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PRESENTATION OF THE VERBS IN BULGARIAN-POLISH ELECTRONIC DICTIONARY

Abstract

This paper briefly discusses the presentation of the verbs in the first electronic Bulgarian-Polish dictionary that is currently being developed under a bilateral collaboration between IMI-BAS and ISS-PAS. Special attention is given to the digital entry classifiers that describe Bulgarian and Polish verbs. Problems related to the correspondence between natural language phenomena and their presentations are discussed. Some examples illustrate the different types of dictionary entries for verbs.

Keywords: aligned bilingual corpus, digital resources, digital entry classifiers, electronic dictionary, event, state.

1 Introduction

The first Bulgarian-Polish digital bilingual resources (currently under development and continuously growing with the addition new features) are the main result of the collaborative work under the joint research project "Semantics and contrastive linguistics with a focus on a bilingual electronic dictionary" between IMI-Bulgarian AS and ISS-Polish AS, coordinated by L. Dimitrova (IMI-BAS) and V. Koseska (ISS-PAS). These resources include the first Bulgarian-Polish digital corpus, the starting point of the collaborative investigation, and the first Bulgarian-Polish electronic dictionary. The Bulgarian-Polish digital corpus (Dimitrova, Koseska, 2009a, 2013) contains two parts: a parallel corpus (parallel texts in Bulgarian and Polish, whereby the translation correspondence is 1 : 1) and a comparable corpus that includes digital texts in Bulgarian and Polish (literary works, excerpts from newspapers, Internet textual documents, with the text sizes being comparable across the two languages). Some texts of the parallel corpus are annotated at the "paragraph" level or at the "sentence" level according to the digital text annotation standards and form the so-called aligned corpus.

Mono- and multilingual corpora are large repositories of natural language data with an important role in natural language processing. These digital resources are widely applicable to contrastive studies in a multilingual context (Dimitrova, Koseska, 2012), as well as in education for language learning or training of translators (human). They are a valuable multilingual dataset for language engineering research and development, especially for training of the software tools for machine translation. A special kind of bilingual corpora — aligned corpora — are intended to provide language data for digital dictionaries.

How the headwords of the Bulgarian-Polish electronic dictionary were chosen: the selection of headwords to be included in the dictionary is based on the Bulgarian-Polish aligned corpus: the main forms (lemmata) of the most frequent word forms in the corpus are selected. The words distribution according to POS-classification follows the procedure for selecting of headwords included in the six monolingual lexical databases of CONCEDE project: **open** POS — no more than 90%, **closed** POS — minimum 10% of the whole set of lemmata chosen. In this case, the Bulgarian-Polish aligned corpus provided information that was included in the dictionary entries of an experimental version of the Bulgarian-Polish electronic dictionary (Dimitrova, Dutsova, 2012). Some examples of the dictionary bound up with the Bulgarian-Polish aligned corpus follow:

> **напиш|а, -еш** vp. event, transitive; napisać event, transitive; **Сложих лист на машината и се опитах да ∼а телеграма до Варшава.** Wkręciłem papier w maszynę i próbowałem napisać depeszę do Warszawy [R. Kapuściński, Bulgarian-Polish corpus]

> **I напомня|м, -ш** vi. state, intransitive; przypominać state, intransitive; **Вътрешността на улдера ∼ше донякъде на експерименталната ракета "Термо Факс", която някога пилоти'рах...** Wnętrze uldera przypominało trochę eksperymentalną rakietę Termo-Fax, którą kiedyś prowadziłem...; **... а стартовите площадки върху тръбните опори напомняха на етажерки...** a lądowiska, które wystawały z nich na tle nieba, wysunięte w powietrze na rurowych przęsłach, przypominały etażerki. [S. Lem, Bulgarian-Polish corpus]

With the above examples we show how valuable are the links between the Bulgarian-Polish aligned corpus and the Bulgarian-Polish dictionary (Dutsova, 2013; Dimitrova & Dutsova, 2013; Dutsova, 2014 (in this volume)).

