

# Semantic features in the automatic analysis of verbs of creation in Bulgarian and English

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## Abstract

The paper focuses on the semantic class of verbs of creation as a subclass of dynamic verbs. The objective is to present the description of creation verbs in terms of their corresponding semantic frames and to outline the semantic features of the frame elements with a view to their automatic identification and analysis in text. The observations are performed on Bulgarian and English data with the aim to establish the language-independent and language-specific features in the semantic description of the analysed class of verbs.

**Keywords:** verbs of creation, frame semantics, Bulgarian, English

## 1 Introduction

The paper shows ongoing research on the semantic and conceptual properties of verbs with a view to their realisation in various languages. In particular, here we focus on the class of creation verbs and their possible automatic analysis and disambiguation in text.

For the purpose of the automatic classification of creation verbs according to their aspectual class (state, activity, accomplishment and achievement, as discussed below), we consider a set of features at lexical, semantic, syntactic and valence level which determine the realisation of the verb in the sentence.

While some verbs can be clearly classified to one aspectual class at the lexical level, others cannot be classified and can have different realisations depending on the context. Some verbs can express an activity (e.g., *He has been writing all morning*), accomplishment (e.g. *He wrote a letter*), or even a state (e.g., *He writes illegibly*, i.e. the quality / state of his writing is such that it cannot be easily read).

As a consequence of these observations, the aspectual classes are considered as realised in

text rather than at the lexical level. The aspectual properties are therefore described as a combination of lexical, morphosyntactic and valence properties.

An additional layer for consideration is the lexical aspect in Bulgarian and other Slavic languages. Examples 1 – 6 show use cases of the Bulgarian verbs *готвя* ‘cook’ (imperf.) and *сготвя* ‘cook’ (perf.), the latter derived from the former using prefixation, and both translated into English as ‘cook’. Relevant to the study of the semantic properties of verbs of creation is the fact that perfective verbs are always telic (Examples 5 and 6) and the limitations in their interpretation stemming from that (e.g., Example 6). Ambiguity at the lexical level between the telic and atelic interpretation of verbs can only occur with imperfective verbs (Examples 1, 2 vs. 4).

- (1) *Той готви часове наред.*  
He cooks hours in sequence.  
‘He cooks for hours on end.’ (*готвя* ‘cook’, imperf.; atelic)
- (2) *Той готви ястието часове наред.*  
He cooks dish-DEF hours in sequence.  
‘He cooks the dish for hours.’ (*готвя* ‘cook’, imperf.; atelic)
- (3) *Той готви това ястие за един час.*  
He cooks this dish for one hour.  
‘It takes him one hour to cook this dish.’ (*готвя* ‘cook’, imperf.; telic)
- (4) *Той сготви ястието.*  
He cooked dish-DEF.  
‘He cooked the dish.’ (*сготвя* ‘cook a complete dish’, perf.; always telic)
- (5) *Той сготви ястието за един час.*  
He cooked dish-DEF for one hour.  
‘He cooked the dish in an hour.’ (*сготвя* ‘cook a complete dish’, perf.; always telic)
- (6) \**Той сготви ястието часове наред.*  
He cooked dish-DEF hours in sequence.

\*‘He (completely) cooked the dish for hours.’ (*сготовя* ‘cook a complete dish’, perf.; always telic)

With a view to establishing testing criteria and approaches for the automatic classification of verbs in terms of the aspectual classes, the semantic class of verbs of creation is a good illustrative class since creation verbs, as a subclass of verbs of change, presuppose reaching an end point – a new state, an object coming into existence as a result of the performed action, thus have a clear telic interpretation as achievements and accomplishments. However, it is interesting to observe their use in specific contexts as activities, and based on illustrative material to perform contrastive analysis and observe the semantic, morphosyntactic and valence features determining their interpretation and allowing their disambiguation.

## 2 Relevant works

The review of relevant works goes in two directions: (a) an overview of general aspectual verb classes in order to derive the set of lexical-semantic, morphosyntactic and valence properties determining the classification of predicates; and (b) an outline of the particular class under observation, the class of creation verbs, and its place among the general classification of verbs.

