibbs 2005; Clark 2008. See also Barsalou 1999). Indeed, while all approaches available in the Cognitive Linguistics area agree that meaning, conceived in conceptual terms, is the central component in language, in ECG the embodied nature of this conceptual knowledge is awarded a prominent role. A direct consequence of this focus on embodiment is a deeper connection to other disciplines which study this dimension of human cognition. In particular, while virtually all cognitive models look at theoretical and experimental work from the field of psychology, ECG scholars are prone to pay particular attention to the results obtained by academics involved in neuroscientific research work as well. Indeed, a shared conviction between ECG researchers is that linguistic and conceptual knowledge is grounded in our neural structures and arises through our bodily and sociocultural experience in the world (see e.g. Gallese and Lakoff 2005). This leads to the view of language as more or less directly reflecting neural and mental processes.[14]

The characteristic of ECG mentioned above is related to another of its properties: the fact that while other cognitive approaches to grammar aim to portray linguistic knowledge, ECG is especially concerned with a description of the online processing of linguistic information and on the relation between linguistic items and embodied knowledge (see Evans and Green 2006: §20.3). This point should not be undervalued, because it leads to a somewhat different perspective on linguistic analysis. As a matter of fact, ECG is primarily concerned with the description of the steps involved in the comprehension of linguistic utterances. Therefore, taking for granted that grammar is a network of constructions, ECG tries to describe the process of recognition of the relation between a linguistic form and the corresponding embodied semantic structure which is supposed to occur in real time in the speaker's mind: this is the so-called process of **constructional analysis**, which is supposed to uncover the portion of meaning which is shared by the members of a community, supplying the parameters for a more intrasubjective process labeled **enactment**. Constructional analysis is carried out online in an incremental fashion, which involves the constant interplay between the large, composite construction, and its component parts, which drives the interpretation of the meaning of an utterance. This kind of interaction is considered as having a basically statistical nature; thus, the representation of the mechanisms which underpin this process can draw several beneficial insights from the results shown by studies carried out making use of probabilistic computational models, such as those illustrated by Narayanan and Jurafsky (1998, 2001; for recent developments, see Feldman 2010; Bryant and Gilardi forthcoming).

Finally, the ECG model can be characterized as a formal tool to provide a computational dimension to the bulk of notions developed within the field of Cognitive Linguistics during the last decades (e.g. Feldman 2004; Feldman et al. 2009). The ECG formalism is very different from the kind of formalisms used in the generative linguistic tradition: it does not aspire to be, strictly speaking, a theory on its own, but rather it aims to provide the analyst with a precise formal representation of several insights of Cognitive Linguistics, together with insights from the Embodied Cognition framework (cfr. Lakoff's 1987 comparison between his notion of "practical formalism" and what he calls "technical formalism"). As will be shown below, it can be seen as an instrument to supply an explicit description of the formal and semantic structure of linguistic units, at several different levels of generality and abstraction.

What is more, grammars built using the structures of the ECG formalism are suitable to be implemented on machines. This is a point of paramount importance, for two main reasons: firstly, it provides cognitive linguistic notions with formal rigor, allowing the analyst to test their theories; moreover, it makes the analysis of linguistic utterances significantly faster. For instance, given the whole inventory of schemas and constructions which constitute a certain ECG grammar, a piece of software such as Luca Gilardi's ECG Workbench[15] is able to provide the analyst with the SemSpec of an input sentence in a few seconds, allowing the analyst to check if their hypotheses are plausible or not saving an enormous amount of time, when working on new data. This aspect should not be disregarded, because it might permit the analyst to account for phenomena related to facets of language such as acquisition, variation, and change with the help of a reliable computational framework, whose precision and flexibility make it a valuable tool for linguistic analysis (see e.g. Chang 2008). The importance of the formal dimension of ECG also emerges we take into account the broader linguistic debate. As a matter of fact, a criticism of Cognitive Linguistics which has often been advanced by advocates of generative approaches has to do with its supposed lack of formal rigor: cognitive linguists are often said not to be able to formally test their theories. The ECG formalism may allow cognitive linguists to reject this kind of criticism. Indeed, when a scholar collects a body of linguistic data and provides an interpretation of these data adopting a cognitive approach, the ECG formalism allows them to convert their interpretation in formal terms and to check the precision of their account making use of computational tools, i.e. building an adequate ECG grammar. If the interpretation offered by the scholar is accurate and it is consistently converted in formal terms, the scholar will then be entitled to claim that they have built a computational system, based on the theoretical assumptions of Cognitive Linguistics, which works well. This is a very important point, since the implementation of ECG grammars might allow cognitive linguists to challenge the dominant generative paradigm on its own turf, proving that the notions developed within the Cognitive Linguistics enterprise can be used to build grammars which are not only theoretically motivated and psychologically plausible, but also formally rigorous. Therefore, the ECG model can be seen as an attempt to strengthen the Cognitive Linguistics paradigm by providing scholars with a set of formal tools which allow the analyst to test their theories on computational grounds.

4. An ECG account of Italian caused-motion constructions

The present section will be dedicated to an analysis of Italian caused-motion constructions, observed through the lens of the ECG model. In §4.1, I shall provide the reader with an exposition of the reasons why this particular phenomenon was chosen, followed by a brief introduction to the kind of data examined and the methodology used in my investigation. Then, in §4.2, the analysis of a couple of example sentences will be illustrated in detail. Finally in §4.3, I shall briefly discuss the results of my analysis.

4.1. Data and methodology

In ECG, the label "caused-motion construction" applies to any sentence-level construction which expresses an action whereby an entity causes another entity's movement through space by means of an act of force-transmission. Exploiting a slightly modified version of Goldberg's (2006) notation, one can assert that an active caused-motion construction will show the form represented in (4), the meaning reported in (5), and the argument structure illustrated in (6) below:[16]

(4) Subj V Obj Obl_{path}

(5) X caused Y to move Z_{path}

(6) CAUSE-MOVE (causer patient path)[17]

My choice to work on Italian caused-motion constructions drew inspiration from Goldberg's work. In her 1995 influential book, Goldberg claims for the existence of some particular sentence-level constructions, whose interest lies in their being inherently meaningful, without reference to the words fulfilling them. This statement is fortified by a detailed investigation of four particular grammatical constructions which are ubiquitous in the English language: the ditransitive construction, the caused-motion construction, the resultative construction, and the "way" construction. In the following years, several scholars have adopted Goldberg's perspective and a lot of work has been developed on these kinds of constructions (especially in English); moreover, a few variants of Goldberg's model have arisen. Nevertheless, very little has been done on Italian from a Construction Grammar approach. The paucity of constructionist studies on Italian drove me to decide to direct my efforts to study a phenomenon of the grammar of this language. In particular, the scarceness of work on Italian sentence-level construction led me to choose one of the constructions analyzed by Goldberg (1995) for English and try to account for the corresponding Italian construction. The choice to investigate the caused-motion construction was quite straightforward, for in Italian the "way" construction does not exist, resultative constructions are not frequent (and their status is unclear, see e.g. Broccias 2003), and ditransitive constructions only occur with dative pronouns.[18] On the contrary, caused-motion constructions are not so rare in this language, thus representing a suitable phenomenon to observe, despite their frequency being much lower in Italian than in English.

Italian caused-motion constructions are quite different from their English counterparts for at least one main reason, i.e. they occur with a much more restricted range of verbs. It is possible that this is due to the fact that Romance languages are "verb-framed" languages, whereas Germanic languages are "satellite-framed" languages;[19] therefore, an English sentence such as (7) (drawn from Goldberg 1995: 161) can be translated into Italian as (8), with a more generic motion verb, or as in (9), using a circumlocution with the verb fare ("to make"):

(7) Frank sneezed the tissue off the nightstand.

(8) Frank spinse la salvietta
Frank push:PRT.3SG the.FSG tissue.SG
da-l tavolino con
from-the.MSG nightstand.SG with
uno starnuto.
a.MSG sneeze.SG

"Frank pushed the tissue off the table by sneezing"

(9) Frank fece cadere la
Frank make:PRT.3SG fall:INF the.FSG
salvietta da-l tavolino
tissue.SG from-the.MSG nightstand.SG
con uno starnuto.
with a.MSG sneeze.SG

"Frank made the tissue fall off the table with a sneeze"

Moreover, while in English it is not uncommon for the subject of an intransitive-motion construction to appear also as the object of a caused-motion construction which involves the same verb (in the same form), this phenomenon does not seem to occur in Italian. For instance, while in English the sentences in (10) and (11) are both fine, the Italian counterpart of the intransitive-motion construction takes itself the form of an intransitive-motion construction, as can be seen in (12), but the caused-motion construction in (10) would be translated differently, for instance using a circumlocution with the verb *fare* + infinitive, as in (13) below:

(10) The bread slid off the table.

(11) Linda slid the bread off the table.

(12) Il pane scivolò
The.MSG bread.SG slide:PRT.3SG
da-l tavolo.
from-the.MSG table.SG

"The bread slid off the table"

(13) Linda fece scivolare
Linda make:PRT.3SG slide:INF
il pane da-l

the.MSG bread.SG from-the.MSG
tavolo.
table.SG

"Linda made the bread slide off the table."

While in both English and Italian, caused-motion constructions are very often exploited to convey figures of speech, in the present paper I shall concentrate on (quite typical) caused-motion constructions which occur in literal predication, expressing actual caused-motion events. Consider the sentence reported in (14) below:

(14) Il rapinatore gettò
The.MSG robber.SG toss:PRT.3SG
il portafogli a terra.
the.MSG wallet.SG to ground.SG

"The robber tossed the wallet to the ground."

The sentence-level constructions analyzed in the next subsection were built on analogy with instances of real language in use drawn from ItWaC (Italian Web as Corpus, see Baroni and Kilgariff 2006), an electronic corpus containing almost two billion Italian words crawled from the web. The process of choosing the data went through several stages. My first step was the preparation of a list twelve Italian force-exertion verbs,[20] selected primarily on the basis of my own intuitions about their likelihood to occur in caused-motion constructions, which was later tested through the investigation of ItWaC, exploiting the online corpus query system Sketch Engine.[21] Then, I gathered a sample of about a hundred randomly selected sentences expressing caused-motion, but being careful to pick only those involved in literal predication. Then, I further restricted the number of my sentences selecting just a few of them to serve as a model for the sentences to be analyzed below. These sentences, which show a roughly common form, argument structure, and core meaning, were chosen on the basis of their level of simplicity and normality (lack of oddity) of the message they convey.[22] For instance, a sentence like the one shown in (15) below looked more natural than that illustrated in (16):

(15) Michela lanciava sassi
Michela throw:IMPF.3SG stone.PL
nel-l' acqua.
into-the.FSG water.SG

"Michela was throwing stones into the water."

(16) Giuliano lanciava le
Giuliano throw:IMPF.3SG the.FPL
uova sulla televisione.
egg.PL on-the.FSG television.SG

"Giuliano was throwing eggs against the television."

Therefore, the former was considered more suitable than the latter for my purposes. Then, I decided to make use of a few declarative sentences with a rather simple structure (each involving a different verb, drawn from the list mentioned above). The number of sentences to be actually analyzed, which is fairly small (four active and four passive clauses), was determined to cope with the fact that carrying out an ECG analysis of even a very short clause is rather costly, in terms of both time and space.[23] I also fixed some parameters regarding the syntactic and semantic properties of the sentences to be analyzed (e.g. verb tense, person, semantic role etc.). I was very strict in the setting of these criteria, in order to enable myself to provide an account of homogeneous data, which embody a very circumscribed and clearly defined phenomenon, i.e. the linguistic expression of quite prototypical volitional forceful caused-motion action in Italian. As a consequence of the imposition of these restrictions, the choice of my target sentences cannot be seen as either completely based on introspection or entirely based on the observation of empirical data: the instances of real language found in ItWaC were exploited as a model in order to avoid building implausible examples, but I had to modify (more or less heavily, depending on the particular case) the instances drawn from the corpus, since the specificity of the requirements I posited for my target data were too strict to be simultaneously satisfied by the examples extracted from a random sample of the corpus, and an exploration of the whole database would have been too demanding and time-consuming.

When my target sentences were collected, they were analyzed adopting an approach similar to that recently used by Ellen Dodge (see e.g. Dodge 2010a, Dodge 2010b; Dodge and Bryant forthcoming). In particular, I made use of a grammar similar to the one exploited in Dodge and Bryant (forthcoming), opportunely modified to handle the properties of the Italian language.[24] Building such a grammar was made significantly easier by the possibility to refer to the ontology included in Gilardi's Starter2 grammar. Dodge and

Bryant's grammar, successfully put to use in a study on transitive constructions, was basically developed for English but, as Ellen Dodge (personal communication) pointed me out, it has been worked out in order to be suitable for languages other than English as well.

I should say something about the nature of caused-motion constructions, now. An important property of theirs is transitivity: actually, these constructions are transitive, and the concept of transitivity is less simple and straightforward than one may tend to believe[25]. A transitive action is generally considered to involve an active participant who performs an intentional action on a patient, affecting them in some way. When the clause is in the active voice, in Italian as in English, these two participants are expressed by a subject NP and a direct object NP, respectively. Nevertheless, in both languages several verbs which can be used transitively also appear in intransitive sentences, in which the patient participant is expressed as the subject. Consider the following English examples offered by Dodge and Bryant:

(17) (a) He slid the glass across the table.

(b) The glass slid down the ramp.

Now consider the following Italian sentences:

(18) (a) Scesi le
go.down:PRT.1SG the.F.PL
scale.
stair.PL

"I went down the stairs."

(b) Scesi dall'
go.down:PRT.1SG from-the.FSG
auto.
car.
"I got off the car."