2 Advantages of the Digital Dictionary

It is well known that the creation of every kind of dictionary is a continuous and time-consuming process. The preparation of a single paper dictionary takes several months (or even years), and the dictionary remains unchangeable after publication, i.e. a paper dictionary is a static collection of dictionary entries. On the contrary, a digital dictionary is a dynamic collection of dictionary entries which provides a dynamical structure of the dictionary entry per se. The process of word collection in it can be continuously expanded. New dictionary entries can be added or their content can be enriched by the addition of supplementary information (grammatical, etymological) about the headword, of examples (for clarification of usage), of phrases and combinations, and when necessary — but not least — by the correction

of various mistakes. The system of classifiers used for structuring the dictionary entry content could be improved in order to describe optimally the headword. The digitally-presented information (digital content of the dictionary entries) can with time serve the purposes of not only one, but multiple dictionaries (e.g. its usage for the creation of a new (or different type of) digital dictionary of synonyms, antonyms, word-forming, etc, based on the main digital dictionary). For example, two monolingual digital dictionaries (explanatory or terminological) in two different languages can be used to produce a new bilingual dictionary, although in practice that is non-trivial.

3 Verbs in Bilingual Dictionaries and headword in the Verb Entry

Here, we devote special attention to the presentation of a verb, because verbs are the richest POS with specific characteristics.

It is a common practice to list as a headword in the dictionary entries the infinitive of the verb. In Bulgarian the infinitive has disappeared and has been functionally replaced by the "да-construction", which connects the particle "да" to the present tense forms. In this respect Bulgarian is more similar to other Balkan languages (modern Greek, for example), but differs from Polish where the infinitive is preserved. This is an important example for the requirement of distinguishing a form from its function and meaning. The present tense form in this case does not have "present tense"-meaning. In the Bulgarian verb entries it is accepted to list as headword the 1st person singular form of the present tense. In Bulgarian, a very well developed system exists for expression of the "tense"-category: there are forms to express nine different verb tenses. The verb also supports the expression of the following grammatical categories: person, number, voice, aspect, tense and mode. Depending on particularities of their lexical meaning, Bulgarian verbs are classified as either transitive (which allow a direct object — the action is transferred from the subject to another object), or intransitive (the action is not transferred to an object). In traditional printed dictionaries not all specifications are encoded and presented by the appropriate classifiers.

The main difficulty in the creation of a bi- or multilingual digital dictionary lies in the fact that in every language the lexical form has not just one, but several meanings. We could not expect that these meanings overlap across the respective compared languages. This is the reason why in such cases we should follow the content and not the lexical form, which is exemplified by our experience with the "Semantic Category of Time", 7th volume of the Bulgarian-Polish Contrastive grammar (Koseska, 2006).

Another problem for the development of a digital dictionary is the choice of classifiers of the data that form the different types of dictionary entries, depending on the headwords POS. This is an issue of harmonization of the classifiers for various languages, the solution of which has to present a unified selection of classifiers and a standard form of their presentation. In a broader sense, the issue of unification of classifiers in the dictionary entry approaches the issue of a new part-of-speech (POS) classification keeping in mind the specifications of a digital dictionary. It is accepted that classifiers carry different morphosyntactic and/or semantic characteristics of the words (in particular, the dictionary entry) and split the set of

words according to properties. Most often the classifier connects the word with its respective part of speech depending on the class to which the word belongs. However, the classifier can show specific features of the word, such as gender, number, tense, etc. Tense is a meaning of the form, but has not been fully defined. At the present stage of research the POS-classification in a natural language is based on different criteria (morphological, syntactic or "narrow" semantic) which are reduced only to the separation of grammatical categories. Thus the POS-classification is different not only depending on the language but is also significantly different in certain languages. That's why the digital form of the dictionary requires the word-forms of the languages compared to be bilaterally classified, and not unilaterally, according to the source language only, as is the case with standard printed bilingual dictionaries. So far, the meaning of the forms has been the main obstacle of the description, dictionaries and corpora, both mono- and bilingual.

