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Representation of indirect senses of adjectives in Word Net and Ru Word Net

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Abstract

Much research has been devoted to studying the ways polysemous words are represented in electronic linguistic databases, ontologies and thesauri. This study reports the ongoing project (since 2018) aiming at providing a Complex Analysis of the Structure and Content of RuWordNet Thesaurus. In our paper we focus on figurative language, in particular, indirect meanings of polysemous adjectives and compare the ways they are represented in English WordNet and Russian RuWordNet. We use the term 'indirect sense' to indicate literal meanings developed as a result of primary meaning. To collect the data for the study, we applied the continuous sampling method and extracted 20 polysemous adjectives from WordNet and traced their equivalents in RuWordNet. The research data was limited to two groups of adjectives: color terms and adjectives describing the weather. The comparison of adjectives in two lexical databases showed the ratio of indirect senses to all senses as 77.8% in WordNet and 48.9% in RuWordNet. The data analysis indicates that the presentation of indirect senses of polysemous adjectives in WordNet and RuWordNet is different, and the low ratio for RuWordNet is explained by the use of hypernym/hyponym relations. The study also showed that color terms presented in both databases illustrate certain differences in English and Russian linguistic world views.

Keywords: figurative language; indirect sense; adjective; WordNet, RuWordNet

1. Introduction

Lexical databases, thesauri, ontologies and other electronic resources are effective tools for the study of semantics, in particular, polysemy and figurative meanings of words. Systematic relations between word senses and issues of figurative language representation in electronic resources are discussed in various research papers (Fellbaum, 1998; Peters, 2004; Veale, 2004; Handl, 2011; Chugur et al., 2002). However, representing figurative language in WordNets is a challenge, so is modeling of polysemous word senses in empirical computational semantics for applications of NLP (Boleda et al., 2012; Ravin et al., 2000). The present study is developed within the ongoing project (since 2018) aiming at providing a Complex Analysis of the Structure and Content of RuWordNet Thesaurus, the largest database for the Russian language.

In this study, we focus on figurative language, in particular, indirect meanings of polysemous adjectives and compare the ways they are represented in English WordNet and Russian RuWordNet. The terms 'figurative language', 'figurative meaning (sense)', and 'indirect meaning' are interpreted

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differently in English and Russian scientific works (Handl, 2011; Hanks, 2004; Apresyan, 1995). We use the term 'indirect' to define literal meanings developed as a result of metaphorical or metonymical extensions of a primary meaning.

Figurative language and its representation in WordNet has been discussed in numerous research works (Fellbaum, 1998; Peters, 2004; Hanks, 2004; Lohk et al., 2019; Tomuro, 1998). However, little information is found how figurative senses are presented in RuWordNet thesaurus. This study aims to partially compensate for the lack research in this field.

2. Literature Review

2.1. WordNet and RuWordNet Lexical Databases

WordNet (frequently referred to as Princeton WordNet) is a lexical database of the English language. WordNet contains 155327 words including: verbs, nouns, adjectives and adverbs. Information about word senses is organized around 117000 unordered sets of synonyms (synsets) which are in conceptual-semantic and lexical relations. Synset members might be single (simplex) words, phrasal verbs, collocations, idioms, etc. WordNet synsets are usually illustrated by glosses (semantic indicators of word senses in the form of a short definition) and sentences, which help to clarify the senses. Synsets are related to each other, presenting a semantic network, and several types of pointers are used to indicate certain semantic relations: hypernymic/hyponymic (super-subordinate relation), meronymic/holonymic (part-whole relation), cause, etc. So, WordNet's structure makes it a unique form of information storage and a tool for computational linguistics and for solving various NLP tasks (Fellbaum, 1998, 2012; Miller, 1995).

RuWordNet is a modern thesaurus for the Russian language created on the basis of semi-automatic transformation of another thesaurus of the Russian language RuThes into the WordNet format (Loukachevitch et al., 2016). The structure of RuThes is quite different from WordNet-like resources. According to Loukachevitch, RuThes presents ontology for NLP, and the concepts are mainly introduced in the form of a hierarchical network of ontological synonyms presenting authentic language expressions (Loukachevitch et al., 2019). These RuThes concepts which are directly related to the semantic meanings of words and expressions of the Russian language are used to systematize the network of synonyms and synsets in RuWordNet. At present RuWordNet is one of the best resources of synonyms in automatic word processing.

