

Semantics and pragmatics in the derivation of aspectual readings in Russian

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Natural language expressions are generally underspecified and need specification of different kinds to get a contextually relevant interpretation. One instance of underspecification is the imperfective aspect in Russian, which gives rise to a considerable variety of readings. This poses certain problems for an account in purely semantic terms: What is the common denominator of all these interpretations? Is there a systematic way to derive the different readings? To answer these and related questions, this paper proposes an account in more pragmatic terms based on a “selectional theory” of aspect.

1. General embedding of the problem

Information extraction is an increasingly significant research area within computational linguistics, developed primarily to cope with the growing amount of information provided by the internet. Temporal information is of special importance as regards applications like text summarization or question-answering systems, where the localization of events in time and the relations obtaining among them are of considerable importance. This information is partly lexically given, but to a certain degree also relies on non-linguistic sources.

Interesting in this respect are aspecto-temporal forms in Russian that are known for their highly underspecified nature. They allow for the induction of temporal and further, rather specific readings (cf. *table 1*), which are the result of an interplay of lexical semantic information provided by the predicate, markers of grammatical aspect (ipf.¹ selects phases, pf. boundaries), of local lexical as well as discourse level information and information induced by pragmatic principles. Accordingly, the main problem with grammatical aspect in Russian, in particular with the ipf. aspect, consists in finding some invariant meaning for the markers and deriving and computing the contextually relevant readings.

¹ ‘ipf.’ = imperfective aspect; ‘pf.’ = perfective aspect

This paper is organized as follows: Section 2 illustrates the variety of readings of the ipf. aspect and points out a possible system behind this diversity. The semantic framework for the characterization of aspect assumed in this paper – a ‘selectional’ theory of aspect – is illustrated in section 3. Section 4 sketches some general pragmatic principles and applies them to the derivation of aspectual readings, section 5 offers a short conclusion.

2. Aspectual readings in Russian

2.1 The problem

Facing the huge variety of aspectual readings in Russian, especially as regards the ipf. aspect, the following questions arise: What is the common denominator that justifies the subsumption of certain linguistic phenomena under the heading of “grammatical aspect”? Considering the multitude of readings, do we have to claim aspect to be grammatically polysemous or is there one invariant meaning behind those different uses – language internally as well as cross-linguistically? And, finally, are there any regularities in the derivation of those readings? The following examples illustrate the problem:

(1) *Actual-processual reading*

Šar medlenno podnimal'sja.
Balloon slowly ascend:PAST:ipf
'The balloon was ascending slowly.'

(2) *Inactual reading*

Ran'še on rabotal v universitete.
In the past he work:PAST:ipf at university:LOC.
'He used to work at university.' (= 'He was a teacher at university.')

(3) *General-factual reading*

Vot na ètoj stene visela kartina.
There at that wall:LOC hang:PAST:ipf painting.
'There was a painting hanging on that wall.'

(4) *Durative reading*

Ona dolgo smotrela na fotografii detej.
She for a long time look:PAST:ipf at photographs:ACC children:GEN
'She looked at the children's photos for a long time.'

(5) *Habitual reading*

Ja chorošo vspominajo o deduške: on guljal so
I well remember:PRES:1Sg:ipf grandpa he take a walk:PAST:ipf with
vnukami, s nimi igral v futbol, kuril trubku, ...
grandchildren with them play:PAST:ipf football smoke:PAST:ipf pipe ...

‘I remember grandpa very well: he used to go for a walk with the grandchildren, to play football with them, to smoke a pipe...’

(6) *Potential reading*

Chorošij byl slesar': ljubye zamki otkryval.
 Good PAST locksmith: every lock:PI open:PAST:ipf
 ‘He was a good locksmith: he could open every door.’

(7) *Atemporal reading*

Železo tonet v vode.
 Iron go down:PAST:ipf in water:LOC
 ‘Iron sinks in water.’