The observations presented here are based on the aspectual classes of activities, accomplishments, achievements and states (Vendler, 1957, 1967; Dowty, 1979), distinguished with respect to the following four features: [ $\pm$  static], [ $\pm$  dynamic], [ $\pm$  telic] and [ $\pm$  punctual]. In particular, we focus on dynamic verbs characterised by [ $-$  static] and [ $+$  dynamic], and analyse the class of verbs of creation within dynamic verbs.

Rappaport Hovav (2008: 14–16) discusses the event-denoting predicates and argument realisation with respect to the lexicalized meaning and the lexical properties that determine the aspectual meaning, as well as the aspectual class of the larger unit, the VP, that the verb appears in.

Dowty (1979: 132–135) and Rappaport Hovav (2008: 16–17) state that all dynamic predicates ([ $-$  static]) are characterised by a change, and thus they refer to an interval as the change occurring involved two moments in time (initial and final moment). With respect to aspectual properties of

verbs, Dowty (1979: 132–135) and Rappaport Hovav (2008: 16–17) distinguish between scalar (e.g., *fall*, *warm*) and non-scalar change (e.g., *scribble*, *exercise*). Scalar verbs require an ordered set of values for a particular attribute, with the order from the initial towards the final value. Non-scalar verbs involve a complex change which cannot be expressed in terms of a scale on a single attribute.

Moreover, Beavers (2008: 245) argues that the telicity of dynamic predicates arises from a homomorphism between the event and some bounded participant in the event. In particular, the boundedness of the event is related to the boundedness of the incremental theme, a property, or a path. Beavers (2008: 257) gives the following definition:  $P$  is a dynamic predicate iff  $P$  predicates over an event  $e$ , a force-recipient  $x$ , a scale of change  $s$ , and possibly other entities.

Further, Rappaport Hovav (2008: 17–18) argues that the change specified by activity verbs is usually more complex than that of achievements and accomplishments. In line with the observations of Beavers (2008: 250–257), Rappaport Hovav (2008: 17–18) discusses two-point scales (where there are only two states, e.g. *die*, *reach*, *shut*) and multi-point scales (for gradual change, e.g. *warm*, *lengthen*, *flatten*). Two-point scales are inherently bounded, thus the predicates associated with them are telic and punctual. On the other hand, for multi-scale predicates an additional distinction is made between closed scales (where there is an end point), e.g. *flatten* (until  $x$  becomes flat) and open scales (where there is no end point), e.g. *lengthen* (potentially indefinitely).

Beavers (2008) proposed a unified approach to the determination of telicity by considering three verb classes: incremental theme verbs; true change-of-state verbs with an argument exhibiting a gradable property of the argument; and inherently directed motion verbs for which the path of motion is a measurable feature. Most relevant to the study of creation verbs is the incremental theme, whose scalability is with respect to volume, area, height, etc. Further, Levin (2010: 1–2) introduces the feature **Scale** and considers it as an integral part of the verb semantics and conceptual structure.

With a view to verbs of creation, there are several particularly relevant studies that outline the place of the verb class under investigation within

general classifications of verb predicates.

The classification of predicates and the semantic relations between predicates and their arguments have been studied within various theoretical approaches, based in general on their syntactic properties and behavior (Levin (1993); Pinker (1989), among others), the thematic structure (Van Valin and LaPolla, 1997) or the semantics of frames (Fillmore, 1982). Levin (1993) analyses creation and transformation verbs as one whole class as they exhibit similar alternations. In particular, verbs of creation enter into the Material/Product alternation (e.g., *He carved the wood into a flute / He carved the flute out of wood*), the Raw Material subject alternation (e.g., *She baked bread from the wholemeal flour / This wholemeal flour bakes a good bread*), the Instrument subject alternation (e.g., *I draw nice sketches with this pencil / This pencil draws nice sketches*), etc.