RuWordNet contains 111500 words and expressions of the Russian language presented in the form of synsets of three parts of speech: 29297 synsets of nouns (including simplex nouns, noun groups, multi-word expressions and prepositional groups), 12865 synsets of adjectives (simplex adjectives and adjective groups), and 7636 synsets of verbs (simplex verbs and verb groups). RuWordNet establishes hypernymic/hyponymic, meronymic/holonymic and antonymic relationships, as well as the relationships of instance-class, reason, logical sequence, POS-synonymy and subject area (domain) (Loukachevitch et al., 2016, 2019; Solovyev et al., 2020; Bochkarev & Solovyev, 2019).

2.2. Figurative Meaning vs Indirect Meaning

There are several important issues to consider regarding the ambiguity of word meaning. If homonymy is the relation (often as a result of coincidence) between words with identical forms but different meanings, polysemy is viewed as a type of 'lexical ambiguity' when a word has a certain number of related meanings or a common element of meaning (Peters, 2004; Veale, 2004; Apresyan, 1995).

Description of the meanings of polysemous words in WordNet-like databases is accompanied by certain difficulties. In WordNet, in case if a string occurs in more than one synset in the hierarchy, it is considered polysemous (Fellbaum, 1999).

Some researchers recognize that the differences in word senses in WordNet are too subtle for computer applications. Verbs and adjectives have a particularly large number of senses, for example, 44 senses for the verb give and 21 for the adjective good (Loukachevitch et al., 2016). Moreover, the number of senses of certain lexical units sometimes differs significantly in various lexical resources. The problem of lexical polysemy for computer applications is aggravated by the fact that WordNet synsets corresponding to the meanings of polysemous words, in most cases, do not have any relations with each other. These problems have led to the challenge of clustering polysemous words senses (Lacalle & Agirre, 2015).

The study of polysemy makes it necessary to consider the principles of describing figurative language. As soon as the figurative use of a word becomes sufficiently stable and functions as a part of general language usage, a particular meaning (sense) is to be fixed in dictionaries. The importance of representation of the figurative language in electronic resources and lexical databases like WordNets is due to the fact that figurative words and multi-word strings (including idioms, metaphors, metonymies etc.) abound in everyday language and are found in texts of many genres (Fellbaum, 1998). As Peters puts it, "if they [lexical resources] encode word meanings they somehow need to capture the fluidity of word meaning" (Peters, 2004, p. 12). Another logical assumption is that the frequency of senses plays a crucial role in their initial activation, and the more frequent the sense is, the sooner it is activated (Handl, 2011). In case of electronic resources and lexical databases, some limitations concern complicated constructions whose meanings (senses) go beyond the lexical level and are based on syntax as well, while 'completely frozen strings' can be integrated into the WordNet database as synonymous members of existing WordNet synsets (Fellbaum, 1998).

Hanks (2004) argues that any lexical resource should list norms of language use rather than dynamic exploitations of norms, which makes it necessary to provide recognition criteria for norms of word usage. According to Hanks, due to the vagueness of the term 'figurative language' the latter should not be described in WordNets and similar lexical databases and interpreting figurative language should be achieved by other means [Hanks, 2004, p. 11].

It has been stated that there is no agreement on the boundary between literal and non-literal language (Fellbaum, 1998), the dividing line between literality and non-literality is blurred rather than commonly assumed (Handl, 2011). Researchers claim that most lexicographers do not agree as to the quantity of senses a certain word should have, their semantic content and the way the words can be grouped (Masevich & Zakharov, 2020; Peters, 2004; Ravin et al., 2000) at the same time, they tend to agree that the boundaries between word senses are vague and overlapping.

According to Dowker, "there is a close relationship between polysemy and figurative language" because the former can be viewed as "both a consequence and cause of figurative language use" (Dowker, 2003, p. 325). Some polysemous meanings developed by the word are based on metaphorical or metonymical extensions of a primary meaning, as, for example, the primary meaning of a noun 'head' (part of a body) extended metaphorically to the sense 'head' (chief person) (Dowker, 2003, p. 325).

In the Russian lexicographic tradition the dictionary meanings of polysemous words are usually organized in the following way: direct meaning(s) of a word is (are) followed by indirect (based on metaphorical, metonymic or other types of transference) meanings. The indirect meanings that appear in the language not long ago are traditionally marked by a dictionary label 'indirect meaning'.