As highlighted by Dodge and Bryant, if I wanted to handle argument realization patterns at verb-level, one would need to posit a different construction for each different pattern, while using Goldberg's **argument-structure constructions** (A-S constructions henceforth) enables me to capture broader generalizations about the argument realization patterns for groups of semantically similar verbs.[26]

At least one transitive A-S construction, identified with a prototypical transitive event,[27] is posited to unify with the different types of various verbs. It also specifies links between these scene roles and their fillers (agent ↔ subject, patient ↔ direct object). The unification of the construction with a verb causes the blending of its roles with those of the verb (cfr. Goldberg 1995). This methodology potentially permits one to posit a single verb construction for verbs which appear in different argument realization patterns. Such a verb construction will unify with the transitive A-S construction but also potentially with more. Therefore, the same verb construction can describe different kinds of events.

Dodge and Bryant define several different transitive A-S constructions, each of which aims to reveal relatively local generalizations over constituency, form, and meaning, also recognizing relations between and generalizations over these constructions. A crucial role is played by the representation of A-S constructions as a hierarchy. In Dodge and Bryant's grammar, A-S constructions have three important types of meaning specification relevant to the present analysis. The first concerns the type of scene, since not all transitive sentences describe the prototypical transitive scene. The solution proposed is to use a different schema to represent each scene. Consider, for instance, the following English examples:

(19) He cut the bread.

(20) The falling shard of glass cut the bread.

(21) He saw the bread.

The simple clause in (19) depicts the prototypical transitive scene, and its semantic content is represented by the **CauseEffectAction** schema (Fig. 1), which combines two schemas to represent more complex situations. CauseEffectAction is a subcase of **ComplexProcess** (Fig. 2) in which process1 (the cause) has a **ForceApplication** (Fig. 3) type constraint and process2 (the effect) is more loosely constrained to be some **Process** (Fig. 4). ForceApplication is a subcase of the **MotorControl** schema (a subcase of Process, Fig. 5) and evokes the **ForceTransfer** schema (Fig. 6).[28]

CauseEffectAction also adds roles for a **causer** and an **affected** participant, and uses co-indexation to bind the causer and affected roles to the appropriate roles in **process1** and **process2**. A further constraint specifies that the affected participant corresponds to the **actedUpon** role of ForceApplication. Consequently, causer is **forceApplication.actor**, and affected is **protagonist** for process1 as well as **forceApplication. actedUpon.** The ForceApplication schema describes MotorControl actions which imply force-exertion. As a consequence, it evokes another schema, ForceTransfer, which describes a transfer of force between a **supplier** and a **recipient**. ForceApplication inherits the roles of MotorControl, adding also a role an actedUpon entity. The constraints block of the schema specifies, through its bindings, that the entity that is acted upon receives the force supplied by the actor, and that the actor's effort is correlated with the amount of force transferred. As shown above, MotorControl is a subcase of Process and adds roles for an **actor**, **effector**, and **effort**. The actor is the protagonist, the effector is the controlled body part, and the effort is the energy expenditure.

The kind of scene captured by the example in (20) differs from that depicted by the previous sentence because it lacks agency. This sentence represent a two-participant event in which the non-agentive notion of one participant (*the falling shard of glass*) affects the other (*the bread*) in some way (*being cut*). In this kind of "causal action", the causer may not be an animate entity. This kind of scene can be captured using a different schema, labeled **CauseEffectProcess**, which is similar to CauseEffectAction but has looser constraints on the type of causal process involved.[29]

The example in (21) describes a scene involving a subject associated with a process but this process does not cause any effect on the other participant. A sentence of this kind can be analyzed as describing an event involving one entity who undergoes some perceptual experience (he), and another entity that provides the content of this experience (the bread). Such an event can be represented with a schema containing (at least) these two roles.[30] This kind of scene is related to the prototypical transitive scene depicted in (19) in that the experiencer, as well as the agent in that kind of scene, in order to successfully perform the action, needs to "attend to" various properties of the entity he is acting on. There is an unbalanced experiential / perceptual relation between the two participants.

The second type of meaning specification I am concerned with regards the relation between verb and A-S construction meaning. As Dodge and Bryant point out, transitive sentences that describe prototypical transitive scenes face the problem that the same verb can often be used to describe different types of scene, which are often accompanied by difference in argument realization patterns. Instead of positing a different verb construction for each type of scene that a verb can be used to portray, Dodge and Bryant posit a single verb construction which can potentially unify with different A-S constructions, each of which may describe a different type of scene.

Finally, the third type concerns perspective: A-S constructions also specify from which participant's perspective this scene is conceptualized and described. Perspective especially plays a crucial role in the distinction between active and passive sentences: the former describe a transitive event from the perspective of the causer, whereas the latter take the perspective of the patient participant. Taking all these aspects into consideration, in the next section I can move on to analyze a couple of Italian sentences, each of which exemplifies one of two different types of caused-motion constructions.

Fig. 1: The CauseEffectAction schema

```
schema CauseEffectAction
 subcase of ComplexProcess
  roles
     process1: ForceApplication
     process2: Process   // inherited
     causer
     affected
  constraints
     protagonist ↔ causer
     protagonist2 ↔ affected
     process1.ActedUpon ↔ affected
```

Fig. 2: The ComplexProcess schema

```
schema ComplexProcess
 subcase of Process
  roles
    protagonist   // inherited
    protagonist2
    x-net: @complexx-net
    process1: Process
    process2: Process
  constraints
    protagonist ↔ process1.protagonist
    protagonist2 ↔ process2.protagonist
```

Fig. 3: ForceApplication schema

```
schema ForceApplication
 subcase of MotorControl
 evokes ForceTransfer as ft
  roles
    actedUpon
    effort   // inherited
  constraints
    actor ↔ ft.supplier
    actedUpon ↔ ft.recipient
    effort ↔ ft.amount
```

Fig. 4: the Process schema

```
schema Process
 roles
   x-net: X-net
   protagonist
```

```
schema MotorControl
 subcase of Process
 roles
   actor: animate
   effector
   effort
   routine
 constraints
   actor ↔ protagonist
  routine ↔ x-net
```

Fig. 5: the MotorControl schema

Fig. 6: the ForceTransfer schema

```
schema ForceTransfer
 roles
   supplier
   recipient
   amount
```

4.2. Analysis

As underlined at the end of §2, my analysis will show that Italian caused-motion constructions can be basically divided into two different types. Those occurring with the vast majority of verbs are part of a group which might be labeled **symmetric caused-motion constructions**, whereas those which occur with the verbs *spingere* and *tirare* constitute a group I will label **asymmetric caused-motion constructions**. Since illustrating an ECG analysis of even a small sentence is remarkably costly (in regard to both time and space), here I will just provide the reader with an explicit analysis of one exemplar active sentence per type.[31] Let me begin with a symmetric construction. Consider the simple clause in (22):

(22)

I	bambini	lanceranno	
The.MPL	*child.PL*	*throw:FUT.3PL*	
i	sassi	a-l	bersaglio.
the.MPL	*stone.PL*	*at-the.MSG*	*target.SG*

"The children will throw the stones at the target"

I begin my analysis by illustrating the lexical construction corresponding to the verb used in the sentence in (22), *lanceranno*, shown in Fig. 7 below. Since *lanceranno* is the third-person plural form of the verb *lanciare* in the simple future tense, this construction is labeled **Lanciare1SimpleFuture3Pl**. **Lanciare1**, shown in Fig. 8, is the lexical construction referring to the verb *lanciare* when it takes the specific meaning implied by the sentence, and it is a subcase of the more schematic construction **Lanciare** (Fig. 9 below).

Let me consider the Lanciare1SimpleFuture3Pl construction first. As can be seen in Fig. 7, not only is it a subcase of the Lanciare1 construction, but also of three other constructions, which specify the tense, number, and person of the verbal form under consideration. The **SimpleFutureTense** construction, illustrated in Fig. 10 below, is a subcase of a more general **FiniteVerb** construction, (Fig. 11) which in turn is a subcase of an even more general **HasVerbFeatures** construction (Fig. 12), a subcase of the root **HasAgreementFeatures** construction (Fig 13).

Fig. 7: the Lanciare1SimpleFuture3Pl construction

```
construction Lanciare1SimpleFuture3Pl
 subcase of Lanciare1, SimpleFutureTense, Plural, 3rdperson
 constructional: VerbFeatureSet   // inh.
  constraints
    self.features.verbform ← simplefuture   // inh.
    self.features.number ← plural   // inh.
    self.features.person ← 3   // inh.
 form: WordForm   // inh.
  constraints
    self.f.phon ← /lanʧe'ran:o/
 meaning: CauseMotionAction   // inh.
  constraints
    self.m.x-net ← @throw   // inh.
```

Fig. 8: the Lanciare1 construction

```
construction Lanciare1
 subcase of Lanciare
 constructional: VerbFeatureSet   // inh.
  constraints
    self.features.verbform ← base   // inh.
 form: WordForm   // inh.
  constraints
    self.f.phon ← /lan'ʧare/   // inh.
 meaning: CauseMotionAction
  constraints
    self.f.x-net ← @throw
```

Fig. 9: the Lanciare construction

```
construction Lanciare
 subcase of LexVerb
 constructional: VerbFeatureSet   // inh.
  constraints
    self.features.verbform ← base
 form: WordForm   // inh.
  constraints
    self.f.phon ← /lan'ʧare/
 meaning: Process   // inh.
```

SimplePastTense inherits the **constructional** block from the FiniteVerb construction. This block is bound to the **VerbFeatureSet** schema (Fig. 14 below), which represents a subcase of the **AgreementFeatureSet** schema (Fig. 15).

The **constructional** block is used to perform a double duty (see e.g. Chang et al. 2004; Bergen and Chang 2005): to list constructional constituents in complex constructions, but also to specify the elements or constraints applicable to a (simple or complex) construction as a whole, i.e. the information which cannot be properly ascribed to either the form or the meaning pole.[32]

Fig. 10: the SimpleFutureTense construction

```
construction SimpleFutureTense
 subcase of Finite
 constructional: VerbFeatureSet   // inh.
  constraints
    self.features.verbform ← simplefuture
```

Fig. 11: the FiniteVerb construction

```
construction Finite
 subcase of HasVerbFeatures
 constructional: VerbFeatureSet   // inh.
  constraints
    self.features.verbform ← finite
```

Fig. 12: the HasVerbFeatures construction

```
construction HasVerbFeatures
 subcase of HasAgreementFeatures
 constructional: VerbFeatureSet
```

Fig. 13: the HasAgreementFeatures construction

```
construction HasAgreementFeatures
constructional: AgreementFeatureSet
```

Fig. 14: the VerbFeatereSet schema

```
schema VerbFeatureSet
 subcase of AgreementFeatureSet
  roles
    verbform
    number   // inherited
    person   // inherited
```

Fig. 15: the AgreementFeatureSet schema

```
schema AgreementFeatureSet
 roles
   number
   person
```

LanciareSimpleFuture3pl is also a subcase of the **Plural** and the **3rdPerson** constructions, shown in Fig. 16 and Fig. 17 below, respectively.

Fig. 16: the Plural construction

```
construction Plural
 subcase of HasAgreementFeatures
 constructional
  constraints
   self.features.number ← plural
```

Fig. 17: the 3rdPerson construction

```
construction 3rdPerson
 subcase of HasAgreementFeatures
 constructional
  constraints
   self.features.person ← 3
```

Observing Fig. 7, you will have noticed that the form pole of the construction is constrained to be a word using the WordForm schema, shown in Fig. 18 below.[33]

Fig. 18: the WordForm schema

```
schema WordForm
 roles
   phon
```

The phonological structure of *lanceranno* is specified by setting the right value for the **phon** role. The **self** keyword is used to refer to the construction itself, and the **f** keyword to refer to its form pole. The meaning pole of LanciareSimpleFuture3Pl is constrained to be **CauseMotionAction**, a schema shown in Fig. 19 below. CauseMotionAction is a subcase of the CauseEffectAction schema shown in Fig. 1 above. The x-net role of Lanciare1SimpleFuture3Pl is assigned the proper x-net value (i.e. **@throw**). Being a subcase of CauseEffectAction (and, consequently, of ComplexProcess), CauseMotionAction is composed by two different processes: the first one is constrained to be a process of ForceApplication (see Fig. 3 above), since there is a causer participant performing a forceful action on an affected participant, while the second process has a **MotionAlongAPath** type constraint, for the affected participant becomes the protagonist of a motion event along a path. The MotionAlongAPath schemas is shown in Fig. 20 below, where we can also observe the addition of an x-net role, constrained to be a **motionalongapath** action.

MotionAlongAPath is a subcase of the **Motion** schema and it evokes the **SPG** (SourcePathGoal) schema, shown in Fig. 21 and Fig. 22 below, respectively. The MotionAlongAPath schema inherits the roles of the Motion schema, with the mover role being particularly important, since it is bound to be the trajector of the SPG schema, a subcase of the TL schema, shown in Fig. 23. The **TL** schema can be reasonably conceived as a subcase of a more general schema I will label **Relation** (not shown). The Motion schema binds the **mover** role to the protagonist of the second process of CauseMotionAction, i.e. MotionAlongAPath.

The evocation of the SPG schema is crucial, since it specifies that the mover of MotionAlongAPath is a trajector which moves from a **source** along a **path** to a **goal**. The SPG schema, introduced by Johnson (1987), structures our comprehension of directed motion. It is a subcase of Langacker's (1987) TL (TrajectorLandmark) schema, which portrays a spatial relationship involving a **trajector**, whose orientation, location, or motion is defined with reference to a **landmark**.[34] The third role of the TL schema, **profiledArea**, serves to define the attentionally-profiled region of space. The importance of the SPG schema will become clearer later. At present the reader can just bear in mind that the mover of MotionAlongAPath is the trajector of SPG.