In his analysis of creation and depiction verbs, Forbes (2006) talks about event semantics and the “unfinished object problem” in sentences such as *Jack was building a house, Jack was drawing a circle*. Although there is vagueness with respect to what is considered a house (even unfinished), a circle is not a circle unless it is complete. However, the author assumes that the event in the progressive implies existential neutrality, neither requiring it nor forbidding the existence of the object.

In Bulgarian and other Slavic languages the verb aspect is a lexical category and the perfective and imperfective verbs are considered different words with different lexical meanings derived as a result of word formation. The properties of the verb aspect have been studied extensively (Andreychin, 1944; Ivanchev, 1971; Nitsolova, 2008; Kutsarov, 2007; Koeva, 2011; Charalozova, 2021).

In summary, we adopt Vendler’s classification of activities, achievements, accomplishments and states with the relevant features and test to distinguish between them. The aspectual classification in Bulgarian is more complex as it also takes into account the verb’s lexical aspect and the additional restrictions stemming from it. Verbs of creation within the class of verbs of change fall into the categories of activities, achievements and accomplishments as they express a transition from one state (non-existence) to another (existence), so there is an inherent end point but it is not necessarily implied when the

activities are discussed.

### 3 Verbs of creation in WordNet and BulNet

The focus is on the representation of verbs of creation in the hierarchical structure of Princeton WordNet and the Bulgarian WordNet, and how it is reflected by the system of the semantic frames from FrameNet that the verbs evoke.

The lexical-semantic network WordNet (Miller, 1995; Fellbaum, 1998) represents the lexicon in the form of a network of synonym sets (synsets) interconnected by semantic, lexical and other relations. One of the main relations building the hierarchical structure of WordNet is hypernymy (and its opposite relation – hyponymy), which organises the vocabulary of a given semantic field into a tree.

WordNet, as well as its Bulgarian counterpart BulNet (Koeva, 2006, 2021), is the main resource used in the study. The semantic description of verb predicates in WordNet also includes their classification into general semantic classes based on assigned semantic primitives (Miller and Fellbaum, 2007), e.g. verbs of motion, verbs of emotion, verbs of communication, verbs of creation, etc.

In Princeton WordNet there are 834 synsets labelled with the semantic primitive verb.creation, covering a total of 1898 verb literals in English. Out of them, 453 synsets are linked to verb synsets in the Bulgarian WordNet covering a total of 2073 verb literals in Bulgarian.

In general, the class of verbs of creation includes, among others:

- Verbs of intentional creation of a physical object – rooted at the synsets eng-30-01685313-v {create} ‘pursue a creative activity; be engaged in a creative activity’; eng-30-01617192-v {make, create} ‘make or cause to be or to become’ and eng-30-01753788-v {create} ‘bring into existence’.
- Verbs of creating a depiction – stemming at eng-30-01686956-v {picture, depict, render, show} ‘show in, or as in, a picture’.
- Verbs of building – starting from eng-30-01654628-v {construct, build, make} ‘make by combining materials and parts’ and from eng-30-01656788-v {assemble, piece, put

together, set up, tack, tack together} ‘create by putting components or members together’.

- Verbs of decorating – stemming at eng-30-01675963-v {decorate, adorn, grace, ornament, embellish, beautify} ‘make more attractive by adding ornament, colour, etc.’.
- Verbs of authoring, or textual creation – stemming at eng-30-01698271-v {write, compose, pen, indite} ‘produce a literary work’.
- Verbs of manufacturing – starting from the synset eng-30-01621555-v {produce, make, create} ‘create or manufacture a man-made product’.
- Verbs of cooking – rooted at eng-30-01664172-v {cook, fix, ready, make, prepare} ‘prepare for eating by applying heat’.
- Verbs of processing – stemming at synset eng-30-01668603-v {work, work on, process} ‘shape, form, or improve a material’.
- Verbs of abstract, cognitive and/or emotional creation – rooted at eng-30-01631534-v {create by mental act, create mentally} ‘create mentally and abstractly rather than with one’s hands’ or at eng-30-01646866-v {provoke, evoke, call forth, kick up} ‘evoke or provoke to appear or occur’.
- Verbs of performing – stemming from the synset eng-30-01714208-v {perform} ‘give a performance (of something)’.
- Verbs of musical performance – stemming at synset eng-30-01726172-v {play} verb.creation ‘perform music on (a musical instrument)’.

