Russian *za*-headed time adverbials: A frame-based account of scopal behaviour

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Data Russian time measure phrases headed with the preposition *za* (e.g., *za čas* 'in an hour') are considered to be parallel to English *in*-headed adverbials. The attachment of a *za*-PP is traditionally regarded as a telicity test and telicity is considered to be closely related (although not equivalent) to prefectivity. However, it has been shown that *za*-PP attachment aligns neither with perfectivity (Filip, 2000) nor with telicity (Rothstein, 2008). Thus, despite the general parallelism with English *in*-adverbials, there has been no working explanation of how the structure of the event denoted by a given verbal phrase is related with the (in)compatibility with *za*-PPs.

Let us illustrate the matter with an example. Consider the imperfective verb *peregrevat'sja* 'to overheat/be overheating' that contains the root *gre-* 'heat', the prefix *pere-* (excessive interpretation), and the imperfective suffix *-va-*. This verb has a progressive (a subevent of an overheating event) and a habitual (repeated event of overheating) interpretation. In case of the first interpretation the attachment of a *za*-PP is not possible (parallel to the case of English *in*-adverbial). However, in the second case such an attachment is allowed, as illustrated by (1), whereby the adverbial takes narrow scope (for each appliance, it got overheated in an hour). Note that the verb in this case is imperfective and the event description is atelic according to any possible definition.

(1) Pribory peregrevalis' za čas.
appliances PERE.heat.PST.PL.IMP.REFL in hour
'Appliances got overheated in an hour.'

(2) Pribory poperegrevalis' za čas
appliances PO.PERE.heat.PST.PL.IMP.REFL in hour
'All of the appliances overheated in an hour.'

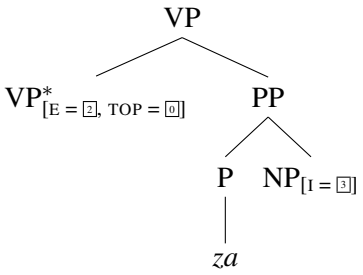
Now let us consider a perfective verb which is obtained by an additional prefixation step: *poperegrevat'sja* 'to stay overheated for some time/to be overheated'. This verb can refer to an event of overheating that lasted for some time (delimitative interpretation) and to an event of overheating that happened to all of the objects (distributive interpretation). However, only the latter interpretation is possible in combination with a *za*-adverbial (2), which in this case necessarily takes wide scope (an event of overheating of all the appliances lasted for an hour). In this paper, we offer a formal account that allows to predict both the possibility of attachment and scope of *za*-headed time measure phrases. The example considered here is a case of a complex verb where several mechanisms work together, making the correct prediction especially challenging. The approach we propose also works in less complex (and more common) cases.

Types and constraints Let us start with shifting the traditional notion of telicity to the architecture that includes two features: *terminativity* and *boundedness*. While the latter term is commonly encountered in the literature, the former one is not as well-known. It is used, among others, by Corre (2015) to extend the notion of telicity by including verbs that contain the prefix *po-* (in its delimitative interpretation). Our representation format is LTAG (Joshi and Schabes, 1997) paired with a feature-based decompositional system with types and relations (Frame semantics) as introduced in Kallmeyer and Osswald 2013.

We will call an event *terminative* if it contains a final stage (FIN attribute is present at the event node) or if it is a part of another terminative event. In other cases it is *non-terminative*. An event description is *bounded* if it contains a final stage such that the degree associated with it is a concrete value or a bound variable. In other cases it is *non-bounded*. Such feature architecture allows for three combinations: {*non-terminative, non-bounded*}, {*terminative, non-bounded*}, and {*terminative, bounded*}. The following general background constraints (in hybrid logic, partially taken from Kallmeyer *et al.* (2015)) ensure correct typing within the relevant domain:

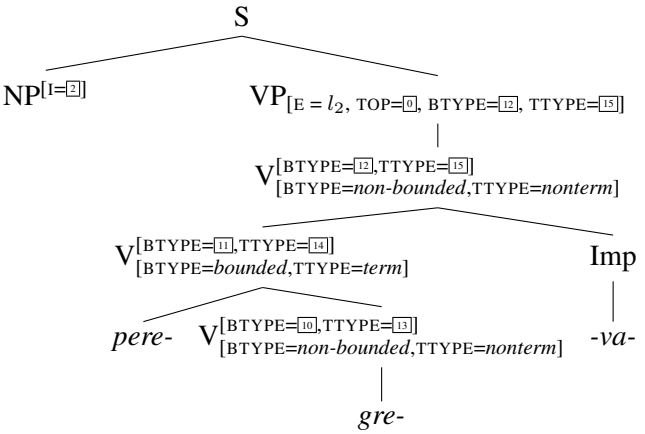
a. $\mathbf{\forall}(\textit{progression} \rightarrow \textit{non-bounded})$
b. $\mathbf{\forall}(\downarrow e.\textit{progression} \rightarrow \langle \textit{segment-of} \rangle e)$
c. $\mathbf{\forall}(\downarrow e.\textit{iteration} \rightarrow \mathbf{\exists}(\downarrow e_1.\langle \textit{segment-of} \rangle e \wedge \mathbf{\exists}(\downarrow e_2.\langle \textit{segment-of} \rangle e \wedge \neg @_{e_1} e_2)))$
d. $\mathbf{\forall}(\textit{non-bounded} \rightarrow \textit{iteration} \vee \textit{progression})$
e. $\mathbf{\forall}(\textit{iteration} \rightarrow \neg \textit{progression})$
f. $\mathbf{\forall}(\langle \textit{segment-of} \rangle \textit{iteration} \rightarrow \textit{terminative})$
g. $\mathbf{\forall}(\textit{bounded} \rightarrow \textit{terminative})$
h. $\mathbf{\forall}(\textit{bounded} \rightarrow \langle \text{FIN} \rangle \top)$
i. $\mathbf{\forall}(\textit{non-bounded} \rightarrow \neg \textit{bounded})$
j. $\mathbf{\forall}(\textit{non-terminative} \rightarrow \neg \textit{terminative})$