Fig. 19: The CauseMotionAction schema

```
schema CauseMotionAction
 subcase of CauseEffectAction
  roles
    process1: ForceApplication   // inh.
    process2: MotionAlongAPath
    causer   // inh.
    affected   // inh.
    x-net: @causemotionaction
  constraints
    protagonist ↔ causer   // inh.
    protagonist2 ↔ affected   // inh.
    process1.actedUpon ↔ affected   // inh.
```

Fig. 20: The MotionAlongAPath schema

```
schema MotionAlongAPath
 subcase of Motion
  evokes SPG as spg
  roles
    x-net: @motionalongapath
  constraints
    mover ↔ spg.trajector
```

Fig. 21: The Motion schema

```
schema Motion
 subcase of Process
 roles
   mover
   speed
   heading
 constraints
   mover ↔ protagonist
```

Fig. 22: the SPG schema

```
schema TL
 subcase of Relation
 roles
   trajector
   landmark
   profiledArea
```

Fig. 23: The TL schema

```
schema SPG
 subcase of TL
 roles
   source
   path
   goal
```

Since it is a phrasal construction, ActiveCauseMotion presents a constructional block, where its constituents are defined. It defines an **np** constituent, which represents its object, and a **pp** constituent, which represents the movement of such an object along a path. The meaning of ActiveCauseMotion is identified with the **CauseMotionAction** schema. As an A-S construction, ActiveCauseMotion inherits from VerbPlusArguments (Fig. 27) an evoked **EventDescriptor** schema (Fig. 26) in order to clarify how the scene described by the sentence should be simulated. Also, ActiveCauseMotion inherits the fact that its meaning as a whole is bound to the **eventType** role of the EventDescriptor schema, while the meaning of its verb is bound to the **profiledProcess** of the same schema. This meaning is then elaborated by the construction which, in addition to these inherited meaning constraints, constrains its causer participant to be co-indexed with the **profiledParticipant** role of EventDescriptor, and its affected participant to be co-indexed with the meaning of the **np** constituent. Then, In ActiveCauseMotion1, profiledParticipant is also identified with the **topic** role of the EventDescriptor schema.[35] Moreover, the meaning of the construction itself is co-indexed with the meaning of the verb, while its second process is co-indexed with the SPG schema, which is the meaning of the pp constituent (as will be shown below). ActiveCauseMotion1 has also a **form** block, which adds two form constraints: the verb's form (**v.f**) is constrained to come before the NP's form (**np.f**), which in turn is constrained to come before the PP's form (**pp.f**).

Dodge and Bryant's grammar also includes clause-level constructions, such as **Declarative**, which identifies its meaning with EventDescriptor schema, stating that this type of construction describes an event. Declarative is a subcase of **S-With-Subj** construction (not shown), from which it derives a **subj** constituent, together with some properties related to the subject. It also inherits the constraint that the meaning of subj is bound to the EventDescriptor's profiledParticipant role. Declarative in this way signals that the event should be simulated from the perspective of the entity referred to by the subject constituent. At the same time, Declarative does not specify either what type of event is being described or which event-related semantic role the profiledParticipant is associated with. This information is provided by the analysis of the second constituent of the Declarative construction, a finite verb phrase (**fin**). The unification of an A-S construction with Declarative causes the semantic role bound to profiledParticipant to be co-indexed with the meaning of Declarative's subj constituent. The constructional block of Declarative also provides the information that the clause's **mood** feature is filled by the declarative value. The Declarative construction is shown in Fig. 28 below.

Before directing my efforts at the description of the other constructions instantiated by the sentence in (22), I can now provide the reader with a brief summary of what observed so far. In order to specify the nature of the event described (a two-participant event in which the agent exerts force on the patient, causing their movement from a source along a path to a goal), the A-S construction ActiveCauseMotion1 inherits from ActiveCauseMotion the identification of its meaning with the CauseMotionAction schema. The meaning of ActiveCauseMotion1 is bound to the eventType of an evoked EventDescriptor schema. Therefore, the eventType role of EventDescriptor and the CauseMotionAction schema share the same causal structure.

The profiledParticipant of ActiveCauseMotion1 is specified to be the causer role of CauseMotionAction. ActiveCauseMotion1 inherits a verb constituent and the constraint which binds its meaning to the profiledProcess of the EventDescriptor schema. Moreover, ActiveCauseMotion1 binds the meaning of the verb constituent to that of the A-S construction itself.

The Lanciare1SimpleFuture3Pl construction also identifies its meaning with the CauseMotionAction schema; therefore, it meets the constraints specified for the verb constituent of ActiveCauseMotion1. Moreover, Lanciare1SimpleFuture3Pl specifies that the caused-motion action involves a particular kind of action (a throwing x-net). Consequently, the verb construction and the A-S construction share the same general schematic meaning, with the verb construction also providing a more specific meaning.

ActiveCauseMotion1 also has inherited an np constituent and a pp constituent. The form of the np constituent is constrained to follow the form of the verb. Meaning constraints require that the meaning of np is bound to the affected role of the CauseMotionAction schema. As a result, this construction specifies that the entity expressed by the "direct object" np is acted upon and affected by the action of the causer. The pp constituent is constrained to be filled by a PP expressing path, and its form is constrained to follow that of the np constituent. Meaning constraints specify that the second process of CauseMotionAction (i.e. MotionAlongAPath) is bound to the SPG schema which is the meaning of pp.

Declarative's meaning is identified with an EventDescriptor schema. It shows an inherited subj constituent, whose meaning is bound to the profiledParticipant role of EventDescriptor. Moreover, it has a second constituent, fin, which unifies with ActiveCauseMotion1. In addition, Declarative specifies that the EventDescriptor evoked by the A-S construction is to be identified with that of Declarative, highlighting the fact that both constructions describe the same event. Furthermore, the profiledParticipant roles referred to by each of these constructions will be identified with each other. As a result, the meaning of the referent of Declarative's subj constituent will be identified with the causer of CauseMotionAction.

Fig. 24: the ActionCauseMotion1 construction

```
construction ActiveCauseMotion1
 subcase of ActiveCauseMotion
 constructional
  constituents
    v: Verb   // inh.
    np: NP   // inh.
    pp: PathPP   // inh.
 form
  constraints
    v.f before np.f
    np.f before pp.f
 meaning: CauseMotionAction   // inh.
  evokes EventDescriptor as ed   // inh.
  constraints
    self.m ↔ ed.eventType   // inh.
    v.m ↔ ed.profiledProcess   // inh.
    self.m ↔ v.m
    self.m.affected ↔ np.m   // inh.
    self.m.causer ↔ ed.profiledParticipant   // inh.
    ed.profiledParticipant ↔ ed.topic
    self.m.process2 ↔ pp.m.spg
```

Fig. 25: The ActionCauseMotion construction

```
construction ActiveCauseMotion
 subcase of VerbPlusArguments
 constructional
  constituents
    v: Verb   // inh.
    np: NP   .
    pp: PathPP
 meaning: CauseMotionAction
  evokes EventDescriptor as ed   // inh.
  constraints
    self.m ↔ ed.eventType   // inh.
    v.m ↔ ed.profiledProcess   // inh.
    self.m.affected ↔ np.m
    self.m.causer ↔ ed.profiledParticipant
```

Fig. 26: The EventDescriptor schema

```
schema EventDescriptor
 roles
   eventType: Process
   profiledProcess: Process
   profiledParticipant
   topic
```

Fig. 27: The VerbPlusArgument construction

```
general construction VerbPlusArguments
 subcase of VP
 constructional: VerbFeatureSet
  constituents
    v: Verb
  constraints
    self.features ↔ v.features
 meaning: Process
  evokes EventDescriptor as ed
  constraints
    self.m. ↔ ed.eventType
    v.m. ↔ ed.profiledProcess
```

Fig. 28: the Declarative construction

```
construction Declarative
 subcase of S-With-Subj
 constructional
  constituents
    subj: NP   // inherited
    fin: VP
  constraints
    self.features.mood ← declarative
form
  constraints
   subj.f before fin.f
 meaning: EventDescriptor
  constraints
   self.m. ↔ fin.ed
   subj.m ↔ fin.ed.profiledParticipant   // inherited
```

The constructions (and the relative schemas) illustrated above provide fairly general constraints on the fillers of various participant roles. More specific information on the fillers of these roles for a particular event will be supplied when the NP and PP constructions instantiated in the utterance unify with the other instantiated constructions. The meanings of nominal and pronominal constructions in the grammar are represented using a referent descriptor (RD) schema. This schema contains several roles which can be used to define various constraints related to a referent. The **RD** schema is shown in Fig. 29 below.

Fig. 29: The RD construction

```
schema RD
 roles
   category
   natgender
   number
   mass
   accessibility
   referent
```

In the sentence (22), there are two NP constructions (one for the subject *i bambini* and one for the object *i sassi*) and one PP construction (for the spatial phrase *al bersaglio*). The expression *bambini* in Italian can instantiate two different constructions: one which refers to two or more children of different or unknown sex, the other to two or more male children. It is not possible to know which of the two constructions is actually instantiated without information on the discourse and situational context. In my analysis, I shall consider the first hypothesis, but this is just an arbitrary choice.[36] The **Bambini1** construction, which inherits all the features of a more general **Bambini** construction (not shown),[37] adding the crucial information related to the value of the category of the referent described, is represented in Fig. 30 below. The constructional block is bound to the **NominalFeatureSet** schema (Fig. 33). In Fig. 31, you can find the **I** construction (a subcase of the **MalePlDefiniteArticle** construction, Fig. 32).[38]

The **grammgender** role of the NominalFeatureSet schema in the **constructional** block of MalePlDefiniteArticle is used to specify the fact that the grammatical gender of this noun is male because Italian, unlike languages like English, has no neuter gender; consequently, any noun in Italian must be classified as either masculine or feminine, on the basis of mainly historical, formal, or semantic features.[39]

The two constructions illustrated above will be combined by the **DeterminerPlusNP** construction (Fig. 34 below), which establishes a formal constraint on the order of the constituents and a semantic constraint which binds the meaning of the complex construction to the meaning of both constituents. The DeterminerPlusNP construction will unify with Declarative's subj constituent, supplying the following information: the entity that fills the causer and profiledParticipant roles is **morethanone** and it is represented by members of the category **Child**. The level of accessibility *of i bambini* is uniquely-identifiable, since the use of a definite determiner denotes the possibility to uniquely identify the referent.

ActiveCauseMotion1's np constituent will unify with the NP whose noun constituent is *sassi*, providing more specific information on the filler of the affected role. The Sassi1 construction (subcase of the Sassi construction, omitted) is shown in Fig. 35 below. Again, **Sassi1** and I will be combined together by the DeterminerPlusNP construction. Both the Bambini and the **Sassi** constructions instantiate the **MalePluralNoun** construction, shown in Fig. 36 below (another construction I posited in order to address phenomena not observed in English).

The MalePluralNoun construction is a subcase of the constructions **PluralNoun** (Fig. 37) and **Male** (Fig. 38). PluralNoun is a subcase of the constructions **Noun** (Fig. 39 below) and **Plural** (Fig. 40). Noun is a subcase of the more general construction **Nominal** (Fig. 41 below), which is a subcase of the **HasNominalFeatures** (Fig. 42), which in turn is a subcase of HasAgreementFeatures (Fig. 13 above).

Fig. 30: The Bambini construction

```
construction Bambini1
 subcase of Bambini
 constructional: NominalFeatureSet  // inh.
  constraints
    self.features.grammgender ← male  // inh.
    self.features.number ← plural  // inh.
 form: WordForm  // inh.
  constraints
    self.f.phon ← /bam'bini/  // inh.
 meaning: RD  // inh.
  constraints
    self.m.category ← Child
    self.m.number ← morethanone  // inh.
```

Fig. 31: The I construction

```
construction I
 subcase of MalePlDefiniteArticle
 constructional: NominalFeatureSet  // inherited
  constraints
    self.features.grammgender ← male  // inh.
    self.features.number ← plural  // inh.
 form: WordForm  // inh.
  constraints
    self.f.phon ← /i/
 meaning
  evokes RD as rd  // inh.
  constraints
    rd.number ← morethanone  // inh.
    rd.accessibility ← uniquely-identifiable  // inh.
```

Fig. 32: The MalePlDefiniteArticle construction

```
construction MalePLDefiniteArticle
 subcase of PlDefiniteArticle, Male
 constructional: NominalFeatureSet  // inherited
  constraints
    self.features.grammgender ← male  // inherited
    self.features.number ← plural  // inherited
 form: WordForm  // inherited
 meaning
  evokes RD as rd  // inherited
  constraints
   rd.accessibility ← uniquely-identifiable  // inherited
   rd.number ← morethanone  // inherited
```

Now, I come to the PP *al bersaglio*, which is perhaps the most interesting component of the sentence-level construction under consideration. First of all, a representation of the **Bersaglio1** construction is provided in Fig. 42 below.

Al is a complex preposition,[40] composed of the simple preposition *a* and the determiner *il*. In this kind of sentence-level construction, *a* has a dynamic meaning represented in a construction labeled **A2** (illustrated in Fig. 47 below), subcase of the PathPreposition construction (Fig. 45) and of a more generic **A** construction (Fig. 46). PathPreposition is a subcase of the **SpatialPreposition** construction (Fig. 44). Both SpatialPreposition and A are subcases of the **Preposition** construction (Fig. 43). The meaning of the PathPreposition construction is constrained to be SPG (already shown in Fig. 23 above). The meaning of the A construction, instead, is more generically constrained to denote a Relation. The A2 construction inherits from both PathPreposition and A, but its meaning also evokes a Proximity schema (Fig. 48). **Proximity** has two roles which help to describe the relation expressed by the preposition: **center**, which is connected to the landmark role of SPG, and **proximalArea**, bound to the profiledArea role of SPG. Also, A2 adds the meaning constraint that the goal role of the SPG schema has to be bound to its landmark role (while it was already specified above that the trajector of this motion is the mover role of MotionAlongAPath. i.e. the affected role of CauseMotionAction). Identifying the goal of the motion with its landmark I define the type of event being described: a motion toward a certain entity (cfr. Zlatev's 2007 point on cognitive approaches to path and direction).