The analysis made in Section 2.2 revealed ambiguity in the way the terms ‘figurative language’, ‘figurative meaning (sense)’, and ‘indirect meaning’ are viewed in English and Russian. In this study, we use the term ‘indirect’ to indicate literal meanings developed as a result of metaphorical or metonymical extensions of a primary meaning.

2.3. Adjectives in WordNet and RuWordNet

Some studies which analyze the ways of structuring adjectives in different lexical semantic networks revealed that adjectives are vague and “highly dependent on the meaning of accompanying nouns” (Azarova & Sinopalnikova, 2004, p. 252), have no denotation scope of their own, need a specific semantic organization (Stefanova & Dimitrova, 2017) and, as a result, in many cases cannot be defined by means of the WordNet relations (Alonge et al., 2000). Ways of representing adjectives in WordNet and RuWordNet briefly given below illustrate these general observations.

In WordNet adjectives of two major classes are presented: descriptive and relational. The first class is descriptive adjectives which are frequently given as binary oppositions, for example, adjectives ‘short’ and ‘long’ are values of the attribute ‘LENGTH’. The second class is relational adjectives such as ‘commercial’ and ‘crystal’ which have no relation to a certain attribute. Except the above mentioned major classes, there is a separate type of adjectives, named color adjectives. According to Gross and Miller, “English color terms are exceptional in several ways. They can serve as either nouns or adjectives, yet they are not nominal adjectives: they can be graded, nominalized, and conjoined with other descriptive adjectives” (Gross & Miller, 1990, p. 272).

In RuWordNet adjectives are interlinked to a number of hypernyms that refer to core RuThes concepts. Such hypernyms as material (RuThes concept: ‘thing, artifact’) and qualitative (RuThes concept: ‘property, characteristic’) are the most frequently used, and some other hypernyms are: situational, background (RuThez concept: ‘circumstances, setting, conditions’), biological (RuThez concept: ‘living organism’), role (RuThez concept: ‘role, position, place’), emotional (RuThes concept: ‘feeling, emotion’) and others. Considering the semantic structure of the thesaurus, the examples of hypernyms are viewed as the most basic notions in the Russian language and adjective hyponyms linked to them describe more specific properties and states. The number of hyponyms that are linked to one hypernym can vary from several dozen (such as 13 hyponyms for a hypernym ‘printed’ (RuThes concept: ‘printed matter’) to several hundred (for example, a hypernym ‘material’ links 349 hyponyms and a hypernym ‘qualitative’ links 344). So, adjectives present the least developed part of speech in RuWordNet mainly because “presenting adjectives within a wordnet remains one of the most difficult and disputable matters of the lexical semantics” (Azarova & Sinopalnikova, 2004, p. 251).

2.4 Research Questions

In the present study, we answer the following questions:

1. How are indirect senses of adjectives presented in WordNet and RuWordNet?

2. Does the analysis of indirect senses of adjectives in WordNet and RuWordNet reveal differences in English and Russian linguistic world views?

3. Method

In this study the authors used an expert assessment analysis to describe the representation of indirect meanings (senses) of polysemous adjectives in WordNet and RuWordNet. We manually extracted adjectives in order to trace the ways WordNet and RuWordNet present polysemy and

indirect meanings based on metaphorical or metonymical extensions of a primary meaning. Our methodology involved three steps: 1) continuous sampling of polysemous adjectives in WordNet lexical database (N=20) and their equivalents in RuWordNet (N=20), 2) analysis of total number of adjective senses in WordNet (N=140) and RuWordNet (N=47), 3) detection of indirect senses of polysemous adjectives in WordNet (N=109) and RuWordNet (N=23) and finding the ratio of indirect senses to all senses. To verify the polysemy and indirect meanings the authors used English and Russian explanatory dictionaries. We anticipated that certain thematic groups of adjectives might show differences in English and Russian linguistic world views. For this reason, we decided to limit our research data to two groups of polysemous adjectives referring to basic concepts: color terms and adjectives describing the weather, as the qualitative assessment of the senses is to be a manual task (Peters, 2004, p. 13). So, the limited number of data is justified by the importance of an in-depth study rather than quantitative analysis.