#### 4 Semantic frames in FrameNet describing verbs of creation

The study of the systematic semantic relations in each of the resources, as well as the characteristics determining the relationship between their basic units (synsets and semantic frames) and the relations between them, supports the enrichment of synsets in WordNet with conceptual information. By assigning frames to the synsets in WordNet, we aim at defining semantic classes of verbs based

on similar lexical semantics, but more importantly, that evoke the same or similar (related) frames which exhibit similar configurations of frame elements.

FrameNet (Baker et al., 1998) is a system of semantic frames with their frame elements. Frames are schematic descriptions of the conceptual structure of situations through actors, circumstances, and other conceptual roles called frame elements. Koeva (2010) discusses the properties of the resource BulFrameNet – a corpus-based lexicon giving an exhaustive account of the semantic and syntactic combinatory properties of Bulgarian verbs. Koeva and Doychev (2022) present BulFrame – a web-based system for the extensive description of verbs using semantic frames offering a unified theoretical model for the formal presentation of frames and frame elements.

Lexical units in FrameNet, in particular verbs, are grouped in semantic frames based on common semantics, formalised through a common set of participants and circumstances (frame elements) and the relations between them (Fillmore, 1982, 1985, 2003; Fillmore and Baker, 2009; Ruppenhofer et al., 2016) with valence patterns inductively derived from corpus evidence.

There has been considerable work on mapping WordNet and FrameNet automatically (Shi and Mihalcea, 2005; Tonelli and Pighin, 2009; Leseva and Stoyanova, 2020), with synsets in WordNet being assigned semantic frames from FrameNet.

The system of FrameNet semantic frames that described verbs of creation is presented in Table 1.

While usage examples in FrameNet are illustrating the use of English words, the valence patterns are largely applicable to other languages and moreover, to some degree, the most frequent and typical syntactic configurations are also transferable (or can be adapted) cross-linguistically. For example, the frame **Building** has as most frequent configurations the following: NP.Ext<sub>Agent</sub> VERB NP.Obj<sub>Created\_entity</sub> and NP.Ext<sub>Agent</sub> VERB NP.Obj<sub>Created\_entity</sub> PP[from]<sub>Components</sub>. Example 7 illustrates that these are valid for typical usage examples both in Bulgarian and in English, up to language specific lexical selections (e.g., prepositions).

(7) NP.Ext<sub>Agent</sub> VERB NP.Obj<sub>Created\_entity</sub>  
He BUILT a house.

NP.Ext<sub>Agent</sub> VERB NP.Obj<sub>Created\_entity</sub>  
Той ПОСТРОИ къща.



Frame	Frame elements		
	Agent	Created entity	Components
General frames			
<b>Creating</b>	<b>Creator / Cause</b>	<b>Created entity</b>	
→ <b>Intentionally create</b>	<b>Creator</b>	<b>Created entity</b>	<b>(Components)</b>
Frames with physical <b>Created entity</b>			
→ <b>Building</b>	<b>Agent</b>	<b>Created entity</b>	<b>Components</b>
→ <b>Create physical artwork</b>	<b>Creator</b>	<b>Representation</b>	
→ <b>Manufacturing</b>	<b>Producer / Factory</b>	<b>Product</b>	<b>(Resource)</b>
→ <b>Cooking creation</b>	<b>Cook</b>	<b>Produced food</b>	<b>(Ingredients)</b>
→ <b>Text creation</b>	<b>Author</b>	<b>Text</b>	
Frames with abstract <b>Created entity</b>			
→ <b>Achieving first</b>	<b>Cognizer</b>	<b>New idea</b>	
→ <b>Coming up with</b>	<b>Cognizer</b>	<b>Idea</b>	
Frames of creating a <b>Performance</b>			
<b>Performers and roles</b>	<b>Performer</b>	<b>Role / Performance</b>	

Table 1: FrameNet frames representing the class of creation verbs. None-core frame elements are in brackets.