The construction corresponding to the definite article Il is shown in Fig. 49 below. A2 and Il are then combined by the **ComplexPathPreposition** construction, shown in Fig. 50.

Fig. 33: The NominalFeatureSet schema

```
schema NominalFeatureSet
 subcase of AgreementFeatureSet
  roles
    case
    grammgender   // inherited
    number   // inherited
    person   // inherited
```

Fig. 34: The DeterminerPlusNP construction

```
construction DeterminerPlusNP
 subcase of NPSpecifierPlusNP
 constructional: NominalFeatureSet   // inherited
  constituents
    s: Determiner
    np: Np   // inherited
  constraints
    self.features ↔ np.features   // inherited
    self.features ↔ s.features   // inherited
 form
  constraints
    s.f before np.f   // inherited
 meaning: RD
  constraints
    self.m ↔ np.m   // inherited
    self.m ↔ s.m   // inherited
```

Fig. 35: The Sassi1 construction

```
construction Sassi1
 subcase of Sassi
 constructional: NominalFeatureSet   // inh.
  constraints
    self.features.grammgender ← male   // inh.
    self.features.number ← plural   // inh.
 form: WordForm   // inh.
  constraints
    self.f.phon ← /'sas:i/   // inh.
 meaning: RD   // inh.
  constraints
    self.m.category ← Stone
    self.m.natgender ← neuter   // inh.
    self.m.number ← morethanone   // inh.
```

Fig. 36: The MalePluralNoun construction

```
construction MalePluralNoun
 subcase of PluralNoun, Male
 constructional: NominalFeatureSet   // inh.
  constraints
    self.features.grammgender ← male   // inh.
    self.features.number ← plural   // inh.
  form: WordForm   // inh.
  meaning: RD   // inh.
   constraints
     self.m.number ← morethanone   // inh.
```

Fig. 37: The PluralNoun Construction

```
construction PluralNoun
 subcase of Noun, Plural
 constructional: NominalFeatureSet   // inherited
  constraints
    self.features.number ← plural   // inherited
 form: WordForm   // inherited
 meaning: RD   // inherited
  constraints
    self.m.number ← morethanone
```

Fig. 38: The Male construction

```
construction Male
 subcase of HasAgreementFeatures
 constructional
  constraints
    self.features.grammgender ← male
```

Fig. 39: The Noun construction

```
construction Noun
 subcase of Nominal
 constructional: NominalFeatureSet   // inherited
 form: WordForm
 meaning: RD   // inherited
```

Fig. 40: The Nominal construction

```
construction Nominal
 subcase of HasNominalFeatures
 constructional: NominalFeatureSet   // inherited
 meaning: RD
```

Fig. 41: The HasNominalFeatures construction

```
construction HasNominalFeatures
 subcase of HasAgreementFeatures
 constructional: NominalFeatureSet
```

Fig. 42: The Bersaglio1 construction

```
construction Bersaglio1
 subcase of Bersaglio
 constructional: NominalFeatureSet   // inh.
  constraints
    self.features.grammgender ← male   // inh.
    self.features.number ← singular   // inh.
 form: WordForm   // inh.
  constraints
    self.f.phon ← /ber'saʎo/   // inh.
 meaning: RD   // inh.
  constraints
    self.m.category ← Target
    self.m.number ← one   //   inh.
```

Fig. 43: The Preposition construction

```
construction Preposition
 subcase of Word
 form: WordForm   // inh.
 meaning: Relation
```

Fig. 44: The SpatialPreposition construction

```
construction SpatialPreposition
 subcase of Preposition
 form: WordForm   // inh.
 meaning: TL
```

Fig. 45: The PathPreposition construction

```
construction PathPreposition
 subcase of SpatialPreposition
 form: WordForm   // inh.
 meaning: SPG
```

Fig. 46: The A construction

```
construction A
 subcase of Preposition
 form: WordForm   // inh.
  constraints
    self.f.phon ← /a/
 meaning: Relation   // inh.
```

The ComplexPathPreposition construction inherits from both the PathPreposition construction and the **ComplexPreposition** construction (Fig. 51 below). ComplexPreposition is a general subcase of the Preposition construction and it was posited to underlie all contracted prepositions, which represent a ubiquitous phenomenon in the Italian language.[41] The ComplexPathPreposition construction specifies that the form of A2 fuses with the form of Il, while its meaning sums that of the simple preposition with that of the determiner. Moreover, its constructional slot also underlines that the complex preposition shows the same features of the article.

Fig. 47: The A2 construction

```
construction A2
 subcase of PathPreposition, A
 form: WordForm  // inh.
  constraints
    self.f.phon ← /a/   // inh.
 meaning: SPG   // inh.
  evokes Proximity as p
  constraints
    self.m.landmark ↔ self.m.goal
    self.m.landmark ↔ p.center
    self.m.profiledArea ↔ p.proximalArea
```

Fig. 48: The Proximity schema

```
schema Proximity
 subcase of SpatialRelation
  roles
    center
    proximalArea
```

Although ComplexPathPreposition is sufficient to illustrate the combination of the preposition a and the determiner *il*, since the form of the complex preposition al is not a simple agglutination of *a* + *il* (which would presumably be **ail*), I shall represent the construction **Al2** explicitly in Fig. 52 below (the complex preposition found in the next sentence will not be shown). The ComplexPathPreposition construction and the Bersaglio construction are finally combined together in the **ComplexPathPP** construction, shown in Fig. 53 below.

ComplexPathPP represents a subcase of both the ComplexPP construction (Fig. 54 below), a general construction aimed to handle all PPs which include a complex preposition, and the PathPP construction (Fig. 55 below), which underlies all PPs including a path preposition. As a result, the ComplexPathPP construction has two constituents: **prep**, constrained to be a ComplexPathPreposition, and **np**, more loosely constrained to be an NP. The preposition and the NP are also bound to show the same features: this constraint is essential to guarantee the agreement between the contracted preposition and the following NP, which is required in Italian. With regard to form, np is constrained to follow prep. Moreover, meaning constraints specify that the overall meaning of ComplexPathPP is bound to the meaning of prep, and that its landmark role is bound to np.

Fig. 49: The Il construction

```
construction Il
 subcase of MaleSgDefiniteArticle
 constructional: NominalFeatureSet   // inh.
  constraints
    self.features.grammgender ← male   // inh.
    self.features.number ← singular   // inh.
 form: WordForm   // inh.
  constraints
    self.f.phon ← /il/
 meaning
 evokes RD as rd   // inh.
  constraints
    rd.number ← one   // inh.
    rd.accessibility ← uniquely-identifiable   // inh.
```

Fig. 50: The ComplexPathPrepostition construction

```
construction ComplexPathPreposition
 subcase of ComplexPreposition, PathPreposition
 constructional: NominalFeatureSet   // inh.
  constituents
    prep: PathPreposition   // inh.
    s: Determiner   // inh.
  constraints
    self.features ↔ s.features   // inh.
 form: WordForm   // inh.
  constraints
    prep.f fuses with s.f   // inh.
 meaning: SPG   // inh.
  constraints
    self.m ↔ prep.m   // inh.
    self.m ↔ s.m   // inh.
```

Fig. 51: The ComplexPreposition construction

```
construction ComplexPreposition
 subcase of Preposition
 constructional: NominalFeatureSet
  constituents
    prep: Preposition   // inh.
    s: Determiner
  constraints
    self.features ↔ s.features
 form: WordForm   // inh.
  constraints
    prep.f fuses with s.f
 meaning: Relation   // inh.
  constraints
    self.m ↔ prep.m
    self.m ↔ s.m
```

Fig. 52: The Al2 construction

```
construction Al2
 subcase of ComplexPathPreposition
  constructional
   constituents
     prep: A2
     s: Il
 form: WordForm   // inh.
  constraints
    self.f.phon ← /al/
 meaning: SPG   // ihn.
  constraints
    self.m ↔ prep.m   // inh.
    self.m ↔ s.m    // inh.
```

Fig. 53: The ComplexPathPP construction

```
construction ComplexPathPP
 subcase of ComplexPP, PathPP
 constructional: NominalFeatureSet   // inh.
  constituents
    prep: ComplexPathPreposition
    np: NP   // inh.
  constraints
    np,features ↔ prep.features   // inh.
 form
  constraints
    prep.f before np.f   // inh.
 meaning: SPG   // inh.
  constraints
    self.m ↔ prep.m   // inh.
    self.m.landmark ↔ np.m   // inh.
```

Fig. 54: The ComplexPP construction

```
construction ComplexPP
 subcase of PP
  constructional: NominalFeatureSet   // inh.
   constituents
     prep: ComplexPreposition
     np: NP   // inh.
  constraints
    np.features ↔ prep.features
 form
  constraints
    prep.f before np.f   // inh.
 meaning: Relation   // inh.
```

Fig. 55: The PathPP construction

```
construction PathPP
 subcase of SpatialPP
 constructional: NominalFeatureSet  //  inh.
  constituents
    prep: PathPreposition
    np: NP  // inh.
 form
  constraints
    prep.f before np.f  // inh.
 meaning: SPG
```

The unification of the constructions instantiated in my example produces a SemSpec, consisting in schemas, constraints, and bindings, which supports an enactment of the event described by the sentence. The EventDescriptor schema provides several crucial simulation parameters. Its profiledProcess role is bound to the meaning of Lanciare1SimpleFuture3Pl. It is a process of CauseMotionAction and has an x-net of throwing. The eventType role is bound to the meaning of ActiveCauseMotion1, in which the meaning of the argument structure is bound to that of its verb constituent. Therefore, eventType is also bound to CauseEffectAction. The A-S construction provides information about the general type of event being described, and the verb adds more information about the specific processes involved in such an event, including information on their structure and setting time.[42]

Moreover, the unification of ActiveCauseMotion1, Lanciare1SimpleFuture3Pl, Declarative, and the instantiated NP and PP constructions results in various bindings associated with each of the participants of this event. The causer role of CauseMotionAction is bound to:

- the protagonist of CauseMotionAction;
- the actor and protagonist of ForceApplication;
- the profiledParticipant of EventDescriptor;
- the subj constituent of Declarative;
- the referent of *i bambini*.

The affected role of CauseMotionAction is bound to:

- the protagonist2 of CauseMotionAction;
- the actedUpon of ForceApplication;
- the mover and protagonist of MotionAlongAPath;
- the np of ActiveCauseMotion1;
- the trajector of SPG;
- the entity referred to as *i sassi*.

Furthermore, ComplexPathPP specifies the direction of the motion undergone by the trajector, i.e. toward the entity referred to as *il bersaglio*.

This SemSpec, capturing the conceptual core of the sentence-level construction under consideration, will drive the enactment of an event in which two or more uniquely identifiable children perform a forceful throwing action on two or more uniquely identifiable stones, obtaining their movement toward a uniquely-identifiable target. A contribution to the enactment process may be offered by some components of the sentence which are endowed with a high semantic/pragmatic weight and are most likely to activate a certain frame: as an example, the noun *i bambini* and the phrase *al bersaglio* suggest that the children are playing some kind of game. Since the event is described from the perspective of the agent, it should be enacted from the same perspective. The process of enactment of this event will produce more inferences,[43] about the amount of energy supplied by the agents, the purpose on which they perform the action, and the effector they exploit (at the very least). Then, on the basis of their world knowledge and the (discourse and situational) context, the language understander will arrive at a deeper understanding of the utterance, also drawing further inferences. For instance, the sentence as a whole invites one to think that the agent participants are supposed to have a good time, since everybody knows that children generally like playing games.

Most of the schemas and constructions exploited to carry out my analysis of the sentence in (22) may also be used to analyze a number of active caused-motion constructions in Italian (probably this situation holds for other languages as well). Indeed, following Dodge and Bryant's (forthcoming) proposal for transitive constructions, I suggest that ActiveCauseMotion1, the A-S construction which played a crucial role in the analysis of the sentence-level construction just examined above, can be identified with a prototypical (basic-level) caused-motion event conceptualized and described from the perspective of the agent participant. As such, it is posited to unify with a group of verbs which share some basic semantic characteristics (see Torre 2011). After this illustration of the characteristics of a symmetric caused-motion construction, I can now move on to analyze a clause which belongs to the other type, **asymmetric constructions**. Consider the example in (23) below:

(23) Spingevamo le ceste
Push:IMPF.1PL the.FPL basket.PL
ne-l ripostiglio.
into-the.MSG lumber-room.SG

"We used to push the baskets into the lumber-room."

The structure of this sentence is highly similar to that of the one observed above. Nevertheless, its semantic content is a bit different, since the meaning of the verb *spingere* does not exactly match the meaning of the A-S construction, as highlighted by Dodge (2010b) for the English corresponding verb "push". Rather, it unifies with just a part of the A-S construction, precisely, the first process which is part of the CauseMotionAction (namely ForceApplication) schema. Indeed, if I consider the verb *spingere* out of context, I can notice that it denotes an action in which a causer participant exerts force on a patient participant in order to move it, but it does not entail that the causer reaches their goal. That is, the verb *spingere* can also be used to denote an action in which the causer exerts force on the patient, but fails to move it. The same condition cannot be observed in the sentence analyzed above. Therefore, I shall follow Dodge (2010b) in adopting a different subcase of the ActiveCauseMotion construction, in which this slight difference between the sentence in (23) and the one previously illustrated is captured. This extension will be labeled **ActiveCauseMotion2** and shown in Fig. 56 below.