4. Results and Discussion

4.1 Polysemous Adjectives in WordNet and RuWordNet

As stated earlier in Section 2.1, both WordNet and RuWordNet use synsets as the main tool to structure word senses, sense numbers, and hyper/hyponymic relations. However, certain differences in the network structure of the databases concern the ways synonyms are grouped: each synset in WordNet has a gloss, i.e. a brief definition, while in RuWordNet the synsets are linked to a particular RuThes concept. Moreover, for many polysemous words RuWordNet gives less word senses and more hyponyms than WordNet (see Fig. 1).

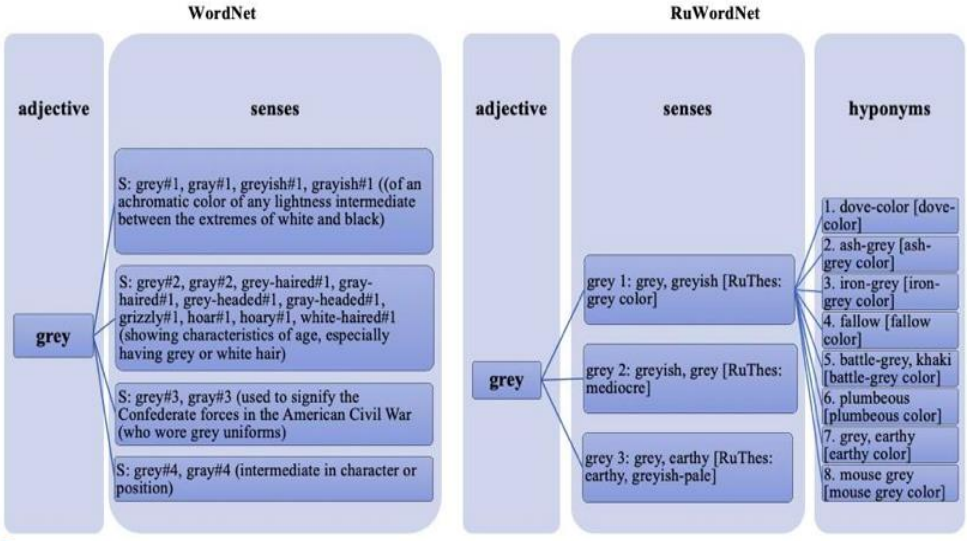

Figure 1. Presentation of senses for the adjective ‘grey’ in WordNet and RuWordNet

For the polysemous adjective ‘grey’ WordNet gives four senses: grey1, grey2, grey3 and grey4, each containing a brief definition, for example, for a gloss grey1 “of an achromatic color of any lightness intermediate between the extremes of white and black” (http://wordnetweb.princeton.edu/perl/webwn). In RuWordNet we can find three senses for the same adjective: grey1, grey2 and grey3, each belonging to a separate RuThes concept, for example, ‘grey color’ (RuThes concept for grey1). Moreover, RuWordNet suggests a list of eight hyponyms for the first sense (grey1) with a certain RuThes concept for each (see Fig.1).

To collect the data for the study, we applied the continuous sampling method and extracted 20 polysemous adjectives from WordNet and traced their equivalents in RuWordNet. The research data was limited to two groups of adjectives: color terms and adjectives describing the weather. We revealed the total number of synsets for 20 adjectives in WordNet (140 items) and RuWordNet (47 items). Finally, we detected indirect senses verifying the word meanings in explanatory dictionaries (Ozhegov, 1992; Efremova, 2006). The number of indirect senses of English and Russian adjectives was equal to 109 and 23 correspondingly. Thus, the ratio of indirect senses to all senses was 77.8% in WordNet and 48.9% in RuWordNet (for raw numbers, see Fig. 2).

