Semantic subclasses of temporal nouns

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Abstract. The purpose of this paper is to illustrate and justify semantic coding of temporal nouns in Russian for Russian-to-English Machine Translation to facilitate syntactic parsing of Russian sentences and their subsequent translation into English. The paper deals only with the semantic classification, based on A. A. Kholodovich's theory of subclasses. The temporal nouns are selected for justification of four subclasses: cyclic, supercyclic, subcyclic, and noncyclic. The codes are to be stored in the dictionary. The parsing rules based on the cooccurrence restrictions between these four subgroups facilitate syntagmatic bracketing of noun groups as an input for the transfer and synthesis into English.

The purpose of this paper is to group temporal nouns into subgroups and analyze the cooccurrence of privileges and restrictions among the temporal subgroups. These restrictions are given within the Kholodovich concept of the nucleus and its optimal environment. It is assumed that the reader is acquainted (1) with the various ways a temporal noun can be identified, and (2) the main temporal figurae assigned to temporal adverbs (see Appendix). We shall use morphological, syntactic, transformational, and pure semantic criteria for subclassification of temporal nouns. In the subclassification proposed here we shall use three main criteria: (1) the concept of primary vs. secondary, (2) the concept of a cycle vs. noncycle, and (3) the concept of subcycle and supercycle. When we take such words as *god* 'year' and *noch' 'night',* we can contrastively observe the following features. The Russian word *god* 'year' indicates a one-cycle duration, during which the earth revolves once around the sun. In this word there is no additional concommitant semantic feature. We shall refer to such a noun as a 'cyclic temporal noun'. in *noch* 'night', on the other hand, we have less than a cycle, and besides we have an additional semantic feature, namely, that the sunlight is not seen. We shall refer to such a noun as a 'subcyclic secondary temporal noun'. The opposite of the cyclic and subcyclic nouns will produce what we call 'noncyclic' and 'supercyclic nouns', for example, two words such as *vechnost'* 'eternity' and *molodost'* 'youth'. In the first we have no cycles to talk about. Such a noun has no boundaries. The word *molodost'* involves more than one cycle. It refers to a particular stage in the development of a living creature, especially a human being. The type *vechnost'* is a 'noncyclic primary temporal noun'. The type *molodost'* 'youth' is a 'supercyclic secondary temporal noun', If we put the above-mentioned criteria (cycle and subcycle) on a matrix, we shall see the distribution displayed in Figure 1.
We may now try to analyze them within the framework of the N1 of N2 noun government structure. We will examine the relations between the

temporal nouns themselves and the relations between the temporal and nontemporal nouns. It may happen that we shall see an utterance like *utro* (N1) *voskresnogo dnja* (N2) 'the morning (N1) of the Sunday (N2)' where both the N1 and N2 positions are occupied by temporal nouns. In such a case we should examine the cooccurrence privileges between any pair of the these subclasses. On the other hand, if N1 or N2 is occupied by a nontemporal noun, we would like to know what nouns occur in the vicinity of the temporal noun.

Figure 1. Temporal nouns.

Criteria:	Primary		Secondary	
Types of nouns:	cyclic	noncyclic	subcyclic	supercyclic
(1) *god* 'year'	#			
(2) *vechnost'* 'eternity'		#		
(3) *noch'* 'night'			#	
(4) *molodost'* 'youth'				#

Nontemporal nouns cooccurring with temporal nouns. To increase control over our operations we divide the cooccurring and the temporal nouns into the following further subgroups (on the morphological level): (1) nouns occurring only in the plural, (2) animate and inanimate, (3) deverbal abstracts (such as *pisanie* 'writing') vs. deverbal concrete (such as *pis'mo* 'letter'), and (4) quantifiers and qualifiers.