NP.Ext<sub>Agent</sub> VERB NP.Obj<sub>Created\_entity</sub>  
 He BUILT a garden bridge  
 PP[from]<sub>Components</sub>  
 from recycled pallets.

NP.Ext<sub>Agent</sub> VERB NP.Obj<sub>Created\_entity</sub>  
 Той НАПРАВИ мост в градината  
 PP[from, of]<sub>Components</sub>  
 от рециклирани палети.

## 5 Usage examples

Usage examples illustrating the use of verbs of creation and their syntactic realisation are mostly drawn from the SemCor and BulSemCor – both annotated with WordNet senses.

SemCor (Miller et al., 1993, 1994; Landes et al., 1998) is manually annotated corpus developed by the Princeton WordNet team. Open-class single words and multiword expressions are assigned unique WordNet senses. SemCor contains a total of 226,040 sense annotations.

BulSemCor (Koeva et al., 2006, 2011; Koeva, 2012) is modelled after SemCor aiming to ensure good coverage of general lexis. In addition to open-class words, in BulSemCor closed-class words (preposition, conjunctions, particles) are also

annotated. BulSemCor contains about 100,000 annotated units.

The use of SemCor and BulSemCor is motivated by the fact that verbs are annotated with unique word senses from WordNet, so they are good source of comparable examples in English and Bulgarian.

A total of 220 semantically annotated sentences have been collected in both Bulgarian and English, illustrating the use of creation verbs.

## 6 Towards automatic analysis and identification of aspectual classes

In this section we discuss the first steps towards the automatic analysis of the usage examples of creation verbs with a view to their automatic classification into Velnder’s aspectual classes. There are two aspects of the approach: (a) defining the set of lexical, semantic, morphosyntactic and valence features determining the classification; and (b) defining a set of procedures for the automatic classification based on the comprehensive analysis of the VP phrase the verb is realised in. While the general

features in (a), which we discuss below, are to a large extent language-independent, the concrete procedures in (b) may rely on language-specific analysis and while we aim at flexibility, we also recognise the limitation of the approach with regards to its application for languages other than Bulgarian and English.

The research presented here is just the first step towards designing methods for automatic identification of aspectual classes, and thus, disambiguation of verbs of creation in text. We aim at providing insights into the possible features that determine the behaviour of verbs, that can further be used, if properly formalised, for training in machine learning.

From the analysis of the related works and the examples extracted from corpora, we can summarise the following observations:

- Creation verbs are agentive. Their semantic frames are characterised by concretisations of the **Agent** frame element, e.g. **Creator**, **Author**, **Cook**. Somewhat different are the frame elements **Cognizer** in the frames representing creation of abstract (mental) entity. In the frame **Manufacturing** the frame elements **Producer** or **Factory** can represent a person, organisation, plant, etc. which produce the product.
- The **Created entity** can be of several semantic types – either an artefact, a man-made physical object (in frames such as **Building**, **Manufacturing** or **Cooking creation**), a text or some language representation (in **Text creation**), a representation or depiction of either a physical object, event or idea (in **Performers and roles** and **Create physical artwork**), or an abstract entity (as in the frames **Achieving first** or **Coming up with**).
- In general, creation verbs are always associated with a **Created entity** and are essentially telic. Their analysis requires two moments in time: a moment before the **Created entity** comes into existence, and the moment it becomes real. However, the **Created entity** can allow for a scalable, gradual interpretation (a whole building, but also half-built, or almost built building), which then in turn allows for considering the activity within the event at any one

interval after the beginning and before the completion, without the telic interpretation (no clear end point and while the result / completion is not implied in the sentence's meaning, thus the event is not necessarily bounded) and using the verb as an activity rather than an accomplishment (or, more rarely, an achievement).

- The incremental property (scalability) of the **Theme**<sup>1</sup> can be at the lexical level (a lexical characteristic of the **Created entity**) or be specified at the sentence level by an interval realised as a prepositional or an adverbial phrase.
- A separate temporal characteristic of the situation (expressed as a prepositional phrase, an adverbial or a clause) can also introduce into the semantics atelicity giving the verb the interpretation as an activity rather than an accomplishment.