The most important consequence of the unification between the verb and the ForceApplication schema is the unification between the profiledProcess role of the EventDescriptor schema with such a process rather than with the CauseMotionAction schema. Apart from the fact that the first process is awarded a “privileged” status (particularly important for the enactment process), the sentence under consideration does not remarkably diverge from the symmetric one analyzed above. The meaning of the construction is still bound to the CauseMotionAction schema and, at the clausal level, one can still exploit the Declarative construction to describe it. The other points which distinguish the sentence in (23) concern the lexical verb construction and the NPs and the PP involved. A representation of the lexical verb construction can be found in Fig. 57 below. Because *spingevamo* is the first-person plural form of the verb *spingere* in the imperfect tense, this construction is labeled **Spingere1Imperfect1Plural**. The **Spingere1Imperfect1Pl** construction is a subcase of the Spingere1, Imperfect, Plural, and **1stperson** constructions. Its form pole is constrained to be a word by the WordForm schema (see Fig. 18 above), with the phon role which provides its specific phonological structure. The meaning pole of SpingereImperfect1Pl is constrained to be ForceApplication (Fig. 3 above). The x-net role of SpingereImperfect1Pl is also assigned the proper value, namely one of pushing.

Having established the general constraints on the fillers of the participant roles which depart from those observed in the analysis of the previous sentence, I can directly turn to the NPs and PPs, which provide more specific information on the fillers of these roles for the particular event described by the sentence-level construction under consideration. Italian is an instance of what linguists (especially in the generative tradition, see e.g. Haegeman 1991) usually label "pro-drop languages", i.e. a language which allows the use of implicit subjects (in fact, the Italian language makes extensive use of this strategy). As a matter of fact, in this sentence, we can observe two NP constructions (one for the null subject and one for the noun phrase *le ceste*), along with the PP construction for the spatial phrase *nel ripostiglio*. While the computational representation of the NP *le ceste* is unproblematic, dealing with the construction corresponding to the null subject is less straightforward. In my ECG approach to the analysis of Italian data, this situation will be handled introducing a specific subcase construction for each person's null subject pronoun, thus providing an inventory-based solution to the problem, simple but functional and consistent with the present cognitive-linguistic perspective.[44] Since in Italian the verb agrees with the subject in person and number, it is rather effortless for the understander to retrieve the subject. This is the reason why I consider null subjects as subcases of the personal pronoun with which the verb agrees, whose phonological realization is suppressed, but whose grammatical and semantic traits are fully retained (obviously, this "pro-dropping strategy" can only be used to denote referents who are active in the discourse and/or situational context). The null subject construction, labeled **DropNoi**, is shown in Fig. 58 below, while in Fig. 59 you can find the **Noi** construction, of which DropNoi is a subcase. It is worth emphasizing that the suppression of the phonological form of the pronoun is flagged by the use of the **ignore** command in the **form** block of DropNoi.

The referent of Declarative's subj constituent will unify with DropNoi, providing the information that the entity that fills the causer and profiledParticipant role is a plural, animate referent represented by the current speaker together plus at least one more animate entity. The level of accessibility of a first-person plural pronoun is active, since pronouns are generally used to denote active referents, as already specified above. The ontological category of the referent is assigned the value **animate**, since the pronoun just indicates that one of them is human, while we do not know anything about the other(s), who may be either a human being or an animal.[45]

ActiveCauseMotion2's np constituent will unify with the NP whose noun constituent is Ceste1, providing more specific information on the filler of the affected role. The Ceste1 construction is represented in Fig. 60 below, while the Le construction is shown in Fig. 61.

Finally, we come to the PP *nel ripostiglio*. First of all, the reader can find a representation of the **Ripostiglio** (a monosemous noun) construction in Fig. 62 below. *Nel* is a complex preposition, composed of the simple preposition *in*, and the determiner *il*. Fig. 63 illustrates the In2 construction, subcase of In (not shown) and PathPreposition.

As you will see, the semantics of the In2 construction is different from that of the A2 construction shown in Fig. 47 above. Indeed, the meaning pole of In2 includes the evocation of the **BoundedObject** schema, shown in Fig. 64 below, a subcase of the **BoundedRegion** schema (Fig. 65). Binding the profiledArea of the SPG schema to both its goal role and to the interior role of the BoundedObject schema allows one to capture (and properly formalize) the specificity of the type of motion event described by the preposition *in* in a dynamic construction: the In2 construction denotes the motion of the trajector role of the SPG schema from an outer area to the inside of an object.

The ComplexPathPreposition construction specifies that the form of In2 fuses with the form of Il, while the meaning of the construction sums that of the simple preposition with that of the determiner. Again, the form of the complex preposition *nel* is not a simple agglutination of *in* + *il* (which would presumably be **inil*), but /nel/. The ComplexPathPreposition construction and the Ripostiglio construction will be finally combined together in the ComplexPathPP construction.

The landmark role of SPG unifies with the entity represented by the noun Ripostiglio, and the pp constituent of ActiveCauseMotion2 unifies with the ComplexPathPP construction, specifying the path followed by the mover of MotionAlongAPath (i.e. the affected of CauseMotionAction): from an outer area to the interior of the object defined by the noun Ripostiglio.

The SemSpec produced by the unification of the constructions instantiated by this sentence will be a bit different from the one of the sentence analyzed above. The main difference will be represented by the profiledProcess role of the EventDescriptor schema, filled by the meaning of Spingere1Imperfect1Sg, which unifies with ForceApplication, and its x-net is one of pushing. This is a very important point, for it signals that the enactment process will prominently focus on ForceApplication. Also, the verb specifies the setting time of the event: in Italian (as in other Romance languages), the imperfect is normally used to express repetition and continuity in the past, though other uses are possible (for a brief discussion, see Polesini Karumanchiri and Uslenghi Maiguashca 1988: 166-175). Again, this SemSpec will capture the conceptual core of my sentence, driving the enactment of an event in which the current speaker and at least one more animate being perform a pushing action on more than one uniquely identifiable baskets, obtaining their movement into a uniquely identifiable lumber-room. Once more, the event will be enacted from the agent's perspective. The process of enactment of this event will produce more inferences, about the amount of energy supplied by the agent, the purpose on which he performed the action, the kind of baskets which undergo the action etc. The words *ceste* and *ripostiglio* will hint that probably the action took place in a domestic environment. Then, on the basis of their encyclopedic knowledge and the (discourse and situational) context, the language understander will be able to mentally reconstruct the scene more in detail.

Fig. 56: The ActiveCauseMotion2 construction

```
construction ActiveCauseMotion2
 subcase of ActiveCauseMotion
 constructional
  constituents
    v: Verb   // inh.
    np: NP   // inh.
    pp: PathPP   // inh.
 form
  constraints
    v.f before np.f   // inh.
    np.f before pp.f   // inh.
 meaning: CauseMotionAction   // inh.
  evokes EventDescriptor as ed   // inh.
  constraints
    v.m ↔ self.m.process1
    self.m ↔ ed.eventType   // inh.
    v.m ↔ ed.profiledProcess   // inh.
    self.m.affected ↔ np.m   // inh.
    self.m.causer ↔ ed.profiledParticipant   // inh.
    ed.profiledParticipant ↔ ed.topic
    self.m.process2 ↔ pp.m.spg
```

Fig. 57: The Springere1Imperfect1PI construction

```
construction Spingere1Imperfect1PI
 subcase of Spingere1, ImperfectTense, Plural, 1stperson
 constructional: VerbFeatureSet   // inh.
  constraints
    self.features.verbform ← imperfect   // inh.
    self.features.number ← plural   // inh.
    self.features.person ← 1   // inh.
 form: WordForm   // inh.
  constraints
   self.f.phon ← /spinʤe'vamo/
 meaning: ForceApplication   // inh.
  constraints
    self.m.x-net ← @push   // inh.
```

Fig. 58: The DropNoi construction

```
construction DropNoi
 subcase of Noi
 constructional: NominalFeatureSet   // inh.
  constraints
    self.features.case ← nominative   // inh.
    self.features.number ← plural   // inh.
    self.features.person ← 1   // inh.
 form: WordForm   // inh.
  constraints
   ignore: self.f.phon ← /noi/
 meaning: RD   // inh.
  constraints
    self.m.category ← Animate   // inh.
    self.m.number ← morethanone   // inh.
    self.m.accessibility ← active   // inh.
    self.m.referent ← currentspeakerandotheranimate   // inh.
```

Fig. 59: the Noi construction

```
construction Noi
 subcase of PluralSubjPersPron, 1stPerson
 constructional: NominalFeatureSet   // inh.
  constraints
    self.features.case ← nominative   // inh.
    self.features.number ← plural   // inh.
    self.features.person ← 1   // inh.
 form: WordForm   // inh.
  constraints
    self.f.phon ← /noi/
 meaning: RD   // inh.
  constraints
    self.m.category ← Animate
    self.m.number ← morethanone   // inh.
    self.m.accessibility ← active   // inh.
    self.m.referent ← currentspeakerandotheranimate
```

Fig. 60: The Ceste1 construction

```
construction Ceste1
 subcase of Ceste
 constructional: NominalFeatureSet   // inh.
  constraints
    grammgender ← female   // inh.
    number ← plural   // inh.
 form: WordForm   // inh.
  constraints
    self.f.phon ← /'ʧeste/   // inh.
 meaning: RD   // inh.
  constraints
    self.m.category ← Basket
    self.m.natgender ← neuter   // inh.
    self.m.number ← morethanone   // inh.
```

Fig. 61: The Le construction

```
construction Le
 subcase of FemPlDefiniteArticle
 constructional: NominalFeatureSet   // inh.
  constraints
    self.features.grammgender ← female   // inh.
    self.features.number ← plural   // inh.
 form: WordForm   // inh.
  constraints
    self.f.phon ← /le/
 meaning
  evokes RD as rd   // inh.
  constraints
    rd.number ← morethanone   // inh.
    rd.accessibility ← uniquely-identifiable   // inh.
```

Fig. 62: The Ripostiglio construction

```
construction Ripostiglio
 subcase of MaleSingularNoun
 constructional: NominalFeatureSet   // inh.
  constraints
    self.features.grammgender ← male   // inh.
    self.features.number ← singular   // inh.
 form: WordForm   // inh.
  constraints
    self.f.phon ← /ripo'stiʎo/
 meaning: RD   // inh.
  constraints
    self.m.category ← Lumber-room
    self.m.natgender ← neuter
    self.m.number ← one   // inh.
```

Fig. 63: The In2 constructio

```
construction In2
 subcase of PathPreposition, In
 form: WordForm   // inh.
  constraints
    self.f.phon ← /in/   // inh.
 meaning: SPG   // inh.
  evokes BoundedObject as bo
  constraints
    self.m.landmark ↔ bo.boundedobject
    self.m.profiledArea ↔ bo.interior
    self.m.goal ↔ self.m.profiledArea
    self.m.source ↔ bo.exterior
```

Fig. 64: The BoundedObject schema

```
schema BoundedObject
 subcase of BoundedRegion
  roles
    boundedobject: entity
    boundary: closedcurve   // inh.
    interior: region   // inh.
    exterior: region   // inh.
```

Fig. 65: The BoundedRegion schema

```
schema BoundedRegion
roles
   boundary: closecurve
   interior: region
   exterior: region
```

4.3. Symmetric and asymmetric constructions: discussion

In the previous subsection, I carried out an analysis of a couple of simple Italian caused-motion constructions, adopting an ECG approach similar to Dodge and Bryant's (forthcoming), but adjusted in order to deal with the properties of the Italian language. Overall, the analysis seem to be satisfying, allowing one to make an inventory of the constructions involved in the process of comprehension of the sentence-level constructions taken into consideration, applying some of the key notions and concepts developed in the Cognitive Linguistics framework during the last decades, consistent with the theoretical assumptions of the NTL research program. Earlier in the present paper, I claimed that these two sentences are each representative of different types of caused-motion constructions: the one illustrated in (22) above belongs to the class I labeled "symmetric caused-motion constructions", whereas that shown in (23) is a representative of "asymmetric caused-motion constructions". We can now examine this distinction a bit more in detail.

As highlighted by Dodge (2010a, 2010b), one of the crucial nodes of the ECG model is the combination of the verb and the A-S construction of the sentence under consideration. Following Goldberg (1995, 2006), in ECG argument structures are considered to be constructions in their own right, and to play an important role in the construction of the meaning of a sentence: as a matter of fact, the A-S pattern is considered to convey a general, quite abstract meaning (corresponding to a determined schema), which is further elaborated by the verb (whose meaning not only corresponds to a given schema, but also exhibits a particular x-net). Since my study focused on caused-motion constructions, one of my initial assumptions was that the meanings of my example sentences were bound to the CauseMotionAction schema, and that they could be handled positing two different A-S constructions. Indeed, my analysis shows that symmetric constructions can be handled by the ActiveCauseMotion1 construction, while asymmetric constructions requires a slightly different phrase-level construction, ActiveCauseMotion2. Both ActiveCauseMotion1 and ActiveCauseMotion2 are subcases of a more general ActiveCauseMotion construction. Conceptualizing A-S constructions as radial categories, as suggested by Dodge and Bryant (forthcoming), it is possible to say that ActiveCauseMotion1 represents the prototypical center of the ActiveCauseMotion category, with ActiveCauseMotion2 being a radial extension. Let us now have a closer look at the relationship between verb and A-S construction in the example sentences analyzed in the previous subsection.

The first sentence I analyzed shows the verb *lanciare* ("to throw"). In this case, the semantics of the verb fits quite straightforwardly in the semantics of the A-S construction: since the meanings of these verbs are bound to the CauseMotionAction schema, exactly as the meaning of the ActiveCauseMotion construction and its subcases, this case is rather unproblematic. The situation is a bit different with regard to the other sentence, which involves the verb *spingere* ("to push"). Indeed, the meaning of *spingere* does not reflect the meaning of the A-S construction, since its meaning is not bound to the CauseMotionAction complex process as a whole, but rather to its first component process, ForceApplication. The reader should remember that the CauseMotionAction process comprises two subprocesses. The constituents of the CauseMotionAction schema are ForceApplication and MotionAlongAPath, whose combination captures the fact that a caused-motion action implies a causer's exertion of force on a patient, resulting in the latter's motion through space. While the verb *lanciare*, together with others (e.g. *posare* "to lay", *sollevare* "to lift", *trainare* "to tow") denotes the whole caused-motion action, the verb *spingere*, together with *tirare* ("to pull"), just profiles the force-exertion action, not saying anything about the result of this process, leaving open two possibilities: the causer can **either** succeed **or** fail in moving the patient. It is possible to find evidence of the difference between these two kinds of verb by using a couple of simple logical tests along the lines of those illustrated by Lewandowska-Tomaszczyk (2007: 141-142). Consider the following sentences:

(24) *Ho lanciato/posato/sollevato
Have:PRES.1SG throw/lay/lift:PSTPART
il masso ma non si
the.MSG rock.SG but NEG REFL.3
è mosso.
be:PRES.3SG move:PSTPART.MSG

"I have thrown/laid/lifted the rock but it has not moved."