Nontemporal nouns occurring in position of N1, when the N2 is a temporal noun which occurs only in the singular or only in the plural. We change singular to plural, and vice versa, in order to see whether the time nouns change their meaning. These nouns were found in *Russkij Les* 'Russian Forest', a novel by Leonov. Our observations are checked in *Ushakov's Dictionary* (a sort of Russian *Webster's*).   1

Singular only: *ujma* 'a lot'
Plural only: *sumerki* 'twilight', *sutki* '24 hours (day and night), *budni* 'weekdays' (Leonov 1954), *...u nisskikh eshche est' ujma* (N1 of N1 sg.) *bespechnogo vremeni* (N2 time-noun, sg.) 'Russians still have a lot of carefree time'. Here it is impossible to change the singular N1 into plural. (See also *Ushakov III,* 912).

The form *ujma* has only one meaning: *ochen' bol'shoe kolichestvo* 'a very large quantity'. We classify *umja* as a singular only on the morphological level, and as a 'quantifier' on the semantic level.   (1) The syntactic property of a quantifying noun is that it cannot stand alone.   (2) A substitution test using *mnogo* 'much', *malo* 'many', *kakoe-to* 'some', *kolichestvo* 'certain

quantity' corroborates lexically the fact that *ujma* belongs in the quantifying subclass. If a time-noun is singular, it can express any arbitrary length of objective or subjective time; but once the singular form is defined as a certain arbitrary length of time, then, if the noun is used in the plural, each segment must be the same: e.g. *vremena goda* 'seasons of the year', *zima* 'winter', *vesna* 'spring', *leto* 'summer', *osen'* 'autumn'. Thus, we can compile a list of singular nouns which cooccur with time-nouns.

(1) Quantifiers:
　　(1.1) *poltora, poltory* 'one and a half'
　　(1.2) *dva* (m.), *dve* (f.) 'two', *tri* 'three', *chetyre* 'four'
　　(1.3) *chetvert'* 'a quarter' *(dobruju* 'good', *upushchennuju* 'lost', *kazhduju* 'each')*, *dol'ka* 'part', *chast'* 'segment', *ostatok* 'remainder', *ujma* 'a lot'
(2) Qualifiers: *blizost'* 'proximity', *gorech'* 'sadness', *blagost' 'grace'*
(3) Compound prepositions: *za davnost'ju* 'on the grounds of past events', *po proshestvii* 'after', *na iskhode* 'towards the end of', *ot nachala* 'from the beginning', *na protjazhenii* 'during', *v preddverii* 'in advance of', *v svete* 'in light of', *v nachale* 'in the beginning', *v konce* 'at the end'
(4) Unitary nouns: *solnyshko* 'little sun', *solnce* 'sun'
(5) Inanimate nouns: *svet* 'light', *nebo 'sky', vozdukh* 'air', *tishina* 'silence', *veter* 'wind'
(6) Deverbal nouns: *likovanie* 'joy', *razvitie* 'development', *khod* 'move', *razmakh* 'scope', *ozhidanie* 'expectation', *obstanovka* 'circumstance', *merka* 'measure', *blagovest'* 'good news', *spasenie* 'saving', *uklad* 'structure', *nepogoda* 'weather'
(7) Temporal nouns cooccurring with temporal nouns: *rassvet* 'dawn', *starina* 'antiquity', *nachalo* 'beginning', *budushchee* 'future', *proshloe* 'past'

These nouns deserve additional comments. The conclusions we shall make are preliminary. Further statistical studies will be necessary to confirm or contradict our findings.

We can say that despite various morphological and syntactic features characteristic of the nouns in group (1), semantically there is no difference among the quantifying words in the sense that any quantified word is related to its quantifier through a 'suppressed predicate', i.e. when we say *pjat' dnej,* we mean really 'there are five days'--yet this predicate is easily predictable.

Nouns from group (2), being deadjectival, are capable of playing a role in the compound predicate within the kernel type 'N is A', where A (adjective) is derived from such a noun. Compare *blizost' oseni* 'nearness of autumn' == > *osen' blizka* 'autumn is near'--with the zero auxiliary copula.