Examples 8 – 11 illustrate cases of atelic interpretations of verbs of creation evoking different frames. Example 8 shows a case where the verb's meaning allows for the atelic interpretation as an activity. Example 9 illustrates a combination of the lexical properties of the verb *строя* 'build' and the incremental theme 'highway' (incremental as it is built in stages / sections). In Example 10 forming a caretaker government implies a two-point scale (either not formed or formed), the use of a time / duration phrase *вече цяла седмица* 'for a whole week already' suggests that the act of formation is not punctual but durational, thus making it possible to have an atelic interpretation as an activity. The last Example 11 shows a case of iterative aspect where while the invention of a new technology is a bounded and punctual event (an achievement), the constant iteration of the event brings a possible atelic interpretation when considering not the individual occurrence but the complex iterative activity. However, some authors consider the iterative interpretation as a separate aspectual class which requires further analysis.

In FrameNet DNI (definite null instantiations), INI (indefinite null instantiations), CNI

<sup>1</sup>Here, we use the most general meaning of 'Theme' as the most generalised interpretation of the participant in the situation which determines the stages in the event – the frame element that is being created.

(constructional null instantiations) mark cases where a frame element is not overtly expressed but assumed within the structure of the situation described by the frame. However, here in Example 8 we mark the empty core element with ‘X’ as it is expected from the evoked frame but not when the verb is used as an activity (non-telic, non-bounded) rather than as accomplishment (telic, bounded).

(8) Frame: **Text creation**

[Ванцаров]<sub>Author</sub> пише, за да задоволява  
Vaptsarov writes so that fulfill  
творческия си плам. [X]<sub>Created entity</sub>  
his creative flame.

‘Vaptsarov writes in order to fulfil his creative drive.’

(9) Frame: **Building**

[Държавата]<sub>Creator</sub> ви строи  
State-DEF you builds  
[модерен път]<sub>Created entity</sub>,  
modern road  
а вие недоволствате.  
and you complain.

‘The government builds you a modern highway and you are complaining.’

(10) Frame: **Intentionally create**

[Президентът]<sub>Creator</sub> вече цяла седмица  
President-DEF already whole week  
съставя [служебно  
forms caretaker  
правителство]<sub>Created entity</sub>.  
government.

‘For a whole week already the president has been trying to form a caretaker government.’

(11) Frame: **Achieving first**

[Учените]<sub>Creator</sub> постоянно изобретяват  
Researchers-DEF constantly invent  
[нови технологии]<sub>Created entity</sub>.  
new technologies.

‘Researcher constantly keep inventing new technologies.’

In the observed examples, we can summarise several different realisations of the frame element **Created entity** which denote atelic semantic interpretation of the verb (as an activity) rather than a telic one (as an accomplishment). Let us

illustrate these with variations to Example 8 above, where the **Created entity** is not specified. In order to achieve an atelic interpretation, the **Created entity** can be expressed as: (a) an uncountable, collective, abstract or generalised entity (e.g., poetry, Example 12); and (b) plural and indefinite (e.g., poems, Example 13).

(12) Frame: **Text creation**

[Ванцаров]<sub>Author</sub> пише [поезия]<sub>Created entity</sub>,  
Vaptsarov writes poetry  
за да задоволява творческия си плам.  
so that fulfill his creative flame.

‘Vaptsarov writes poetry in order to fulfil his creative drive.’

(13) Frame: **Text creation**

[Ванцаров]<sub>Author</sub> пише  
Vaptsarov writes  
[стихотворения]<sub>Created entity</sub>, за да  
poems so that  
задоволява творческия си плам.  
fulfill his creative flame.

‘Vaptsarov writes poems in order to fulfil his creative drive.’