(25) Ho spinto/tirato
Have:PRES.1SG push/pull:PSTPART
il masso ma non si
the.MSG rock.SG but NEG REFL.3
è mosso.
be:PRES.3SG MOVE:PSTPART.MSG

"I have pushed the rock but it has not moved."

While the second sentence is perfectly plausible in Italian, the first one is not, since verbs like *lanciare*, *posare*, and *sollevare*, unlike *spingere* and *tirare*, imply the movement of the patient participant, which is not allowed to resist the force-application process performed by the causer participant. If the causer's force-exertion is not sufficient to make the patient move, Italian speakers are forced to exploit a circumlocution with verbs like *provare* ("to try"). See the sentence in (26) below.[46]

(26) Ho provato a
Have:PRES.1SG try:PSTPART to
lanciare/posare/sollevare il masso
throw/lay/lift:INF the.MSG rock.SG
ma non si è
but NEG REFL.3 be:PRES.3SG
mosso.
move:PSTPART.MSG

"I have tried to throw/lay/lift the rock but it has not moved."

The difference between *spingere* and *tirare* and the verbs in (26) above, taking also into consideration their relationship with the A-S construction, may be characterized in cognitive semantic terms exploiting Talmy's notion of **force-dynamics**. Talmy (e.g. 2000) denotes four basic types of possible force-dynamic patterns.[47] These force-dynamic patterns can be summarized as follows:

a) the causer forces the patient to move, overcoming its intrinsic tendency to resist;
b) the patient's intrinsic tendency toward rest is stronger than the force applied by the causer; therefore, the patient does not move;
c) the patient's tendency toward motion overcomes the causer's opposition, so the patient moves;
d) the causer blocks the patient, overcoming its tendency toward motion.

The semantics of the ActiveCauseMotion construction and its subcases can be described by the first of the four conditions listed above: the force-application performed by the causer is stronger than the patient's inherent tendency to stand still, resulting in the patient's movement through space. The meaning of verbs like *lanciare* is convergent with the meaning of the A-S construction, denoting a successful process of caused-motion. From this point of view, the semantics of verbs like *spingere* is less specific; indeed, this verb does not imply that the caused-motion process was successful. As a result, it can be said that the meaning of *spingere* encompasses **both** the a) **and** b) conditions mentioned above: it is the integration with the A-S construction which makes the verb assume the sense captured in a). The combination of verb and A-S construction in this case proves to be a useful cue for the language understander to grasp the meaning of the sentence. Of course, the same remarks apply with regard to the other (both active and passive) Italian caused-motion constructions analyzed in Torre (2011). As a result, from the perspective of the language understander, the importance of the interaction between the A-S construction and the verb is rather clear. Indeed, on the one hand, the verb elaborates and refines the meaning of the argument structure pattern; on the other hand, when the meaning of the verb is not an elaboration of the whole meaning of the A-S construction, the A-S construction still guides the understander to a more specific interpretation of the verb's meaning. This is exactly what outlined above for the verb *spingere* when it combines with the ActiveCauseMotion2 construction.

Casting a glance at Dodge's (2010b) analysis of English caused-motion constructions, it can be noticed that constructions of this kind in English allow more variety than their Italian equivalents. Indeed, while in Italian we can just find verbs whose meanings overlap with either the whole CauseMotionAction schema or its first component process (i.e. ForceApplication), in English we can also observe a third kind of verb, whose semantics profiles the second component process of this schema, MotionAlongAPath. Again, this situation seems to be related to Talmy's typological distinction between verb-framed languages (like Italian) and satellite-framed languages (like English) mentioned in §4.1. Thus, in English it is possible to distinguish between two different classes of asymmetric constructions. For instance, consider the following sentence, which contains the verb *slide*, already found in the example in (11) above:

(27) Jenny slid John's hand off her leg.

The sentence in (27), analogous to that in (11) above, describes the following event: Jenny performs an unspecified act, causing John's hand to slide off her leg: the attention is focused on the effect of the process, not specifying anything about how this result was achieved. In this case, the verb represents the opposite of the Italian spingere, with its meaning reflecting the second process which is part of the CauseMotionAction schema rather than the whole schema or its first process. Exploiting Talmy's force-dynamics patterns, we can say that the English verb *slide* does not imply that the motion process was the result of somebody else's force-application. Consequently, I can say that the meaning of *slide* encompasses both the a) and the c) conditions mentioned above: it is the integration with the A-S construction which makes the verb assume the sense captured in a). In Italian, however, the sentence exemplified in (27) would be translated using a circumlocution with the verb *fare*, as in (28) below:

(28) Jenny fece scivolare la
Jenny make:PRT.3SG slide:INF the.FSG
mano di John dalla
hand.SG of John from-the.FSG
sua gamba.
her.F3SG.SG leg.SG

"Jenny made John's hand slide off her leg."

As a result, it is possible to observe that Italian caused-motion constructions can be divided into two different classes: on the one hand, **symmetric constructions** includes those sentences whose verb shows a semantic structure which perfectly corresponds to that of the A-S construction, i.e. the CauseMotionAction schema; on the other hand, **asymmetric constructions** comprise those whose verb has a meaning which reflects just the first of the two processes which make up the meaning of the A-S construction.

At the very end of the present paper, I would like to introduce a topic which might be of interest for future studies. The small sample of Italian verbs selected for my study of caused-motion constructions is not evenly divided between symmetric and asymmetric caused-motion constructions; on the contrary, most verbs appear to occur with symmetric constructions only, so we may be tempted to think that symmetric constructions clearly outnumber asymmetric constructions. As a consequence, it would be interesting to test this hypothesis carrying out a more genuinely quantitative corpus-based study of the phenomenon under consideration. Even though undertaking such enterprise would be far beyond the scope of the present contribution (most probably, it would require a paper on its own), in the following lines I will briefly report the results of a preliminary (rather unsophisticated, I have to admit) small-scale statistical study on Italian caused-motion constructions.

This analysis can be seen as consisting of two distinct steps. First, I exploited the POS tagset used to annotate the ItWaC corpus[48] in order to ask for occurrences related to forty-eight among the most typical patterns which can be observed in caused-motion constructions.[49] again exploiting the online corpus-query system Sketch Engine. While it was not possible to find examples for several of them, results were found for thirty patterns (the complete list of these patterns is provided in the appendix). For each of these patterns, I analyzed thirty randomly selected examples (for a total of 900 sentences), separating the instances of caused-motion constructions from the examples of other constructions[50] (see Tab. 1 below).

Tab. 1: caused-motion constructions vs. other constructions

	Occurrences	%
Caused-motion constructions	46	5.11
Other constructions	854	94.89
Totals	900	100.00

Later, among the former, I distinguished symmetric from asymmetric constructions, according to the type of verbs occurring in these sentences. The results of this comparison can be found in Tab. 2.

Tab. 2: symmetric vs. asymmetric caused-motion constructions

	Occurrences	%
Symmetric constructions	44	95.65
Asymmetric constructions	2	4.35
Totals	46	100.00

You can observe that in my sample of data symmetric constructions clearly outnumber asymmetric constructions, which "to the naked eye" may seem to confirm the hypothesis made above (but see below). An example of the former is shown in (29) below, while you can find an instance of the latter in (30).

(29) Batista attacca Orton, ma Randy
Batista attack:PRT.3SG Orton but Randy
lancia Batista contro la
throw:3SG Batista against the.FSG
gabbia.
cage.SG

"Batista attacks Orton, but Randy throws Batista against the cage."

(30) Tu hai tirato
you have:PRS.2SG pull:PSTPART.SG
Nevina per la coda mentre
Nevina by the.FSG tail:SG while
io le mettevo
I DAT.3FSG put:IMPF.1SG
il tegame del latte.
the.MSG bowl.SG of-the.MSG milk.

"You pulled Nevina's tail while I was giving her the bowl of milk."

Now, I will delve a bit more into the semantic nature of asymmetric caused-motion constructions. In the exposition above I argued that the verbs which appear in these constructions (*spingere*, *tirare*) by themselves just denote processes of force-application, and that they only assume a proper caused-motion meaning when they appear in a caused-motion construction. In order to empirically test this prediction, I undertook a preliminary analysis of the correlation between these verbs, which I labeled "force-application verbs", and the caused-motion construction, adopting a methodology which might be said to be (very) loosely inspired by the notion of "collostruction strength" illustrated in Stefanowitsch and Gries's (2003) influential paper.

First of all, I counted the frequency of force-application verbs in the 46 instances of caused-motion constructions mentioned above. Then, I calculated the frequency of this kind of verbs in the other constructions included in the sample of the corpus explored to extract those examples of caused-motion constructions. Next, I calculated the frequency of the caused-motion construction with other types of verbs. Finally, I worked out the frequency of other constructions with other verbs. These frequency values were then entered in the three-by-three table you can observe in Tab. 3. In order to evaluate the statistical significance of these values, I performed a two-tailed Fisher's exact test.[51]

Tab. 3: Cross-tabulation of force-application verbs and the caused-motion construction

	Force-application verbs	Other verbs	Row Totals
Caused-motion construction	2	44	46
Other constructions	34	820	854
Column totals	36	864	900

Two-tailed p value = 0.4232

Against the prediction advanced above, this difference is not considered to be statistically significant. Therefore, these results do not support the hypothesis that there is a relevant difference between the occurrence of Italian forceapplication verbs and that of caused-motion constructions. Consequently, this also calls for caution on the claim that symmetric caused-motion constructions greatly outnumber asymmetric constructions.

Even though, as already stated above, this is just a preliminary analysis carried out on a small amount of real-language data (and therefore, it could not be considered as a strong piece of evidence against my hypothesis), its results at least suggest that we are absolutely not in a position to draw any conclusions on the supposed preference of Italian caused-motion constructions to show a complete rather than partial overlapping between the semantic content of the verb and the A-S construction. As matter of fact, even though symmetric constructions apparently outnumber asymmetric constructions in terms of raw frequencies, the only way to reliably confirm or disprove the hypothesis will be to carry out a much more comprehensive study, taking to consideration a wider range of data. At present, our preliminary quantitative analysis does not corroborate the hypothesis, without at the same time providing sufficient evidence to rule it out.[52]

5. Conclusion

After a brief introduction of the main issues on which cognitive approaches to grammar differ from mainstream Generative Grammar (§2 above), and an overview of the ECG model, including its peculiarities within the family of cognitive models of grammar (§3), in the previous section, I showed the analysis of a couple of simple Italian caused-motion constructions, exploiting this model. The purpose of the present paper was to apply the ECG formalism to Italian data, providing for the adaptation and modification required by the grammatical system of this language. In §4.1, I briefly introduced the type of data chosen and the criteria whereby they were selected, along with the methodology I was going to adopt in my study. First of all, I specified the reason why I decided to investigate a phenomenon of the Italian language, i.e the lack of ECG studies on this and typologically related languages. The choice of caused-motion constructions as a target phenomenon drew inspiration from Goldberg's (1995) influential study on English, since its consultation made it straightforward for me to reach two conclusions: on the one hand, several types of constructions frequently found in English have no equivalent in Italian (e.g. the "way" construction), or such constructions are only attested with particular syntactic constituents (e.g. the ditransitive construction), or they are simply rare (e.g. the resultative construction, whose status in Italian is also sometimes unclear, see Broccias 2003), whereas the caused-motion construction, though less productive than in English, can be observed with a certain frequency in Italian; on the other hand, the Italian caused-motion construction shows some differences from its English counterpart, a fact which seems to be somehow related to Talmy's typological distinction between verb-framed and satellite-framed languages (see Ochsenbauer and Hickmann 2010). Then, I clarified that I only wanted to deal with constructions showing literal meaning (i.e. denoting actual caused motion events), in order to provide an ECG representation of their "basic" semantic content.[53] I also specified that the example sentences to be examined were built on analogy with real utterances drawn from ItWaC (a large corpus of written Italian which crawls real usage data from the world wide web), being careful to meet some formal and semantic requirements.

In §4.2, my example sentences were analyzed, making use of the relevant ECG "operational equipment", in order to specify all the constructions involved in each of them, including both concrete instances and more schematic constructions, at the lexical, phrasal, and clausal levels. I took Dodge and Bryant's (forthcoming) study as the main reference text for my analysis, also making use of the taxonomies included in Luca Gilardi's Starter2 grammar. Obviously, since there are several factors on which the Italian language diverges from English, I built my ECG grammar drawing a lattice of constructions which aimed to deal with this particular language, for instance including information on the grammatical gender of nouns, which has to be distinguished from their natural gender for the sake of both formal and semantic accuracy. Overall, the adaptation of the ECG formalism to provide a formal representation of Italian lexical and syntactic construction was carried out rather effortlessly, with a few exceptions whose arrangement turned out to be a bit more difficult and time-consuming, but without any unsolvable problems. As a result, the ECG formalism performed quite well in the representation of the constructions involved in Italian caused-motion constructions taken into account, providing a satisfactory picture of the event described by each sentence. As for the specific grammar I designed in order to handle my data, even though it was not "acid-tested" on computer software, there seems to be no reason why it should not pass the test. It might be necessary for it to undergo some slight modifications, in order to meet the requirements of the software, but there should be no need for radical changes.