Our suggestions are grouped around the mode of form classification and the mode of writing the meanings of verb tense forms (two types with exact definition that can be "translated" in a formal language, for example, Petri nets).

4 Verbal form of aspect, the meaning of time and the net description of the time

Let us address the problems associated with verbal forms and their meanings, without which we could not introduce semantic classifiers of verbs in the dictionary entry. We must emphasize that the introduction of semantic classifiers is needed in order to distinguish verb forms from their aspectual and temporal meanings (Koseska, 2009). It's well known that the ***classifier for aspect*** of a verb is universally accepted. However, we need to stress here that such a classifier is obligatory in the dictionary entry for a Slavic language. If we want to use the bilingual dictionary to compare Bulgarian and Polish verbs, we have to start from the aspectual-temporal meanings rather than from grammatical forms.

Traditional dictionaries do not pay attention to the fact that the aspect classifier concerns the form of the verb only by showing it as perfective or an imperfective, but this classifier does not define the meanings of the perfective and imperfective forms of the verb.

The verbal aspect in Slavic languages is a well-formed grammatical category whose meaning expresses either ***events*** — by the perfective aspect, or ***states*** — by the imperfective aspect, where "***event***" and "***state***" are interpreted via the net description of temporality in a natural language (Koseska-Toszewa, Mazurkiewicz 1988, Koseska, Mazurkiewicz 2010). This is the reason why **we have introduced in the dictionary a semantic classifier** with two values "***event***" and "***state***" for describing the semantic category of time.

We must also distinguish between forms and the meanings of the forms in the dictionary entries. In traditional grammatical descriptions this distinction is missing, which creates intolerable errors in the description of the respective language. This is especially important for the aspect characteristic of the verbs in Slavic languages, where the category "aspect" is not only semantic but also grammatical. The connection of the "aspect" category to temporality depends on the interpretation of "aspect" category. If we assume that "aspect" is a semantic category, the

question about its relation to the semantic category "temporality" is inevitable. According to some Bulgarian linguists, "*aspect cannot be treated separately from tense*" (Ivanchev, 1971), according to others the tenses are meanings independent from the meaning of the "aspect" of the verbal form (Andrejchin, 1944). In languages such as Polish, Czech, Slovak, Ukrainian and Russian, in which "aspect" is a strongly developed semantic and grammatical category, there are few tense forms. This is not the case in South Slavic languages, in which, for example, in Bulgarian, has a high number of tense forms as well as a strongly developed semantic and grammatical category "aspect". As we know, the languages which lack the grammatical category "aspect", such as Latin, French, Italian or Spanish, has a high number of tense forms. As mentioned in (Koseska-Toszewa, 2009), there are two distinct tendencies in the South Slavic languages — the first towards reduction of tense forms (Croatian/Serbian), the second one towards reduction or extinction of the aspect. So it should happen in Bulgarian and Macedonian, but does not!

5 Distinction of the Language Forms and Their Meanings

Without making a distinction between language forms and their meanings we would not get a clear idea of how we could benefit from the parallel corpora. In order to distinguish a form from its meaning, however, we must accurately define what is understood by the meaning of a given language form. We cannot do this without basic research of the set of meanings of this form because the language forms rarely have just one meaning.

For example, the imperfective form of the present tense in Polish and in Bulgarian has four meanings: present, past (historical), future and habituality (Grochowski, 1972).

In Polish, Russian or Ukrainian the past perfect tense is formed from **perfective verbs**, indicating an ***event*** (as in Petri nets theory, refer to 5.1) and has the following meanings: **(1)** ***event*** and **(2)** ***a sequence*** of states and events terminating with an ***event before*** the state of speaking, and **(3)** ***event*** or ***sequence*** of states and events ***parallel*** of the state of speaking (in English this is the meaning of perfect praesens form). In Bulgarian the first two meanings are expressed by the aorist perfective form, and the third meaning — by the form of perfective perfect.