Nouns from group (3), nouns governed by prepositions, are used contextually only as 'temporal compound prepositions' (TCPs). Here it suffices to notice that temporal nouns participating in TCPs must be in the singular, and cannot be used in that function in the plural.

In group (4), unitary nouns, the word *solnyshko* can also have a secondary temporal meaning. Logically, it belongs to a unit subclass by itself. It cannot

be used in the plural. Compare: *do rassveta* vs. *do solnyshka,* where in both utterances the message is the same, i.e.' before the sun rises'.

Nouns from group (5) are not used in the plural with temporal nouns.

Group (6), deverbal nouns, are consistently used only in the singular in the text. The deverbal nouns are used for transformational tests of the type N1 of N2 = = > NV, where V comes from N1, while N2 is occupied by a temporal noun.

Comparing a group of nouns from (1), (2), and (6), we may observe that in (1) the predicate is suppressed, in (2) it is semisuppressed, and in (6) it is explicitly present.

Group (7) contains time-nouns with deictic functions (1), i.e. pronoun-like nouns referring to other nouns.

In conclusion, we may say that when a word is used in its peripheral meaning *(veter* meaning not 'wind', but 'tendency') then, obviously, the environment is responsible for the singular usage since *epokha* 'epoch', *vremja* 'time', normally do not allow for the cooccurrence of *veter* with its primary meaning, i.e., 'wind'.

Animate nouns cooccurring with temporal nouns. We now turn our] attention to the problem of 'animate' nouns cooccurring with primary temporal nouns. Consider the following:

(1) *aviator* (N1) *svoego vremeni* (N2) 'aviator (pilot) of his time'
(2) *starozhily* (N1) *tekh vremen* (N2) 'old-timers of those years (times)'
(3) *zhitel'* (N1) *toj pory* (N2) 'resident of that season (time) ' |
(4) *ljudi* (N1) *togo vremeni* (N2) 'people of that time'

The transformations for these 'N1 of N2' structures show that some of them are easier to change into subject-predicate than others.   Thus, (1), *aviator, zhivshij. letavshij v svoe vremja* 'an aviator <u>who lived,</u> flew in his time' shows that N2 is an adverbial (D) modifier and accordingly a predicate has to be added (the underscored words).

In example (2), *starozhily tekh vremen = = > ljudi <u>zhivshie</u> v te vremena i zhivushchie tam i teper'* 'who lived at that time and are still living there now', note that the predicate is added from the part of the *starozhily* which is composed of <u>staro</u> + <u>zhil</u>-y. The form *zhily,* by itself, does not occur.

Example (3) shows the following transformation: *zhitel' toj pory* 'resident of that time' = = > *ljudi, kotorye zhili v tu poru* 'people who lived at that time'.

Example (4) yields the following: *ljudi togo vremeni* 'people of that time' = = > *ljudi, zhivshie v to vremja* 'people who lived at that time'.

Thus, a feature common to any 'N1 of N2', where N2 is a temporal noun, is the fact that in transformations N2 cannot serve as a subject for N1.

On the other hand, when N1 is an animate and/or a deverbal concrete noun (examples 1, 2, and 3), it functions as a subject, and as defined in this section, we expect to get an interpretation for a predicate. We produce this by inserting a plausible predicate. This fact automatically changes the function of N2 into an adverb (D). The kernelization (making a simple sentence: 'subject-predicate + adverb' from 'N1 of N2') takes the shape of the following transformation: N1 (anim.) of N2 (temp.) = = > N1-subject + RP (Relational

Predicate) + D $< = = $ N2. In short, a minimal group N1 of N2 $= = >$ NVD
($< = = $ N2).