These examples show that lexical and grammatical information provide only part of the inputs required for interpretation and that, accordingly, a purely semantic account is not enough. What is needed is more pragmatics.

2.2 Towards a system behind the different readings

The readings in (1)-(7) are only some of the readings proposed for the ipf. aspect, often in an unsystematic way by merely listing them. This leads to a quite chaotic and confusing picture. Padučeva (1996) makes a first, very coarse classification into three groups, distinguished by their respective *točka oisčeta* (“point of view”; henceforth TO), an aspectual reference point that she claims to be similar to Reichenbach’s reference time. This TO may be synchronous (normal or overlong) or retrospective (cf. *table 1*) and is not to be understood as a point, as the term might suggest, but rather as an interval at which the validity of the event, or some relevant part of it (the part selected by the ‘topic time’, see below), respectively, is asserted.

Klein (1994, 1995) defines aspect in temporal-relational terms as the relation between a topic time TT – the time for which an assertion is made – and the situation time T-Sit. For the unmarked Russian ipf. Aspect, which is rather an ‘non-perfective’ aspect as it may express anything but the perfective value, there are three possibilities of that relation:

- (8) a. TT is included in T-Sit
 b. TT includes T-Sit
 c. TT is simultaneous with T-Sit

The relation between TT and T-Sit characterizes the properties the ipf. aspect may acquire in interpretation.² The function of aspect thus is to make

² That we have indeed to distinguish between these three possibilities is indicated by a look at Turkish, which has morphological means to express the respective relation, cf. Sonnenhauser 2003.

visible a certain part of the event, and that part is asserted to hold at a certain interval of time, namely TO. *Table 1* summarizes these assumptions:

| | Reading of the ipf. Aspect | TO | Relation |
|------|---|--------------------------|-------------------------------|
| I. | Actual-processual, iterative | synchronous, normal | TT included in T-Sit |
| II. | general-factual, durative, iterative | retrospective | TT includes T-Sit |
| III. | habitual, inactual/continuous, potential, permanent, atemporal | synchronous, overlong | TT simultaneous with T-Sit |

Table 1: classification of the readings of Russian ipf. aspect

What becomes evident by Klein's definition of is that we can indeed posit one definite meaning for the ipf. aspect (the three relations), a fairly abstract one that has to be specified in the course of interpretation. This is one argument against treating the ipf. aspect as an instance of grammatical polysemy, and an argument in favor of regarding it as 'sense-general' in the sense of Atlas (1989). The utterance meaning of the respective sentences therefore remains underspecified and has to be enriched pragmatically (cf. Carston 2002).

3. A selectional theory of aspect

Before actually turning to the pragmatic processes, some remarks on the semantic framework have to be made. In this paper, a so-called 'selectional theory' of aspect is assumed (cf. Johanson 1971; Bickel 1996), where aspectual markers are understood as selectors of phases or boundaries, which constitute the decisive units for aspectual selection and are located on a special level of the predicate's semantic representation, at the "temporal tier" (Bickel 1996).³ As has been shown above, the value of the aspectual marker can be defined in a temporal-relational way, namely as the relation between the situation time T-Sit and the topic time TT, whereby the notion of situation time has to be refined in order to distinguish the differences between the various interpretations of the ipf. aspect. TT selects a certain part of the event, which prototypically constitutes a tripartite structure (Moens & Steedman 1988) of preparation phase (dynamic phase φ_{dyn}), culmination point (boundary τ) and consequent state (static phase φ_{stat}). Selection is to be understood as making the selected part of the event visible and thus accessible for truth-conditional evaluation at a certain interval of time, which corresponds to Padučeva's TO and may be located 'within' (synchronous) that selected part or not within it (retrospective). Selection does not mean cutting off the non-selected parts of the event; they are rather presupposed or left to implicatures. *Figure 1* summarizes these assumptions and shows some aspectual markers and the part of the event they