When these constraints are combined with semantic contributions of individual elements as proposed by Zinova (2017), the representations of verbs in (1) and (2) obtain the following relevant properties. The frame for the imperfective verb *peregrevat'sja* 'to overheat/be overheating' can be either of type *iteration* (habitual interpretation, segments are of type *bounded*) or *progression*$\wedge$*terminative* (progressive interpretation, a segment of a *bounded* event). The frame for the verb *poperegrevat'sja* 'to stay overheated for some time/to be overheated' can be of type *iteration*$\wedge$*bounded* or *progression*$\wedge$*terminative*. Let us now show how the constraints associated with the *za*-PP and the proposed feature architecture allow to explain the observed facts.



$l_4 :\downarrow e.\boxed{1} \wedge \textit{bounded}$
$\quad \forall(\langle \textit{segment-of} \rangle e \rightarrow \textit{non-terminative})$
$\quad \wedge \langle \text{DURATION} \rangle \boxed{3}$
$\boxed{0} \lhd^* l_4, \boxed{1} \lhd^* \boxed{2}$

Figure 1: Elementary tree-frame pair for the preposition *za*



$l_1 : \exists \boxed{0},$
$l_3 :\downarrow e.\textit{iteration} \wedge \boxed{12} \wedge \boxed{13} \wedge \forall(\langle \textit{segment-of} \rangle e \rightarrow \boxed{1}),$
$l_2 : \textit{overheating} \wedge \langle \text{THEME} \rangle \boxed{2}$
$\boxed{0} \lhd^* l_3, \boxed{1} \lhd^* l_2$

Figure 2: Tree-frame pair for the verb in (1)

Analysis We propose that a *za*-PP can be attached to any (topmost or embedded) *bounded* event as long as it is not a segment of an embedding *terminative* event. The semantics of *za* that implements these constraints is shown on Fig. 1. As the *za*-PP can either modify the topmost event (0) or an embedded event (2), the frame description contains the underspecified scope constraints. Note that in case of a less complex verbal structure (no embedded events) the analysis is reduced to a requirement for the event to be *bounded* (according to the proposed definition).

Concerning the boundedness of an event described by a complex verb, we want it to be fixed depending on the outermost mophological component. The corresponding type is then passed to the event description in the frame. For instance, *pere-* creates a complex bounded event, which can be turned into an unbounded event by an imperfective suffix. If no such suffix is added, the event remains bounded. We model this with a feature BTYPE on the syntactic tree that can be changed by prefixes and suffixes and that otherwise percolates upwards. The value obtained in the VP node is passed as a type into the semantic frame description. The second feature TTYPE functions similarly and encodes (non)terminativity. Fig. 2 shows this for *peregrevalis'* 'overheated' under habitual interpretation. LTAG's top-bottom unification yields $\boxed{12} = \textit{non-bounded}$. This means that, when combining this verb with a *za*-PP, as in (1), the modifier has to target the embedded event. If the same verb is interpreted progressively, the only bounded event is a segment of a terminative event, so the attachment of the *za*-PP is blocked.

If an additional prefix *po-* is attached (= adjoined) on top of the habitual interpretation of the verb, as in (2), the highest BTYPE value would be *bounded*, and this type would be passed to the semantics as the type of the iteration event. Modification with the *za*-PP would target the higher iteration event since the lower one is a segment of a *bounded* (and thus *terminative*) event. In case the prefix *po-* is attached to the progressive interpretation, the BTYPE of the higher event is *non-bounded* and the TTYPE is *terminative*, so both wide (the event is not bounded) and narrow scope (embedding event is terminative) interpretations are blocked and a *za*-PP cannot be attached.

In sum, we propose an approach that accounts for the compatibility of event descriptions with *za*-headed time measure phrases in Russian via the notions of terminativity and boundedness instead of a single notion of telicity.

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