 Inanimate nouns cooccurring with temporal nouns. These nouns (be they morphologically nondeverbal, concrete, or deverbal concrete, such as *zamok* 'castle' vs. *zapiska* 'note', respectively), if governing N2, function as subjects with a suppressed predicate, and N2 functions as an adverbial modifier of time. Consider the following:

> (1) *zamok 17-go stoletija,* i.e. '<u>built</u> in the 17th century', *postroen* 'built'
> (2) *gazety togo vremeni* 'newspapers', i.e. '<u>retained</u> from that time',
>   *sokhranivshiesja* 'preserved'
> (3) *zapiska 17-go goda* 'note', i.e. '<u>pertaining</u> to the 17th year',
>   *otnosjashchajasja* 'relating'
> (4) *leto 17-go goda* 'summer' i.e. 'which was in the 17th year', *byvshee*

 The words on the right suggest a plausible (but not unique) predicate by which a sentence can be formed from these 'N1 of N2' structures.

 Deverbal nouns cooccurring with the temporal nouns. If N1 is a deverbal process noun, then the relation of N1 to N2 is either:

> (1) a 'predicate-subject' relation as seen in the transform where: N1 $= = >$ 'predicate' e.g. <u>*nastuplenie uchebnogo goda*</u> 'arrival of the school year' $= = >$ *uchebnyj god <u>nastupaet</u>* 'the school year arrived' and N2 $= = >$ 'subject', e.g. <u>*konec sentjabrja*</u> 'end of September' $= = >$ *sentjabr' <u>konchaetsja</u>* 'September draws to an end', <u>*Nachalo goda*</u> 'the beginning of the year' $= = >$ *god <u>nachinaetsja</u>* 'the year begins'

or

> (2) a 'predicate-object' relation as seen in the transform where N1 $= = >$ 'predicate' and N2 $= = >$ 'object' as in: <u>*chtenie knigi*</u> 'reading of a book' $= = >$ *knigu <u>chitajut</u>* 'the book is read' and *ozhidaniie zimy* 'the expectation of winter' $= = >$ *zimu zhdut* 'the winter is expected' or <u>*ozhidanie zimy*</u> $= = >$ *ozhidajut zimy.*

Thus the word *kniga* and the two-place predicate *(Kto?* 'Who?' *Chto?* 'What?') chit*at'* 'to read' are in an antisymmetric relation to each other.

 N1 is a temporal noun and N2 is a deverbal noun. N2 may be a deverbal pun. Consider: *gody lishenij* 'years of deprivation'. The relation is:

N1 of N2 $= = >$ PN = D ($< = = $ N1) RP (Relational Predicate) plus N2.

 Thus, *lishenija imeli mesto v... godakh* (PN = D) 'deprivation took place in ... years' or *v...godakh* (PN = D + C), *kogda lishenija* (N2) *imeli mesto (*RP) 'in...years, when deprivation took place'. N2 could also be a deadjectival noun, such as *vremja* (N1) *zhestokosti* (N2) 'time of cruelty'.   Here again a

restored predicate is necessary. The transformation is: N1 of N2 = = > D (< = = N1) RP + N2. *Vremja* (N1), *v techenie kotorogo kto-to byl zhestok (konchilos')* 'the time during which someone was cruel (ended)'.

It is of interest to note that if N1 is occupied by a temporal noun and N2 by a nontemporal noun, N2 and N1 both serve as 'subjects', and the structure must be so modified as to show it in transformation. This requirement involves, of course, a heterogeneous level in the kernelization of this 'N1 of N2', i.e. such conjunctions as *kogda* 'when' have to be used. To put it differently, when N1 is a temporal noun, as here, its kernelization produces a complex sentence, since 'N1 and N2' serve as the 'subject', and the 'predicate' must still be added from the wider context. Such a predicate has been indicated by parentheses *(konchilos'* 'ended').

N1 is a temporal noun and N2 is a quantifying or qualifying noun. On the basis of the observation that N1 can be an adverb, a predicate, and a subject when N2 is a temporal noun, we can on the 'content' level assume that when N1 is an adverb, it is a modifier of the restored predicate. The particular nature of this modifier depends on the semantic structure of the stem of N1. Then we seek the various possible semantic structures of temporal nouns in the N1 position so that we may accordingly classify them into subgroups.