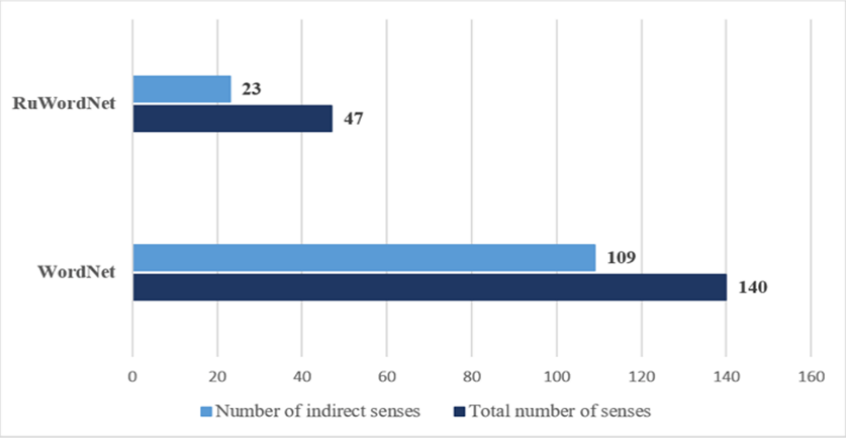

Figure 2. The ratio of indirect senses to all senses for polysemous adjectives in WordNet and RuWordNet.

Therefore, the following question raises: does the data prove that Russian polysemous adjectives reveal less indirect senses compared to English ones? We attempted to answer the question in Section

4.2 Indirect Senses of Polysemous Adjectives

To answer the question stated above, we firstly, analyzed all indirect senses and hyponyms given in RuWordNet, secondly, verified the meanings in Russian explanatory dictionaries, and finally, compared the ways the selected 20 polysemous adjectives are represented in WordNet and RuWordNet (see Table 1).

Table 1. Number of indirect senses of 20 polysemous adjectives in WordNet, RuWordNet and Russian Explanatory Dictionaries

Polysemous adjectives	WordNet	RuWordNet	Russian Explanatory Dictionaries
Black	12	–	11
Blue	7	–	2
Brown	1	–	–
Green	3	3	3
Grey	3	2	4
Pink	–	1	2
Red	2	–	4
White	11	–	9
Yellow	3	–	2
Clear	12	4	6
Cloudy	2	–	–
Cold	12	2	4
Foggy	2	2	3
Frosty	1	–	–
Hot	20	3	5

Icy	2	2	4
Sunny	1	1	1
Warm	8	2	2
Wet	4	–	–
Windy	3	1	1
Adjectives: 20	*Total senses: 109*	*Total senses: 23*	*Total senses: 63*

Then we compared the ways the selected 20 polysemous adjectives are represented in WordNet and RuWordNet. In case of adequacy of the required length of the paper, we have chosen only two polysemous adjectives 'black' and 'clear' and illustrate the differences in representation of their indirect meanings in WordNet, RuWordNet and classical explanatory dictionaries (see Tab. 2). The indirect meanings of other adjectives are given in Appendix section.

Table 2. Representation of indirect senses of adjectives 'black' and 'clear' in WordNet, RuWordNet and Russian Explanatory Dictionaries[2]

Polysemous adjectives	WordNet	RuWord-Net	Russian Explanatory Dictionaries
Black	**black2** (of or belonging to racial group) **black3** (marked by anger or hostility) **black4** (offering little or no hope), **black5** (stemming from evil characteristics or forces; wicked or dishonorable) **black6** (having unfortunate consequences) **black7** ((about face) made black as with suffused blood) **black9** (harshly ironic or sinister) **black10** (deliberately misleading) **black11** (distributed or sold illicitly) **black12** ((about character) deserving disgrace/shame) **black13** ((about coffee) without cream/sugar) **black14** (soiled with dirt)	–	1. belonging to aracial group 2. dark-skinned 3. impenetrable thick 4. gloomy, hopeless 5. dirty 6. evil 7. destructive (disease) 8. fake (PR) 9. illegal 10. back door, backstage 11. associated with Satan and Devil
Clear	**clear1** (apparent to the mind) **clear2** (free from confusion/doubt) **clear3** (affording free passage/view) **clear6** (characterized by freedom from disturbing thoughts) **clear7** ((about sound/color) free from anything that dulls or dims) **clear11** (free from clouds) **clear12** (free of restrictions or qualifications) **clear13** (free from flaws) **clear14** (clear of deductions) **clear15** (easily deciphered) **clear16** (freed from guilt) **clear17** (easy and quick in perceiving)	**clear2** (understandable) **clear3** (well defined) **clear4** (not darkened) **clear5** (calm and joyful)	1. cloudless 2. understandable 3. well defined 4. logical 5. evident 6. calm

The analysis of the results in Table 2 indicates that direct and indirect senses of polysemous adjectives embedded in WordNet are semantically related and numbered on the same page. Regarding RuWordNet, the indirect senses are presented in the hierarchy of the database, i.e. via