It should be noted that the net model for description of time allows a given event be parallel to the moment of speaking (Koseska, Mazurkiewicz, 2010). In Bulgarian these meanings, as already mentioned, are expressed by different verbal forms: the first by aorist of perfective and imperfective aspect (example A from Bulgarian-Polish corpus), the second by perfect of perfective aspect (example B):

Example A:
Bg: **Раненият в корема не *издържа* дълго, изохка, изви се, сякаш танцу'ваше, и рухна на земята.** Pl: Ten z raną w brzuchu nie ***wytrzymał*** długo, stękał, zrobił obrót jak w tańcu, upadł na ziemię. [R. Kapuściński, Bulgarian-Polish corpus]
Example B:
Bg: **Той *е избягал* от затвора.** Pl: On ***uciekł*** z więzienia. /Eng: He escaped from prison./

In Polish in both cases we have the same praeterital form, which in Bulgarian language corresponds to the perfect form, not only to the aorist form.

From the sentence of example B "*He escaped from prison.*" we obtain the information that the ***event*** "ucieczka /Eng: *escape*/ occurred before the state of speaking, and as a result of this ***event***, a discrete state appeared parallel to the state of speaking, namely "*He is on the loose.*"

Based on Bulgarian language material we see the importance of aspectual-temporal relations in the language. Therefore, the forms and meanings of time, especially with respect to Bulgarian, are a key problem that must affect the dictionary entry in every bilingual dictionary, which contains Bulgarian. It must be stressed that the Bulgarian language differs typologically from the other Slavic languages: it is an analytic language, and not synthetic (like Polish language), has no cases (except some vestiges of vocative), but has many tense forms as well as well-formed category "aspect". In some respect Bulgarian resembles a lot more English or Romance languages (French or Italian) than the other Slavic languages.

5.1 Let us discuss in more detail the meanings of perfective or imperfective verbal forms, presented by the nets theory for time description, called "Petri nets".

The "Petri nets" theory was firstly applied to the natural languages by V. Koseska and A. Mazurkiwiecz (Mazurkiwiecz, 1986; Koseska & Mazurkiewicz, 1988).

It is important to underline that through this theory we can describe the semantic category of time using the three basic notions: ***event***, ***state***, and a ***relation*** of "succession", indicating the antecedence and succession in sequences of events and states, referable to the state of speaking. Such a possibility follows from the difference between the concepts ***state*** and ***event***, and from the net description of these basic notions of temporality in natural language.

Following Reichenbach's theory (Reichenbach, 1967), the linear description of temporal meanings is the most frequently applied description of temporal semantics in natural languages. This theory does not exhaust the many meanings of the time, though it mainly refers to English, which has many formally expressed temporal meanings. English, however, does not have formally expressed aspectual meanings, as do the Slavic languages. The weakest point in Reichenbach's theory is the expression of different meanings of the time with the same notion (**event**), refer to V. Koseska in this volume.

5.2 The definition of a given temporal meaning, not just the form of a time, is easy and affordable if we know what this meaning is.

It is determined by the following rule: THE FORMS OF PERFECTIVE ASPECT correspond to the above meanings (1) ***event***, and (2) sequence of ... ***event before or parallel*** ... , and THE FORMS OF IMPERFECTIVE ASPECT correspond to (1) ***state***, and (2) sequence of ***states ... state referable*** ...