³ There are of course more elements that play specific roles in deriving verbal meanings, but as regards aspect, it's only phases and boundaries that are relevant.

explicitly select (as they are the marked members of the respective aspectual oppositions): the English progressive *-ing* and the Turkish *-iyor(du)* both select the dynamic phase, the Turkish *-miş* explicitly selects the static phase and the Russian pf. aspect is a selector of a boundary:

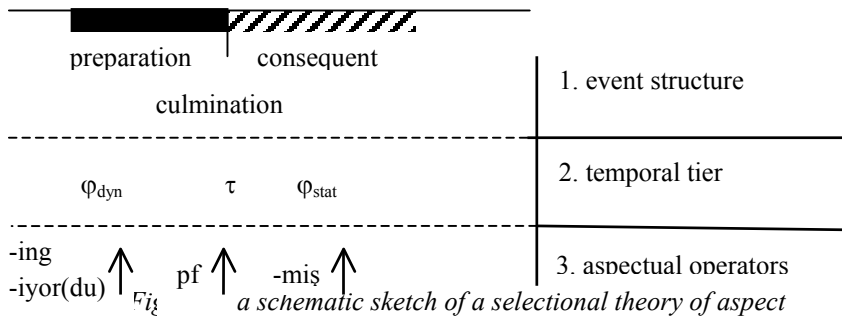


Figure 1 shows only the marked members of the respective aspectual oppositions. This does not imply that the unmarked forms are semantically empty; they are rather sense-general (see section 2.2) and their meaning has to be specified, and can be specified, in the course of interpretation, e.g. by pragmatic means like Q-inferences (see below, section 4.2).

Such a selection theoretic approach to aspect has certain advantages. The classification of verbs in terms of combinations of phases and boundaries that may be part of the semantic representation of the verb, emerge as the result of VP-composition or may be pragmatically induced, makes the question of class-affiliation to one of the Vendler-classes irrelevant – at least as regards issues of grammatical aspect.⁴ Accordingly, ‘coercion’ or ‘recategorization’ phenomena can be captured by simple composition – semantically or pragmatically achieved. No combinations of verbal base and aspectual selector are excluded a priori, as appears to be the case with Vendlerian approaches that classify verbs according to their internal temporal properties and exclude, e.g., the application of the progressive marker to stative verbs, thereby disregarding the effect of pragmatic markedness, namely to trigger recategorization. Presuming cooperativity, hearers always try to make sense out of what speakers produce and therefore tend to accommodate the context accordingly. This can be captured by the semantic assumptions presented here, which also avoid the difficulty of how to classify verbs like *eat* and *eat a cake* (cf. Carlson 2000). The argument structure of a verb is not fixed before interpretation; the lexical entry is underspecified as regards verbal arguments (cf. Marten 2002). Furthermore, this approach captures the relevant factors for aspectual computation and interpretation at a fairly abstract level, thus allowing for cross-linguistic generalisation and comparison and capturing common cross-linguistic features of the grammatical category of aspect.

⁴ A classification in terms of Vendler’s distinctions is problematic for some languages, e.g., for Turkish, as has been shown by Johanson 1971.

4. Pragmatics

Pragmatics here is to be understood as “taking context into account in a principled way” (Bunt 2000: 25). This definition of pragmatics raises several questions. First of all, what is context? The notion of context is used in a number of different ways,⁵ and it seems to be anything but clear what is to be understood by that term. Here, context means linguistic factors on different levels (the word level, sentence level and discourse level) as well as conceptual factors pertaining to common-sense knowledge – something that computational linguists attempt to minimize as much as possible and to reduce it to factors of local lexical information in order to provide well-defined input factors for the algorithms. Second, how is context to be taken into account? In computational linguistics, this is mainly achieved by certain algorithms that compute the relevant factors in specific mathematical ways (cf. the “context-scanning strategy” as implemented by Vazov & Lapalme 2000). And as to the principles involved, these are taken to be the heuristics proposed by Levinson (2000) which are based on the Gricean Maxims of Conversation and relevance-theoretic assumptions (Wilson & Sperber 1995; Carston 2002).