[2] The definitions for indirect senses of adjectives are quoted from WordNet: http://wordnetweb.princeton.edu/perl/webwn

hypernym/hyponym relations, though they are not always conceptually related as in case with the adjective ‘black’, while with other adjectives, for instance, ‘clear’, conceptual relations are indicated (see Tab. 2). So, Russian polysemous adjectives with indirect senses are structured in a different way. For example, a polysemous adjective ‘black’ has twelve indirect senses in WordNet, while indirect senses of the same adjective are not presented in RuWordNet (see Tab. 1, Tab. 2). However, according to Russian explanatory dictionaries, this adjective has eleven indirect meanings (see Tab. 1, Tab. 2). Some examples given below show that RuWordNet senses correlate with the meanings suggested by explanatory dictionaries:

Afro-American (RuThes concept: African Americans)

dark-skinned (RuThes concept: dark-skinned, black);

gloomy (RuThes concept: gloomy, lightless);

dirty (RuThes concept: dirty, covered in mud);

illegal (RuThes concept: illegality);

Devilish (RuThes concept: Devil, Satan).

We can conclude that in RuWordNet indirect senses are presented as follows:

Firstly, some indirect senses of adjectives are given in RuWordNet in the forms of hyponyms or hypernyms. For example, the adjective ‘cold’ has 12 indirect senses in WordNet and 2 indirect senses in RuWordNet (See Appendix). However, this does not indicate that indirect meanings are not presented in the semantic structure of RuWordNet. The meanings ‘extremely restrained in feelings’ and ‘prudent’ are hypernyms and ‘indifferent’ is a hyponym related to sense cold2 (https://ruwordnet.ru/ru/search/холодный#meaning-2).

Secondly, some indirect senses are not related to the direct meaning of an adjective (or their relations are not evident due to semantic proximity). For example, in Russian explanatory dictionaries for the adjective ‘green’ we find the indirect meaning ‘belonging to the environmental protection movement’. In RuWordNet this meaning is related to RuThes concept ‘Greenpeace’ which is not linked to the adjective ‘green’ (https://ruwordnet.ru/ru/search/гринписовский).

Finally, some indirect senses of adjectives are not presented in RuWordNet, such as ‘white’ (white skinned) in the meaning ‘belonging to a racial group’. The analysis revealed lack of consistency in description of racial groups based on color terms in RuWordNet. Thus, adjective ‘black’ in the indirect sense ‘black’ (black-skinned) ‘belonging to a racial group’ is presented in RuWordNet (https://ruwordnet.ru/ru/search/чернокожий). As for WordNet, indirect senses black2 (of or belonging to racial group), and white2 (of or belonging to a racial group having light skin) are given (see Appendix).

We suggest that comparative analysis of color terms in WordNet and RuWordNet can illustrate certain differences in English and Russian linguistic world views. In the English language, unlike Russian, adjective ‘white’ develops the following indirect meanings:

white2 (of or belonging to a racial group having light skin), gloss: ‘voting patterns within white population’

white5 (restricted to whites only), gloss: ‘under segregation there were even white restrooms and white drinking fountains’; ‘a lily-white movement which would expel Negroes from the organization’;

white9 ((of coffee) having cream or milk added (https://wordnet.princeton.edu/)

Another example is the Russian adjective ‘pink’ which has an indirect meaning ‘related to joy and pleasure’ (Cf: RuWordNet pink 2 (pleasant)), whereas WordNet has only direct sense pink1 (a light shade of red) (see Appendix). This enables to conclude that representation of such universal concepts

as color terms in WordNet and RuWordNet reveal differences in English and Russian linguistic world views.

5. Conclusions

In this paper we have discussed the ways indirect senses of polysemous adjectives that describe colors and weather are represented in WordNet and RuWordNet. The term 'indirect sense' refers to literal meanings developed as a result of metaphorical or metonymical extensions of a primary meaning. Results indicate that WordNet and RuWordNet are structured differently in terms of presenting indirect senses of polysemous adjectives. Thus, in RuWordNet, the majority of revealed indirect senses were found as hypernyms and hyponyms. Moreover, this enables to conclude that the representation of universal concepts reveals differences in English and Russian linguistic world views. As the research data was limited both in quantity of analyzed items and the chosen sematic groups, we see our further work in the exploratory study of indirect senses in RuWordNet. This can include the analysis of other parts of speech and representation of figurative language in general.