We must emphasize that in the dictionary entry we work with the infinitive form of the verb, which by definition has no directly connection to the semantic category of time, but relates only to the aspect of the verb. For this reason, only at sentence level in the corpora we can obtain information whether the temporal

meaning of the selected shape is (1) ***event*** or (2) ***event***, respectively (1) ***state*** or (2) ***state***, as the next examples shows:

Example C:
I **избягва|м, -ш** *vi. state, intransitive*; uciekać state, intransitive; [but in the example:] **Нищо не му *избягва*** (*sequence of states and events terminating with a state before the state of speaking*) **от око'то** *pot.* nic nie ***uchodzi*** (*sequence of states and events terminating with a state before the state of speaking*) jego uwagi

II избягва|м, -ш *vi. state, transitive*; unikać *state, intransitive*; **тя го *избягва*** (*sequence of states and events terminating with a state before the state of speaking*) ona go ***unika*** (*sequence of states and events terminating with an event before the state of speaking*).

Example D:
I **изб|ягна, -егнеш** *vp. event, transitive*; uciec *event, intransitive*; v. **избягвам I**

II изб|ягна, -е'гнеш *vp. event, transitive* uniknąć *event, intransitive*; v. **избя'гвам II**; **Със светкавична бързина легнах на дъното, протягайки ръка нагоре, тя премина през дънера, без да го докосне, не почувствувах нищо, както и очаквах, но въпреки това илюзията, че по чудо *избягнахме*** ((2) *event — a sequence of states and events terminating with an event before the state of speaking*) **катастрофата, остана ненарушена**. Błyskawicznie przypadłem, ale jednocześnie uniosłem rękę i przeszła przez pień nie dotknąwszy go, nie poczułem nic, jak tego oczekiwałem, a mimo to złudzenie, że cudem ***uniknęliśmy*** ((2) *event — a sequence of states and events terminating with an event before the state of speaking*) katastrofy, pozostało nienaruszone. [S. Lem, Bulgarian-Polish corpus]

Example E:
навед|а -еш *vp. event, transitive*; pochylić, schylić *event*, transitive; v. **навеждам; ~ се** *aux. event*; pochylić się, *schylić się*; **И ние един след друг се ~*охме*** ((2) *event — sequence of states and events terminating with an event before the state of speaking*), **преминавайки през тесните проходи на пещерата**. I po kolei ***schyliliśmy*** się ((2) *event — sequence of states and events terminating with an event before the state of speaking*) w wąskim wylocie jaskini. [S. Lem, Bulgarian-Polish corpus]

We could determine if it is a first or a second meaning of the state only by means of the example from Bulgarian-Polish corpus, given in the entry.

6 Classifiers in the Bilingual Dictionary

Hereby discussed classifiers in our electronic dictionary differ from the classifiers in traditional dictionaries! We attach classifiers not only to the Bulgarian headwords (as a source language words) but also to their translation equivalences. This description ensures

- the possibility to obtain, for example, automatically a Polish-Bulgarian entry from a Bulgarian-Polish entry, using the well-structured Lexical Database (Dimitrova, Panova, Dutsova, 2009);

- an extension aiming at the deeper study of linguistic problems in both languages (see Dimitrova, Koseska, 2009b).

6.1 Syntactic classifiers — the phenomenon "transitivity/intransitivity": the dictionary entry classifiers must reflect the specifics of the compared languages. One of the important classifiers of the verbal form that has to be included in the dictionary entry refers to the phenomenon transitivity or intransitivity of the verb.

According to the tradition in the older Bulgarian and Polish grammars, transitivity and intransitivity used to be considered as a phenomenon related to the ***voice of the verb*** (active or passive). In Polish and Bulgarian the verbs which form passive participles are called ***transitive***. They stand in contrast to the ***intransitive*** verbs which do not form such participles.

Recently, some authors suggest transitivity and intransitivity to be treated as a syntactic phenomenon. They do not introduce the "voice" category in the description of Polish morphology (Saloni, Gruszczyński, Woliński, Wołosz, 2007).

In our opinion the tendency of including more classifiers in the dictionary entry which we consistently follow, makes us confirm the necessity of a ***classifier reflecting transitivity or intransitivity*** of the verb (Dimitrova, Koseska-Toszewa, 2008a–b).