However, Examples 14, 15 and 16 demonstrate different cases of the expression of telicity. The **Created entity** is definite, however may not be entirely fixed or fully determined, e.g. we may not know the beginning of the set *the last poems* or the end of the set of poems collectively named *the first poems*. While in Examples 14 and 15 additional circumstances are revealed, e.g. the *Place* (prison; which also refers to the time of the situation and can be interpreted as *while he was in prison before his death*) or the *Time* (in his youth), then in Example 16 such time-related details are not present. Moreover, Example 16 poses the question whether the presence of a span defined by a (sub)set of the **Created entity** (e.g., first poems) or a time interval (e.g., in his youth), is sufficient for the telic interpretation, as compared to Example 17 (similar also to Example 8) which does not imply an end point although in fact also refers to a limited time span (Vaptsarov’s life).

(14) Frame: **Text creation**

[Ванцаров]<sub>Author</sub> пише  
Vaptsarov writes  
[последните си стихове]<sub>Created entity</sub>  
his last poems-DEF  
[в затвора]<sub>Place</sub>.  
in prison.

‘Vaptsarov writes his last poems in prison.’

(15) Frame: **Text creation**

[Вапцаров]<sub>Author</sub> пише  
Vaptsarov writes  
[първите си стихове]<sub>Created entity</sub>  
his first poems-DEF  
[в младежките си години]<sub>Time</sub>  
in his youth years.

‘Vaptsarov writes his first poems in his youth.’

(16) Frame: **Text creation**

[Вапцаров]<sub>Author</sub> пише  
Vaptsarov writes  
[първите си стихове]<sub>Created entity</sub>  
his first poems-DEF  
[под влияние на поезията на Яворов]<sub>Explanation</sub>  
influenced by Yavorov’s poetry.

‘Vaptsarov writes his first poems under the influence of Yavorov’s poetry.’

(17) Frame: **Text creation**

[Вапцаров]<sub>Author</sub> пише [X]<sub>Created entity</sub>  
Vaptsarov writes  
[под влияние на поезията на Яворов]<sub>Explanation</sub>  
influenced by Yavorov’s poetry.

‘Vaptsarov writes under the influence of Yavorov’s poetry.’

## 7 Future work

A set of principles can be derived for the consistent semantic description of verbs of creation through FrameNet semantic frames. In particular, the identification of inconsistencies and gaps in the hierarchical structure in each of the two resources, WordNet and FrameNet, can be beneficial – such as frames which are not defined, e.g. we can see that WordNet represents a more diverse and fine-grained subclasses within the class of verbs of creation, while FrameNet does not offer a complete system of frames to cover all nuances; this will also apply to the system of frame elements to adequately reflect the level of specialisation and concretisation of meanings.

Moreover, the scalability, or gradability of the frame element **Created entity**, e.g. the so-called incremental theme, is an essential semantic feature which to a large degree determines the syntactic realisation of the verb, so it is an important semantic feature to implement in frame element

description. It can be introduced as a separate semantic feature on the frame element, and the relevant syntactic realisations should be explored in more details.

Further, other non-core frame elements within the semantic frames evoked by verbs of creation are also key in determining the telic and atelic realisation of the verb in context. As shown by the examples, these can be **Time** (expressed as prepositional phrases, adverbial phrases, clauses, etc.), **Place** (in some cases with temporal references as well). Questions regarding the possible interpretations arise when the sentence is focused on describing additional aspects of the situation, e.g. **Explanation**, **Purpose**, **Manner**, etc., and whether and when these cases can be considered as atelic.

The current study outlines some of the main specific features of the verbs denoting creation and does not aim at completeness and extensive coverage of all semantic classes, their description, or comprehensive representation of the features governing their realisation in a sentence. As is evident from the data, the class of verbs of creation covers a wide range of semantically diverse verbs. A more in-depth analysis is required to uncover the specific features of certain subclasses within the class and be able to fully describe their syntactic realisation and alternations. Moreover, this will be a substantial step towards their automatic identification and processing.

## Acknowledgments

This paper is carried out as part of the scientific programme under the project *An Ontology of Activity Predicates – Linguistic Modelling with a Focus on the Bulgarian Language* funded by the Bulgarian National Science Fund (Grant Agreement No. KP-06-N80/9 of 8.12.2023).

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