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Appendix

Representation of indirect senses of 20 polysemous adjectives in WordNet, RuWordNet and Russian Explanatory Dictionaries

Polysemous adjectives	WordNet	RuWordNet	Russian Explanatory Dictionaries
Black	**black2** (of or belonging to racial group) **black3** (marked by anger or hostility) **black4** (offering little or no hope) **black5** (stemming from evil characteristics or forces; wicked or dishonorable) **black6** (having unfortunate consequences) **black7** ((about face) made black as with suffused blood) **black9** (harshly ironic or sinister)	–	1. belonging to aracial group 2. dark-skinned 3. impenetrable thick 4. gloomy, hopeless 5. dirty 6. evil 7. destructive (disease) 8. fake (PR) 9. illegal 10. back door, backstage 11. associated with Satan and

	black10 (deliberately misleading) **black11** (distributed or sold illicitly) **black12** ((about character) deserving disgrace/shame) **black13** ((about coffee) without cream/sugar) **black14** (soiled with dirt)		Devil
Blue	**blue2** (used to signify the Union forces in the American Civil War (who wore blue uniforms)) **blue3** (filled with melancholy and despondency) **blue4** (characterized by profanity or cursing) **blue5** (suggestive of sexual impropriety) **blue6** (belonging to or characteristic of the nobility or aristocracy) **blue7** (morally rigorous and strict) **blue8** (causing dejection)	—	1. related to homosexuality 2. idealized
Brown	**brown2** ((of skin) deeply suntanned)	—	—
Green	**green2** (concerned with or supporting or in conformity with the political principles of the Green Party) **green3** (not fully developed or mature; not ripe) **green4** (looking pale and unhealthy)	**green2** (pale) **green3** (not ripe) **green4** (inexperienced, naïve)	1. belonging to the environmental protection movement 2. not ripe 3. inexperienced, young
Grey	**grey2** (showing characteristics of age, especially having grey or white hair) **grey3** (used to signify the Confederate forces in the American Civil War (who wore grey uniforms)) **grey4** (intermediate in character or position)	**grey2** (mediocre) **grey3** (earthy, greyish pale)	1. pale 2. unremarkable 3. uneducated, uncultured 4. cloudy
Pink	—	**pink2** (pleasant)	1. related to joy and pleasure 2. related to lesbianism
Red	**red2** (characterized by violence or bloodshed) **red3** ((especially of the face) reddened or suffused with or as if with blood from emotion or exertion)	—	1. associated with Soviet regime, communists and army 2. belonging to a racial group; Indians of North America 3. ceremonial, honorary 4. beautiful (as an epithet)
White	**white2** (of or belonging to a racial group having light skin) **white3** (free from moral blemish or impurity; unsullied) **white4** (marked by the presence of snow) **white5** (restricted to whites only) **white6** (glowing white with heat) **white7** (benevolent; without malicious intent) **white8** ((of a surface) not written or printed on) **white9** ((of coffee) having cream or milk added) **white10** ((of hair) having lost its color) **white11** (anemic looking from illness or emotion)	—	1. very pale 2. blond 3. white haired 4. clean (about a sheet of paper) 5. morally impeccable 6. associated with natural forces, able to get rid of evil 7. belonging to a racial group 8. associated with White Guard 9. official (press)