Relations between temporal nouns cooccurring in both N1 **and** N2 **positions.** The four subgroups of temporal nouns established at the beginning of this paper (cf. Figure 1) can cooccur with one another, with certain restrictions. I shall label each of these subgroups of temporal nouns by the abbreviation listed after the name of each subgroup: cyclic (cyc.), subcyclic (sbc,), supercyclic (spc.), and noncyclic (ncy.). As previously stated, temporal nouns can be objectively and conveniently classified into four subgroups:

cyc. cyclic: e.g. *god* 'year', *mesjac* 'month', *sutki* '24 hours'
sbc. subcyclic: e.g. *den'* 'day', *noch'* 'night', *semerki* 'twilight'
spc. supercyclic: e.g. *molodost'* 'youth', *starost'* 'old age', *molodezh'* 'young people', *vozrast* 'age'
ncy. noncyclic: e.g. *vremja* 'time', *sovremennost'* 'contemporary', *pora* 'time', *srok* 'time, period, deadline', *zhizn'* 'life'

The table displayed in Figure 2 is very close to one's own intuitive notions. Indeed, the minus in cyc./sbc. is given on the basis of 'part vs. whole' within cyclic time units, such as *den'* vs. *sutki* vs. *mesjac*. The minus in cyc./ncy, is given on the basis of a polar contrast between the 'segmental' vs, 'nonsegmental' temporal nouns such as *god* vs. *vremja*. The minus in spc./sbc. is given on the basis of a secondary temporal noun vs. a part of a cyclic temporal noun which is a non sequitur, such as **molodezh' sroka* 'youth of a deadline'.

The minuses in ncy./sbc. and ncy./spc. are caused by logical contradictions between the noncyclic (ncy.) vs. the cyclic (cyc., sbc.), and primary temporal (ncy.) vs. secondary temporal (spc.).

Figure 2. Table of relations for N1 and N2.

N1 N2: cyc.		sbc.	spc.	ncy.
cyc.	N1 = D N1 N2	nest	N2 =subj.	nest
	+	-	+	+
sbc.	N1 = D N1 N2	N1 N2	N1 = D N2 - subj.	N2 figur.
	+	+	+	+
spc.	N1 = subj. N2 = D	nest	N1 = subj. N2 = obj.	N2 = subj. N1 = pred.
	+	-	+	+
ncy.				N2 figur.
	+	+		+

If we reverse the order of the above expressions, there is no correspondence in terms of the presence of a minus except with the pair ncy./cyc. and cyc./ncy.:

(1) a minus for cyc./sbc., but no minus for sbc./cyc.
(2) a minus for spc./sbc., but no minus for sbc./spc.
(3) a minus for ncy./sbc., ncy./spc., but no minus for sbc./ncy., spc./ncy.
(4) a minus for cyc./ncy., but no minus for ncy./cyc.

Now we can see that the noncyclic are opposed only to the secondary temporal noun, i.e. we can use spc./ncy.: *molodezh' sovremennosti* 'youth of contemporary time', but we cannot say ncy./spc.: **sovremennost' molodezhi* 'contemporariness of youth'.

It is obvious that larger statistical studies are needed. When an N1 is governed by a preposition, it has to be checked for participating in a CTP (Compound Temporary Preposition), as has been indicated.

Summary of the functional roles of 'N1 and N2'. 'N1 of N2' may constitute part of a 'PN1 of N2' structure. In this case we have several possible varieties.

Within 'PN1 of N2', PN1 may function as P, O, A, or the nominal part of a compound predicate.

We may also have PN1 without N2 where N1 is a time-noun, e.g. P-PN: *i sto semnadcat' tysjach v god* (Ushakov 266), where PN is a plain PN without the N2. It functions as a preposition with the meaning *vo vremja, za* 'during, in the course of, in'.