The following examples show the difference between specifications of the syntactic phenomenon "transitivity/intransitivity" of verbs in Bulgarian and their correspondences in Polish:

настъп|я, -иш *vp. event*, *transitive*; nastąpić *event*, *intransitive*; v. **настъпвам**; **∼и мазола ми** nastąpił, nadepnął mi na odcisk

настъпва|м, -ш vi. *state*, *intransitive*; następować; nacierać *state*, *intransitive*; **войските ∼т** wojska nacierają

6.2 We note that in the dictionary very often one and the same form in Bulgarian can be perfective and imperfective aspect, but in Polish these aspectual difference are expressed in different forms. So we divide forms and mark them with I and II.

The situation is not the same as in the printed dictionaries where sometimes erroneous indications exist that some word-forms are simultaneously of perfective and imperfective aspect. The headword forms in the dictionary entry of the digital dictionary are indexed according to the number of meanings, and each different meaning is related unambiguously to the form. In this manner most meanings of the form can be encompassed. For example:

I очарова|м, -ш vp. *event*, *transitive* , urzec *event*, *transitive*

II очарова|м, -ш vi. *state*, *transitive*, urzekać *state*, *transitive*

6.3 The homonymous entries are indexed according to the number of meanings with I and II as next example shows:

I издържа|м, -ш *vi. state*, *transitive*; wytrzymywać *state*, *transitive*; **∼м болка** wytrzymuję ból; **∼ критика** wytrzymuję krytykę

II издържа|м, -ш *vi. state*, *transitive*; utrzymywać *state*, *transitive*; **∼м семейство** utrzymuję rodzinę; **∼м се** *aux. state* utrzymywać się

We need to emphasize that we should not fear the greater quantity of dictionary entry classifiers in the electronic dictionary. On the contrary, this is an advantage of the electronic over the printed dictionary.

7 Conclusion

In this article we have discussed the problems that concern the choice of classifiers of the Bulgarian verb as a headword and its translation equivalents in Polish for an adequate presentation in the dictionary entry of bilingual electronic dictionary. These problems have not been sufficiently addressed so far.

In our opinion it is mandatory to use the syntactic and semantic classifications in the dictionary entry for verbs — in order adequate representation of Bulgarian and Polish verbs. These classifiers help to distinguish the form from the meaning. It is only this way we can make a step forward toward the automated machine translation.

Besides, our work on the Bulgarian-Polish dictionary shows the need to connect the dictionary content with the aligned Bulgarian-Polish corpus, a valuable repository of the Bulgarian-Polish & Polish-Bulgarian parallel texts.

References

Andrejchin, L. (1944). *Osnovna bŭlgarska gramatika*. Sofiia.

Dimitrova, L., & Dutsova, R. (2013). Web-application for the Presentation of Bilingual Corpora (Focusing on Bulgarian as One of the Two Paired Languages). *Cognitive Studies | Études cognitives*, *13*, 183–193. doi: 10.11649/cs.2013.012.

Dimitrova, L., & Dutsova, R. (2012). Implementation of the Bulgarian-Polish Online Dictionary. *Cognitive Studies | Études cognitives*, *12*, 219–229.

Dimitrova, L., & Koseska-Toszewa, V. (2008a). Some Problems in Multilingual Digital Dictionaries. *Cognitive Studies | Études cognitives*, *8*, 237–254.

Dimitrova, L., & Koseska-Toszewa, V. (2008b). The Significance of Entry Classifiers in Digital Dictionaries. In L. Iomdin, & L. Dimitrova (Eds.), *Lexicographic Tools and Techniques. Proc. of the MONDILEX First Open Workshop, Moscow, Russia, 3–4 October 2008* (pp. 89–97). Moscow: Russian Academy of Sciences, IITP.