In §4.3, I argued that the two sentences analyzed in the previous subsection embody a distinction which can be drawn between two different types of caused-motion constructions which can be found in the Italian language. On the one hand, the first clause represents an example of the type I labeled "**symmetric** caused-motion constructions", those in which the meaning of the verb perfectly reflects the meaning of the A-S construction, i.e. the CauseMotionAction schema. In other words, both the verb and the A-S construction denotes the whole complex process, which is made up of two subprocesses, which correspond to the ForceApplication and the MotionAlongAPath schemas. On the other hand, the second clause analyzed in this case-study, is an instance of the type I labeled "**asymmetric** caused-motion constructions". In this kind of sentences, the meaning of the verb corresponds to a part of the meaning of the A-S construction only. In the case in point, the meaning of the verb overlaps with the first of the two subprocesses which constitute the CauseMotionAction schema, i.e. the ForceApplication schema. The different nature of these two classes of constructions was easily accounted for recurring to the cognitive semantic notion of **force-dynamics**, which allows the analyst to shed some light on the relationship between verb and A-S construction in Italian caused-motion constructions.

This achievement (not trivial and rather unlikely to be predicted a priori), speaks in favor of the adoption of the ECG model in the analysis of linguistic phenomena. As a matter of fact, the formulation and the empirical test of this hypothesis was made possible by the explicit representation and analysis of the formal and semantic properties of all lexical, phrasal, and clausal constructions which can be detected in each example sentence. Indeed, ECG allows the analyst to "anatomize" a linguistic utterance, investigating the role of all its concrete and schematic constituents and their pattern of combination in a simultaneously bottom-up and top-down fashion (see e.g. Bergen and Chang 2005; Ettlinger 2005; Torre 2011: ch. 3), in order to evaluate the contribution each of them makes to the comprehension of the message being conveyed. A preliminary quantitative analysis of a small number of constructions to see if a difference in frequency between the two types of caused-motion constructions can be found was carried out, but the result turned out to be not statistically significant. However, in order to allow us reach a conclusion with a reasonable degree of confidence, the study will have to be repeated analyzing a vast amount of data.

In conclusion, the present paper seems to allow us to assert that the ECG formalism is suitable to provide a usage-based, cognitively motivated formal representation of the constructional analysis involved in language understanding, endowing cognitive-linguistic notions with a computational dimension. The result of this integration is a formal mechanism of representation based on a robust theoretical apparatus, which allows the analyst to carry out a detailed analysis of the grammatical issues of a language, occasionally offering them the possibility to uncover characteristics which are inherent in the phenomenon under consideration, but might not be immediately spotted without embarking in an explicit analysis of the grammatical and semantic properties of all its constituents.

Appendix

Below, you can find the list of the thirty patterns, among those I used to search for instances of Italian caused-motion constructions in ItWaC (using the facilities offered by the Sketch Engine corpus-query system), which did not result in an "empty research".

1. [pos="NPR"] [pos="VER:fin"] [pos="NPR"] [pos="PRE"]

2. [pos="NPR"] [pos="VER:fin"] [pos="ART"] [pos="NOUN"] [pos="PRE"]

3. [pos="NPR"] [pos="CLI"] [pos="VER:fin"] [pos="PRE"]

4. [pos="NPR"] [pos="VER:fin"] [pos="ART"] [pos="NOUN"] [pos="ADJ"] [pos="PRE"]

5. [pos="NPR"] [pos="AUX:fin"] [pos="VER:ppast"] [pos="NPR"] [pos="PRE"]

6. [pos="NPR"] [pos="AUX:fin"] [pos="VER:ppast"] [pos="ART"] [pos="NOUN"] [pos="PRE"]

7. [pos="NPR"] [pos="CLI"] [pos="AUX:fin"] [pos="VER:ppast"] [pos="PRE"]

8. [pos="NPR"] [pos="AUX:fin"] [pos="VER:ppast"] [pos="ART"] [pos="NOUN"] [pos="ADJ"] [pos="PRE"]

9. [pos="ART"] [pos="NOUN"] [pos="VER:fin"] [pos="NPR"] [pos="PRE"]

10. [pos="ART"] [pos="NOUN"] [pos="VER:fin"] [pos="ART"] [pos="NOUN"] [pos="PRE"]

11. [pos="ART"] [pos="NOUN"] [pos="VER:fin"] [pos="ART"] [pos="NOUN"] [pos="ADJ"] [pos="PRE"]

12. [pos="ART"] [pos="NOUN"] [pos="AUX:fin"] [pos="VER:ppast"] [pos="NPR"] [pos="PRE"]

13. [pos="ART"] [pos="NOUN"] [pos="AUX:fin"] [pos="VER:ppast"] [pos="ART"] [pos="NOUN"] [pos="PRE"]

14. [pos="ART"] [pos="NOUN"] [pos="CLI"] [pos="AUX:fin"] [pos="VER:ppast"] [pos="PRE"]

15. [pos="ART"] [pos="NOUN"] [pos="AUX:fin"] [pos="VER:ppast"] [pos="ART"] [pos="NOUN"] [pos="ADJ"] [pos="PRE"]

16. [pos="PRO:pers"] [pos="VER:fin"] [pos="NPR] [pos="PRE"]

17. [pos="PRO:pers"] [pos="VER:fin"] [pos="ART"] [pos="NOUN"] [pos="PRE"]

18. [pos="PRO:pers"] [pos="CLI"] [pos="VER:fin"] [pos="PRE"]

19. [pos="PRO:pers"] [pos="VER:fin"] [pos="ART"] [pos="NOUN"] [pos="ADJ"] [pos="PRE"]

20. [pos="PRO:pers"] [pos="AUX:fin"] [pos="VER:ppast"] [pos="NPR"] [pos="PRE"]

21. [pos="PRO:pers"] [pos="AUX:fin"] [pos="VER:ppast"] [pos="ART"] [pos="NOUN"] [pos="PRE"]

22. [pos="PRO:pers"] [pos="CLI"] [pos="AUX:fin"] [pos="VER:ppast"] [pos="PRE"]

23. [pos="PRO:pers"] [pos="AUX:fin"] [pos="VER:ppast"] [pos="ART"] [pos="NOUN"] [pos="ADJ"] [pos="PRE"]

24. [pos="ART"] [pos="NOUN"] [pos="ADJ"] [pos="VER:fin"] [pos="NPR] [pos="PRE"]

25. [pos="ART"] [pos="NOUN"] [pos="ADJ"] [pos="VER:fin"] [pos="ART"] [pos="NOUN"] [pos="PRE"]

26. [pos="ART"] [pos="NOUN"] [pos="ADJ"] [pos="CLI"] [pos="VER:fin"] [pos="PRE"]

27. [pos="ART"] [pos="NOUN"] [pos="ADJ"] [pos="VER:fin"] [pos="ART"] [pos="NOUN"] [pos="ADJ"] [pos="PRE"]

28. [pos="ART"] [pos="NOUN"] [pos="ADJ"] [pos="AUX:fin"] [pos="VER:ppast"] [pos="NPR"] [pos="PRE"]

29. [pos="ART"] [pos="NOUN"] [pos="ADJ"] [pos="AUX:fin"] [pos="VER:ppast"] [pos="ART"] [pos="NOUN"] [pos="PRE"]

30. [pos="ART"] [pos="NOUN"] [pos="ADJ"] [pos="CLI"] [pos="AUX:fin"] [pos="VER:ppast"] [pos="PRE"]

References

Bailey, David R. 1997. *When push comes to shove. A computational model of the role of motor control in the acquisition of action verbs*. Berkeley, CA: University of California Ph.D. dissertation.

Baroni, Marco & Adam Kilgariff. 2006. *Linguistically-Processed web corpora for multiple languages*. 11th Conference of the European Chapter of the Association for Computational Linguistics (ACL).

Barsalou, Lawrence A. 1999. Language comprehension. archival memory or preparation for situated action? *Discourse Processes* 28 (1). 61-80.

Bergen, Benjamin K. 2005. Mental simulation in literal and figurative language understanding. In Seana

Coulson & Barbara Lewandowska-Tomaszczyk (eds.), *The literal / non-literal distinction*, 255-278. Frankfurt am Main: Peter Lang.

Bergen, Benjamin K., Nancy C. Chang & Shweta Narayan. 2004. *Simulated action in an embodied construction grammar*. 26th Annual Conference of the Cognitive Science Society.

Bergen, Benjamin K. & Nancy C. Chang. 2005. Embodied construction grammar in simulation-based language understanding. In Jan-Ola Östman and Mirjam Fried (eds.), *Construction grammars. Cognitive grounding and theoretical extensions*, 147-190. Amsterdam and Philadelphia: John Benjamins.

Broccias, Cristiano. 2003. *Quantity, causality, and temporality in change constructions*. 29th Annual Meeting of the Berkeley Linguistics Society (BLS).

Bryant, John & Luca Gilardi. forthcoming. A Cognitive model of sentence interpretation. In Hans C. Boas (ed.), *Computational approaches to embodied construction grammar*. Amsterdam & San Diego: John Benjamins.

Chang, Nancy C. 2008. *Constructing grammar. A computational model of the emergence of early constructions*. Berkeley, CA: University of California Ph.D. dissertation.

Chang, Nancy C., Jerome A. Feldman & Srinivas Narayanan. 2004. *Structured connectionist models of language, cognition, and action*. Neural Computation and Psychology Workshop. Plymouth, UK.

Cienki, Alan. 2007. Frames, Idealized Cognitive Models, and Domains. In Dirk Geeraerts & Hubert Cuyckens (eds.), *The Oxford handbook of cognitive linguistics*, 170-187. Oxford and New York: Oxford University Press.

Clark, Andy. 2008. *Supersizing the mind. Embodiment, action, and cognitive Extension*. Oxford: Oxford University Press.

Corbett, Greville G. 1991. *Gender*. Cambridge, UK: Cambridge University Press.

Croft, William. 2001. *Radical construction grammar. Syntactic theory in typological perspective*. New York: Oxford University Press.

Croft, William, and Alan D. Cruse. 2004. *Cognitive linguistics*. Cambridge: Cambridge University Press.

Dąbrowska, Ewa. 2004. *Language, mind and brain. Some psychological and neurological constraints on theories of grammar*. Edinburgh: Edinburgh University Press.

De Mulder, Walter. 2007. Force dynamics. In Dirk Geeraerts & Hubert Cuyckens (eds.), *The Oxford handbook of cognitive linguistics*, 294-317. Oxford & New York: Oxford University Press.

Dodge, Ellen K. 2010a. Embodied compositional semantics. Unpublished material. Seminar slides. University of California, Berkeley.

Dodge, Ellen K. 2010b. Variations on a theme. Patterns of constructional and conceptual composition. Unpublished material. Seminar Material. University of California, Berkeley, CA.

Dodge, Ellen K. & Abby Wright. 2002. *Herds of wildebeest, flasks of vodka, heaps of trouble. An embodied construction grammar approach to English measure phrases*. In 28th Annual Meeting of the Berkeley Linguistics Society (BLS).

Dodge, Ellen K. & John Bryant. forthcoming. Computational cognitive linguistics. An embodied construction grammar analysis of transitive constructions. In Hans C. Boas (ed.), *Computational approaches to embodied construction grammar*. Amsterdam & San Diego: John Benjamins.

Doleschal, Ursula. 2006. La relazione semiotica fra la categoria grammaticale del genere e la sua denotazione, 42-53. In Silvia Luraghi & Anna Olita (eds.), *Linguaggio e genere. Grammatica e usi*. Rome: Carocci.

Ettlinger, Marc. 2005. *Constructional compositionality and the English resultative*. 41st Meeting of the Chicago Linguistic Society (CLS). Chicago, IL.

Evans, Vyvyan & Melanie Green. 2006. *Cognitive linguistics. An introduction.* Edinburgh: Edinburgh University Press.

Feldman, Jerome A. 2002. *The meaning of reference in embodied construction grammar*. Technical Report, International Computer Science Institute, ICSI TR 02-011, Berkeley, CA.

Feldman, Jerome A. 2004. *Computational cognitive linguistics*. 20th International Conference of Computational Linguistics (COLING).

Feldman, Jerome A. 2006. *From molecule to metaphor. A neural theory of language*. Cambridge, MA: MIT Press.

Feldman, Jerome A. 2010. Embodied language, Best-Fit analysis, and formal compositionality. *Physics of Life Review*, doi:10.1016/j.plrev.2010.06.006.

Feldman, Jerome A., Ellen K. Dodge & John Bryant. 2009. Embodied Construction Grammar. In Bernd Heine and Heiko Narrog (eds.), *The Oxford handbook of linguistic analysis.* New York, NY: Oxford University Press. 111-138.

Fillmore, Charles J., Paul Kay & Mary C. O'Connor. 1988. Regularity and idiomaticity in grammatical constructions. The Case of Let Alone. *Language* 64. 501-538.

Gallese, Vittorio & George Lakoff. 2005. The brain's concepts. The role of the sensory-motor system in conceptual knowledge. *Cognitive Neuropsychology* 22 (1). 455-479.

Gibbs, Raymond W., Jr. 2005. *Embodiment and cognitive science.* New York, NY: Cambridge University Press.

Gibbs, Raymond W., Jr. 2007. Idioms and Formulaic Language. In Dirk Geeraerts and Hubert Cuyckens (eds.), *The Oxford handbook of cognitive linguistics*, 697-725. Oxford and New York: Oxford University Press.

Goldberg, Adele E. 1995. *Constructions. A construction grammar approach to argument structure*. Chicago, IL: The University of Chicago Press.

Goldberg, Adele E. 2006. *Constructions at work. The nature of generalization in language*. New York, NY: Oxford University Press.

Graffi, Giorgio. 1994. *Sintassi*. Bologna: Il Mulino.

Haegeman, Liliane. 1991. *Introduction to government and binding theory*. Oxford: Blackwell.

Johnson, Mark. 1987. *The body in the mind. The bodily basis of meaning, imagination, and reason*. Chicago, IL: The University of Chicago Press.