The main concern of this paper are the principles involved in computing aspectual readings and they will be introduced in more detail below, before actually applying them to the interpretation of aspectual forms. Although the two main directions within pragmatic theory mentioned above – Gricean/Neo-Gricean pragmatics and Relevance Theory – are commonly understood as standing in competition to one another, the most promising way is to combine them. If their different orientations (audience-related vs. speaker-related) are taken into account, it becomes obvious that both approaches rather complement one another (Saul 2002).

Levinson (2000) posits three heuristics – default rules for interpretation – that are based on Gricean Maxims of Conversation and are labelled after the maxim they are derived from: Q-inferences are based on the first quantity maxim (“make your statement as informative as possible”) and license inference to the negation or invalidity of a stronger interpretation, M-inferences stem from violations of the manner maxim (esp. “avoid obscurity of expression” and “avoid prolixity”), and license the inference from marked expressions to marked interpretations. I-inferences are based on the second quantity maxim (“do not say more than necessary”) and allow for inference to a stereotype.

What is not captured by this account is, that the principles at work apply at different levels, namely at the level of logical form (explicatures) and at the propositional level (implicatures) – a central assumption of relevance theory. I- and M-inferences could be said to be derived at the former level and thus to constitute instances of explicatures, whereas Q-inferences are candidates for

⁵ For an overview of the concept of context in various fields in AI see Akman & Surav 1996.

“true” implicatures in the Gricean sense insofar as they are meta-linguistic in that they rely on form alone without taking into account lexical semantics. The heuristics and their inferences can be distinguished according to the input they need to be derived. Q-inferences rely on formal expression alone (here: aspect marker), M-inferences take the form as well as the lexical semantics of the item they are applied to (here: aspect marker plus aspectual class of the verb) and I-inferences additionally require further local-linguistic information, information about the discourse mode and knowledge about stereotypes.

To obviate getting involved in the theoretical discussion concerning the debate on “what is said” vs. “what is implicated” and the like, I will henceforth speak of Q-, I- and M-*inferences*, thus abandoning the terminologically heavily loaded term “implicature”.⁶

In computing aspectual readings, different factors located at different levels have to be kept apart (cf. Nakhimovsky 1988: 33). Those levels provide the application domain for the different inferential mechanisms sketched above: the VP-level or level of aspectual class as the domain of M-inferences, the IP-level or level of grammatical aspect as the domain of Q-inferences and, finally, the level of aspectual perspective or discourse modes as the level of I-inferences. What is important to note here is that the order of the levels described does not implicate an order in derivation of inferences; they rather interact in mutual parallel adjustment. This interaction might be captured within the framework of bidirectional optimality theory (Blutner 2000; Dekker & van Rooy 2000) or game theory (Parikh 2000; 2001), but this is beyond the scope of this paper.

The application of these principles on the derivation of aspectual readings in Russian will be discussed in the following section.

4.1 Q-inferences: level of grammatical aspect

Q-inferences are involved in deriving the meaning of unmarked forms in giving rise to scalar implicatures. Levinson (2000: 82) defines scalar implicatures in terms of entailment, i.e. as expression alternates that are equally lexicalized items out of the same semantic field, whereby the stronger one unilaterally entails the weaker one. The notion of entailment is too strong and is neither a sufficient nor a necessary condition for scalar implicatures,⁷ and a definition of scales as ordered sets of semantic concepts, standing in a salient opposition, being lexicalized or grammaticalized to the same degree and having the same degree of currency or prolixity (Bickel 1996: 14) is more plausible.

The notion of “salient opposition” is difficult to capture, but what is basically understood by this term here is that the elements of such an

⁶ Furthermore, the pragmatic principles mentioned seem to contribute to the propositional meaning, and thus are rather close to explicatures in the relevance-theoretic sense.