Dimitrova, L., & Koseska, V. (2009a). Bulgarian-Polish Corpus. *Cognitive Studies | Études cognitives*, *9*, 133–141.

Dimitrova, L., & Koseska, V. (2009b). Classifiers and Digital Dictionaries. *Cognitive Studies | Études cognitives*, *9*, 117–131.

Dimitrova, L., & Koseska, V. (2012). Bulgarian-Polish Parallel Digital Corpus and Quantification of Time. *Cognitive Studies | Études cognitives*, *12*, 199–208.

Dimitrova, L., & Koseska, V. (2013). Bulgarian-Polish Language Resources (Current State and Future Development). *Cognitive Studies | Études cognitives*, *13*, 161–170. doi: 10.11649/cs.2013.010.

Dimitrova, L., Panova, R., & Dutsova, R. (2009). Lexical Database of the Experimental Bulgarian-Polish online Dictionary. In R. Garabík (Ed.), *Metalanguage and Encoding*

Scheme Design for Digital Lexicography. Proc. of the MONDILEX Third Open International Workshop, 15–16 April 2009, Bratislava, Slovakia (pp. 36–47). Brno: Tribun EU.

Dutsova, R. (2013). Web-application for Presentation of Bulgarian Language Heritage: Bilingual Digital Corpora and Dictionaries. In P. Stanchev, R. Pavlov (Eds.), *Digital Presentation and Preservation of Cultural and Scientific Heritage. Proc of the International Conference DiPP'2013, 18–21 September 2013* (pp. 99–108). Veliko Tarnovo, Bulgaria.

Dutsova, R. (2014). Web-based Software System for Processing Bilingual Digital Resources *Cognitive Studies | Études cognitives*, *14*, 33–43. doi: 10.11649/cs.2014.004.

Grochowski, M. (1972). Znaczenia polskiego czasownika: aktualne, potencjalne, uniwersalne, w świetle kategorialnego znaczenia form „czasu teraźniejszego". *Studia semiotyczne*, *3*, Wrocław.

Ivanchev, S. (1971). *Problemi na aspektualnostta v slavianskite ezitsi*. Sofiia: BAN.

Koseska-Toszewa V. (2006). *Bułgarsko-polska gramatyka konfrontatywna* (Vol. 7), *Semantyczna kategoria czasu*. Warszawa.

Koseska-Toszewa, V. (2009). Form, its meaning, and dictionary entries. In R. Garabík (Ed.), *Metalanguage and Encoding Scheme Design for Digital Lexicography. Proc. of the MONDILEX Third Open International Workshop, 15–16 April 2009, Bratislava, Slovakia* (pp. 105–111). Brno: Tribun EU.

Koseska-Toszewa, V., & Mazurkiewicz, A. (1988). Net Representation of Sentences in Natural Languages. In *Lecture Notes in Computer Science 340. Advances in Petri Nets* (pp. 249–266). Berlin: Springer-Verlag.

Koseska V., & Mazurkiewicz, A. (2010) *Time flow and tenses*. Warszawa: SOW.

Mazurkiewicz, A. (1986). Zdarzenia I stany: elementy temporalności. In V. Koseska-Toszewa, I. Sawicka & J. Mindak (Eds.), *Studia gramatyczne bułgarsko-polskie* (Vol. I: Temporalność, pp. 7–21). Wrocław: Ossolineum.

Reichenbach, H. (1967). Analiza języka potocznego. In *Logika i język*, Warszawa: Państwowe Wydawnictwo Naukowe.

Saloni, Z., Gruszczyński, W., Woliński, M., & Wołosz, R. (2007). *Słownik gramatyczny języka polskiego*. Warszawa: Wiedza Powszechna.

Stieber, Z. (1973). *Zarys gramatyki porównawczej języków słowiańskich. Fleksja werbalna*. Warszawa: Państwowe Wydawnictwo Naukowe.

Publisher: Institute of Slavic Studies PAS & University of Silesia in Katowice