The plain PN can also be used in reversed order and has the meaning of the approximate time used for some action. Consider: Leonov 1954:12 *nedeli cherez tri* (Leonov 1954:12) 'in approximately three years', *goda na dva* (Leonov 1954:59) 'for approximately two years'; PN = CTP: *v prodolzhenie*

posledujushchej chetverti veka (Leonov 1954:304) 'during the subsequent quarter of a century', *po davnosti (istekshikh) let* (Leonov 1954:35) 'on grounds of past years', *v rascvete (tvorcheskikh) sil* (Leonov 1954:651) 'in the prime of one's life, in blossom of creative years'.

PN = D. If PN is spelled together, it functions as an adverb (D). Consider: *let vosem' <u>podrjad</u> (= Pod + rjad)* 'approximately eight years', *let vosem' <u>srjadu</u> (= S + rjad + u)* (Leonov 1954:11) 'straight running in succession', *18 let <u>nazad</u> (= na + zad)* (Leonov 1954:30) '18 years ago'.

Let us recall that in the section devoted to the classification of adverbs, we established among other subgroups, the subgroups of 'continuity' and 'before'. The examples containing *podrjad* 'straight', and *nazad* 'back', cooccurring with temporal nouns, represent these two subgroups, respectively.

If these two functional roles are not played by the N1, then we can add another factor to identify its role: the presence or absence of an 'adjectival modifier' in front of N1, or N2, or both. Here I shall mention only the main factors involved in an 'AN' structure.

The list of adjectival forms (adjective, pronominal, participle) which can precede either of the nouns follows: *poslednij* 'last', *blizhajshij* 'next', *neminuemyj* 'unavoidable', *vtoroj* 'second', *tot* 'that', *zhestochajshij* 'cruelest', *cel'nyj* 'whole.

Some of these adjectival modifiers are optional while others are mandatory. Here are a few examples of A which cannot be dropped: *skuku (voennykh) budnej* (Leonov 1954:405), vs. an omissible A in *v kurse (vsekh) sobytij* (Leonov 1954:298). The reasons for the omission of adjectives are not given here.

The adjective with N1: *(celaja) noch' (skazochnykh) prikjluchenij* 'the whole night of fantastic adventures' (Leonov 1954: 608); <u>*cel'nykh vosemnadcat' let*</u> 'straight 18 years' (Leonov 1954:99), <u>*poslednie desjat' let*</u> 'last 10 years' (Leonov 1954:406).

The adjectives with N1 and N2: *v (samom) kotle (zhestochajshikh) sobytij* 'in the very boiler of the most cruel events' (Leonov 1954:352); *<u>(bytovoj)</u> uklad (nashikh) predkov* '(life) style (of our) forefathers' (Leonov 1954:251). An adjectival modifier may be semantically as important as the noun it modifies. Syntactically, an adjective may occur as the subject, object, or an adverb for the noun it modifies. Compare: *ego delo* 'his affair', *pit'evaja voda* 'drinking water', *vcherashnij den'* 'the yesterday's day', respectively.

Appendix: Semantic temporal figurae.

Words Figurae:	1	2	3	4	5	6	7
1 *vesnoj* 'in springtime'	+	-	-	-	-	-	-
2 *zavtra* 'tomorrow'	-	+	-	-	-	-	-
3 *davno* 'long ago'	-	-	+	-	-	-	-
4 *do groba* 'until deal'	-	-	-	+	-	-	-
5 *bystro* 'quickly'	-	-	-	-	+	-	-
6 *chasto* 'frequently'	-	-	-	-	-	+	-
7 *bezotryvno* 'always'	-	-	-	-	-	-	+

1. A figure of duration which is a single, natural unit.
2. A figure of duration which consists of a set of objectively provided temporal units.
3. A figure of duration where both length and assignment to the specific temporal segment is done by man, i.e. the speaker.
4. A figure of boundaries of time.
5. A figure of speed.
6. A figure of frequency.
7. A figure of eternity.

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