Lakoff, George. 1987. *Women, fire, and dangerous things. What categories reveal about the mind*. Chicago, IL: The University of Chicago Press.

Lakoff, George & Mark Johnson. 1999. *Philosophy in the flesh. The embodied mind and its challenge to western thought*. New York, NY: Basic Books.

Langacker, Ronald W. 1987. *Foundations of cognitive grammar*, vol. 1. Theoretical Prerequisites. Stanford, CA: Stanford University Press.

Langacker, Ronald W. 2008. *Cognitive grammar. A basic introduction*. New York, NY: Oxford University Press.

Langlotz, Andreas. 2006. *Idiomatic creativity. A cognitive-linguistic model of idiom-representation and idiom-variation in English*. Amsterdam & Philadelphia: John Benjamins.

Lewandowska-Tomaszczyk, Barbara. 2007. Polysemy, prototypes, and radial categories. In Dirk Geeraerts & Hubert Cuyckens (eds.), *The Oxford handbook of cognitive linguistics*, 139-169. Oxford and New York, NY: Oxford University Press.

Lombardi Vallauri, Edoardo. 2009. *In che Modo il Linguaggio Non E' nel Cervello*. Seminar held at Collegio Ghislieri, Università degli Studi di Pavia.

Masini, Francesca & Paola Pietrandrea. 2010. Magari. *Cognitive Linguistics* 21 (1). 75-122.

Mok, Eva H. & John Bryant. 2006. *A best-fit approach to productive omission of arguments*. 32nd Annual Meeting of the Berkeley Linguistics Society (BLS).

Narayanan, Srinivas. 1997. *KARMA: Knowledge-based action representation for metaphor and aspect*. Berkeley, CA: University of California Ph.D. dissertation.

Narayanan, Srinivas. 1999. *Moving right along. A computational model of metaphoric reasoning about events*. National Conference on Artificial Intelligence (AAAI).

Narayanan, Srinivas & Daniel Jurafsky. 1998. *Bayesian models of human sentence processing*. 20th Annual Conference of the Cognitive Science Society .

Narayanan, Srinivas & Daniel Jurafsky. 2001. *A Bayesian model predicts human parse preferences and reading times in sentence processing*. 14th Neural Information Processing Systems Conference (NIPS).

Næss, Åshield. 2007. Defining transitivity. Markedness vs. prototypicality. In Matti Miestamo & Bernhard Wälchli (eds.), *New challenges in typology. Broadening the horizon and redefining the foundations*, 179-198. Berlin: Mouton de Gruyter.

Oakley, Todd. 2007. Image Schemas. In Dirk Geeraerts & Hubert Cuyckens (eds.), *The Oxford handbook of cognitive linguistics*, 214-235. Oxford and New York, NY: Oxford University Press.

Ochsenbauer, Anne-Katharina & Maya Hickmann. 2010. Children's verbalizations of motion events in german. *Cognitive Linguistics* 21 (2). 217-236.

Polesini Karumanchiri, Luisa & Raffaella Uslenghi Maiguashca. 1988. *L'Italiano d'Oggi. Note di grammatica per corsi universitari*. Toronto: University of Toronto Press.

Quochi, Valeria. 2007. *A usage-based approach to light verb constructions in Italian. Development and use*. Pisa: Università degli Studi di Pisa Ph.D. dissertation.

Schneider, Nathan. 2010. *Computational cognitive morphosemantics. Modeling morphological compositionality in Hebrew verbs with embodied construction grammar*. 36th Annual Meeting of the Berkeley Linguistic Society (BLS). Berkeley, CA.

Shastri, Lokendra & Carter Wendelken. 2000. *Seeking coherent explanations – A fusion of structured connectionism, temporal synchrony, and evidential reasoning*. 22nd Annual Conference of the Cognitive Science Society.

Talmy, Leonard. 2000. *Toward a cognitive semantics*. 2 Vols. Cambridge, MA: MIT Press.

Taylor, John R. 2003. *Linguistic categorization. Prototypes in linguistic theory*. New York, NY: Oxford University Press.

Taylor, John R. 2007. Cognitive Linguistics and Autonomous Linguistics. In Dirk Geeraerts & Hubert Cuyckens (eds.), *The Oxford handbook of cognitive linguistics*, 566-588. Oxford and New York, NY: Oxford University Press.

Tomasello, Michael. 2003. *Constructing a language. A usage-based theory of language acquisition*. Cambridge, MA: Harvard University Press.

Torre, Enrico. 2011. *Grounding meaning in experience. An embodied construction grammar analysis of Italian caused-motion constructions*. Saarbrücken: Lambert Academic Publishing.

Varela, Francisco J., Evan Thompson & Eleanor Rosch. 1991. *The embodied mind. Cognitive science and human experience*. Cambridge, MA: MIT Press.

Zlatev, Jordan. 2007. Spatial Semantics. In Dirk Geeraerts & Hubert Cuyckens (eds.), *The Oxford handbook of cognitive linguistics*, 318-350. Oxford and New York, NY: Oxford University Press.

---

1 I want to heartily thank two anonymous reviewers, together with the editors of the journal, for their valuable comments on a previous version of this paper. I am also grateful to Cristiano Broccias, Sonia Cristofaro, Luca Gilardi, Emanuele Bardone and Giorgio Caviglia for help and suggestions, and to Dan Ponsford for proofreading the final version of the

present article. I alone am responsible for any and all errors.

2 For a fine-grained yet highly accessible criticism of the Chomskyan paradigm, the reader is advised to see Dąbrowska (2004: chs. 1-9). A concise exposition of arguments against Generative Grammar (with a special focus on linguistic nativism) is also offered in Lombardi Vallauri (2009).

3 Nevertheless, recent developments seem to show that an interaction between cognitive and autonomous perspectives might be possible. For a recent outline of the situation, the reader is referred to Taylor (2007).

4 "Redundancy s not to be disparaged, for in one way or another every language makes extensive use of it." (Langacker 2008: 188).

5 Recent studies on the nature of idioms (e.g. Langlotz 2006) seriously call into question this supposed "unproductivity" of speech formulae. See e.g. Gibbs (2007) for an overview.

6 http://www.icsi.berkeley.edu/NTL/

7 These inferences are not necessarily direct. As a matter of fact, they are often metaphorical (see e.g. Narayanan 1997; Bergen 2005).

8 This statement holds for schemas with a certain degrees of complexity. In fact, the simplest schemas, such as the RD schema shown in the next section, can be simply drawn as list of roles, as Bergen and Chang (2005: 151) underline.

9 ECG scholars usually refer to Langacker's example of the relation between the concept "hypotenuse" and the concept "right triangle" to explain the role of the evokes keyword (see Feldman et al. 2009; Dodge and Bryant forthcoming): while the former is not a kind of right triangle, the latter is not a role of the hypotenuse. The evoking structure is meant to represent relations along the lines of that which lies between the hypotenuse and its right triangle conceptual base. As Bergen and Chang (2005: 153) point out, perhaps it may be construed as a formalization of the "profiling" notion used in Cognitive Grammar and Frame Semantics.

10 A rather central role is played by image-schemas and, to a certain extent, also by frames (for an overview of these cognitive structures, see Cienki 2007; Oakley 2007).

11 Also, as Francisco Gonzálvez García (personal communication) once pointed me out, very little has been done on Italian from any constructionist perspective. Nevertheless, some work has been carried out (mainly from Goldberg's perspective) in recent years (see e.g. Quochi 2007; Masini and Pietrandrea 2010).

12 In my analysis, I shall focus on phonological information only.

13 As an example, Langacker's notion of profiling is extensively used in the analysis of sentence-level constructions.

14 As a matter of fact, ECG is strongly connected to other projects developed by NTL scholars, most of which aim to model the nature of the processes ongoing in the language user's head when they are involved in the task of understanding a given linguistic utterance (See e.g. Shastri and Wendelken 2000).

15 Gilardi's Workbench is freely available for download: http://www.icsi.berkeley.edu/~lucag/.

16 It should be stressed that in ECG the label "construction" is used in a broader sense than it is used by Goldberg.

17 The two arguments in bold type are obligatory, whereas the third is optional.

18 Not all scholars recognize these constructions as true ditransitives (see Goldberg 2006: 76, endnote 2).

19 In Talmy's (2000) typological distinction, satellite-framed languages (mostly) encode manner in the verb stem and path in verbal satellites, while verb-framed languages (prevalently) encode path in the verb stem and manner in adverbial phrases or gerund forms. See also Ochsenbauer and Hickmann (2010).

20 Verbs included in the list: *lanciare* ("throw"), *spingere* ("push"), *tirare* ("pull"), *schiacciare* ("squeeze"), *sollevare* ("lift"), *posare* ("lay down"), *premere* ("press"), *gettare* ("dash"), *scagliare* ("hurl"), *trascinare* ("drag"), *scaraventare* ("fling"), *trainare* ("tow").

21 http://www.sketchengine.co.uk

22 Of course, judgements of "normality" are highly dependent on subjective experience. As a result, different analysts might evaluate the degree of "oddity" of the same sentence differently.

23 As Feldman (2006: 293-294) points out, ECG offers long explanations for short examples, due to the fact that ECG scholars conceive language as inherently complex.

24 To be more precise, It was also adjusted in order to be more consistent with the network model of polysemy developed in Cognitive Grammar (see e.g. Langacker 1987; Taylor 2003: ch. 8). For a very brief discussion, see Torre (2011: 201-206)

25 The complexity of the notion of transitivity has often been underlined by typologists, see e.g. Næss (2007).

26 A-S constructions represent a special class of constructions which provide the basic meaning of clausal expressions in a language and specify the arguments a verb can be combined with. The reader is referred to Goldberg (1995) for a more detailed introduction to this kind of constructions.

27 Dodge and Bryant conceive A-S constructions as a radial category, with a central case and several extensions. On the nature of radial categories and their application to grammar, see Lakoff (1987).

28 Consistent with a convention adopted in studies on ECG, in my study inherited roles may often be omitted in the representation of a schema or construction.

29 In particular, it describes a transfer of force which does not necessarily involve a motor-control action. This is consistent with scenarios in which force is transferred from the non-agentive moving causer to another entity upon impact. For a more detailed characterization of the CauseEffectProcess schema, the reader is referred to Dodge and Bryant (forthcoming).

30 To my knowledge, such a schema still has to be defined in its details.

31 The interested reader can find the analysis of some more sentences in Torre (2011: ch. 3).

32 When a construction inherits a constructional block from a more general one, it (or some of its roles) may be omitted in the representation of the less general construction.

33 The reader should remember that phon is not the only role of the WordForm schema. For the sake of both space and simplification, I shall follow Bergen and Chang (2005) specifying the phonological properties of words only.

34 Bergen and Chang (2005) offer a very brief but clear characterization of TL and SPG.

35 In the beginning, I introduced the topic role in the EventDescriptor schema in order to account for dislocations. Nevertheless, I think it may be useful to keep its existence in mind even when analyzing different kinds of constructions.

36 Note that there is only one difference between the two constructions: in the first case (the one represented in Fig. 30 below), the meaning block of the construction does not offer any information on the referent's natural gender; in the second case (not shown) the natgender role is filled with the value male.

37 The same is true for all the constructions relative to ambiguous or polysemous nouns, though it will not be repeated every time one of them is found. Even though at present polysemy and homonymy have not been addressed in most ECG studies, my solution seems reasonable to this kind of issue, and it also seems consistent with the ECG approach more generally.

38 The MalePlDefiniteArticle is clearly not available in Gilardi's grammar: since articles are not a flexive category in English, I created this construction (and those it inherits from) expressly to deal with Italian data.

39 On the different gender systems of the world's languages, see Corbett (1991). Useful information on the organization of gender in Italian can be found in Doleschal (2006).

40 Since there are no complex prepositions in English, I worked out the relevant constructions myself.

41 Again, ComplexPreposition and its subcases were designed in order to address phenomena of Italian. Indeed, since there are no complex prepositions in English, Gilardi's Starter 2 grammar does not include these constructions.

42 In Italian (as in other Romance languages), the simple future is normally used to describe actions and events which still have to happen.

43 Some scholars who work on ECG (see for instance Bailey 1997; Bergen 2005; Bergen and Chang 2005) also provide a dynamic representation of the enactment process using the x-schema formalism. For a brief overview of this formalism, see e.g. Narayanan (1999).

44 As Evans and Green (2006: 502) underline, "Implicit elements have no phonetic realization but represent speaker knowledge of grammatical categories like noun and verb, subcategories (for example, count and mass noun), and grammatical functions (also known as “grammatical relations”) like subject and object."

45 Again, the situation will be disambiguated when all the constructions instantiated in the sentence unify.

46 Of course, the circumlocution shown in (26) may also be used with verbs like spingere and tirare, as alternatives to the caused-motion construction illustrated in (25).

47 For a brief overview of the force-dynamics notion and its applications in cognitive semantics, the reader is referred to De Mulder (2007). See also Croft and Cruse (2004: §3.5).

48 ItWaC was POS-tagged and annotated using the open-source part-of-speech tagger Treetagger.

49 The reader should bear in mind that the caused-motion construction shows the following syntactic structure: NP V NP (Path)PP.

50 Consistent with the approach introduced in §4.1, only occurrences of literal language were considered instances of "caused-motion constructions", while metaphorical instances (see e.g. (14) above) were included in the "other constructions" category.

51 The statistical test was computed with the help of the facilities offered by the free online resource GraphPad QuickStats: http://www.graphpad.com/quickcalcs/index.cfm

52 Actually, the difference in raw frequencies seems to suggest that the larger the database analyzed, the more statistically significant the difference may turn out to be. At present, this is just a speculation based on my own introspection, though.

53 Here, the literal sense of caused-motion constructions is considered "basic" in a purely diachronic perspective only, since there is no reason to assume that its cognitive status is synchronically more basic than that of figurative meanings in the mind of a speaker.