	white12 (of summer nights in northern latitudes where the sun barely sets)		
Yellow	**yellow2** (easily frightened) **yellow4** (typical of tabloids) **yellow5** (cowardly or treacherous)	—	1. belonging to a racial group 2. containing unverified facts, deceitful (press)
Clear	**clear1** (apparent to the mind) **clear2** (free from confusion/doubt) **clear3** (affording free passage/view) **clear6** (characterized by freedom from disturbing thoughts) **clear7** ((about sound/color) free from anything that dulls or dims) **clear11** (free from clouds) **clear12** (free of restrictions or qualifications) **clear13** (free from flaws) **clear14** (clear of deductions) **clear15** (easily deciphered) **clear16** (freed from guilt) **clear17** (easy and quick in perceiving)	**clear2** (understandable) **clear3** (well defined) **clear4** (not darkened) **clear5** (calm and joyful)	1. cloudless 2. understandable 3. well defined 4. logical 5. evident 6. calm
Cloudy	**cloudy1** (lacking definite form or limits) **cloudy3** (of liquids) clouded as with sediment)	—	—
Cold	**cold2** (extended meanings; especially of psychological coldness; without human warmth or emotion) **cold3** (having lost freshness through passage of time) **cold4** ((color) giving no sensation of warmth) **cold5** (marked by errorless familiarity) **cold6** (lacking originality or spontaneity; no longer new) **cold7** (so intense as to be almost uncontrollable) **cold8** (sexually unresponsive) **cold9** (without compunction or human feeling) **cold10** (feeling or showing no enthusiasm) **cold11** (unconscious from a blow or shock or intoxication) **cold12** (of a seeker; far from the object sought) **cold13** (lacking the warmth of life)	**cold2** (cold in relationships) **cold3** (cold in color)	1. extremely re- strained in feelings, indifferent 2. cold in relationships, un-friendly 3. prudent 4. cold (colors)
Foggy	**foggy1** (stunned or confused and slow to react (as from blows or drunkenness or exhaustion)) **foggy2** (indistinct or hazy in outline)	**foggy2** (vague (unclear)) **foggy3** (vague in shape)	1. dim, inexpressive 2. unclear, indefinite 3. deprived of charm, unattractive
Frosty	**frosty1** (devoid of warmth and cordiality; expressive of unfriendliness or disdain)	—	—
Hot	**hot2** (characterized by violent and forceful activity or movement; very intense) **hot3** (extended meanings; especially of psychological heat; marked by intensity or vehemence especially of passion or enthusiasm) **hot4** ((color) bold and intense) **hot5** (sexually excited or exciting)	**hot2** (passionate, hot) **hot3** (hot-tempered, hot-headed) **hot4** (hot, tense)	1. passing in a hurry, tense (time) 2. passionate 3. hotheaded 4. very strong (feeling) 5. impatient (horses)

	hot6 (recently stolen or smuggled) **hot7** (very fast; capable of quick response and great speed) **hot8** (wanted by the police) **hot9** (producing a burning sensation on the taste nerves) **hot10** (performed or performing with unusually great skill and daring and energy) **hot11** (very popular or successful) **hot12** (very unpleasant or even dangerous) **hot13** (newest or most recent) **hot14** (having or bringing unusually good luck) **hot15** (very good; often used in the negative) **hot16** (newly made) **hot17** (having or showing great eagerness or enthusiasm) **hot18** (of a seeker; very near to the object sought) **hot19** (having or dealing with dangerously high levels of radioactivity) **hot20** (charged or energized with electricity) **hot21** (marked by excited activity)		
Icy	**icy1** (devoid of warmth and cordiality; expressive of unfriendliness or disdain) **icy2** (extremely cold)	**icy2** (icy (very cold)) **icy4** (icy (contemptuously cold))	1. indifferent 2. hostile (look or voice) 3. resembling ice (type of glass) 4. frozen, numb
Sunny	**sunny1** (bright and pleasant; promoting a feeling of cheer)	**sunny2** (happy (full of happiness))	1. happy
Warm	**warm2** (psychologically warm; friendly and responsive) **warm3** (inducing the impression of warmth; used especially of reds and oranges and yellows when referring to color) **warm4** (freshly made or left) **warm5** (easily aroused or excited) **warm6** (characterized by strong enthusiasm) **warm7** (characterized by liveliness or excitement or disagreement) **warm8** (uncomfortable because of possible danger or trouble) **warm9** (of a seeker; near to the object sought)	**warm1** (warm in color) **warm3** (good relationships)	1. friendly, good relationships 2. pleasant for the eye, warm in color
Wet	**wet3** (supporting or permitting the legal production and sale of alcoholic beverages) **wet4** (producing or secreting milk) **wet5** (consisting of or trading in alcoholic liquor), wet#6 (very drunk)	–	–
Windy	**windy2** (not practical or realizable; speculative) **windy3** (resembling the wind in speed,	**windy1** (frivolous, thoughtless)	1. (frivolous, thoughtless)

	force, or variability) **windy4** (using or containing too many words)		
Adjectives: 20	*Total senses: 109*	*Total senses: 23*	*Total senses: 63*