⁷ See Hirschberg 1991 for a detailed analysis of scalar implicatures and the difficulty of finding an adequate definition for them, partly due to their context-dependency. What all classes of scalar implicatures share are the characteristics of the class of partial ordering relations, that might be subsumed under a general poset condition.

opposition are from the same semantic field – ‘perfectivity’ in our case – and that they differ from one another in only one feature parameter. This opens up the possibility of a twofold interpretation of scalar orderings: first, as one element unilaterally implying the other, and secondly, as one element having one feature more than the other. The second interpretation is the one that captures the relations of the Russian aspects: the pf. aspect has one feature more, namely the feature of explicit boundary-selection. Thus the scale for the perfectivity field in Russian is <pf, ipf>. If the speaker decides to use the weaker element of the scale, the hearer infers from that the invalidity of the stronger expression. Whereas the use of the pf. aspect explicitly marks the selection of a boundary, the use of the semantically weaker ipf. aspect does not exclude the selection of the boundary. As a consequence, the use of the ipf. aspect gives rise to the three relations mentioned above (8a-c). In interpreting utterances, obviously, it is important what has not been said and that the information about the possible alternates is common knowledge between speaker and hearer (cf. Parikh 2000).

In the case of Russian, the pf. aspect as the marked member of the aspectual opposition functions as an explicit selector of boundaries, whereas the unmarked ipf. aspect does not make any commitments in that respect thus giving rise to the possible relations mentioned in (8a-c). To illustrate this point, let’s have a look at the following examples:

- (9) a. On napisal nekotorye slova arabskimi bukvmi.
 He write:PAST:pf some words Arabic:INSTR letters:INSTR
 ‘He wrote some words in Arabic letters.’
- b. On pisal nekotorye slova arabskimi bukvmi
 He write:PAST:ipf some words Arabic:INSTR letters:INSTR.
 ‘He was writing/could write/usually wrote/wrote some words in Arabic letters.’

In (9a) the pf. aspect explicitly selects the boundary, a selection meaning focussing, foregrounding or explicitly asserting it. That is, the relation TT – T-Sit crucially has to include the “transition bounds” (Passonneau 1988), or the culmination point, respectively. The sentence (9a) thus receives a reading of totality or completedness and allows for the advancement of narration. Note that the ‘totality’ reading does not arise due to the aspectual marker alone, but rather as consequence of the interaction between verbal stem and prefix, and the contribution of the aspectual marker.

The ipf. aspect as the unmarked member of the opposition allows for any relation TT – T-Sit, as long as it does not contain a common subinterval with the consequent state, and is not constrained to the selection of the culmination point. Accordingly, the ipf. aspect may give rise to three possible relations, reflected in the different interpretations of (9b):

- (10)a. TT is included in T-Sit ('was writing')
 $\rightarrow TT \subset \varphi_{\text{dyn}}$
- b. TT includes T-Sit ('wrote')
 $\rightarrow TT \supset \varphi_{\text{dyn}} \tau \varphi_{\text{stat}}$
- c. T-Ast is simultaneous with T-Sit ('could write/usually wrote')
 $\rightarrow TT = \varphi_{\text{dyn}} \tau \varphi_{\text{stat}}$

This is the refined version of (8a-c) above, substituting the rather general term T-Sit for the respective parts of the event that are made visible by the aspectual marker. The first relation, where TT is included in T-Sit, gives rise to the reading "he was writing". If TT fully includes T-Sit, this yields the reading "he wrote" and whenever TT is simultaneous with T-Sit, one gets readings of non-actual reference like habitual or potential readings. Note that the inclusion of T-Sit in TT (10a) is different from the pf. aspect insofar as it does not make any explicit statement concerning the selection of boundaries and thus cannot be used for the advancement of narration.

4.2 M-inferences: Aspectual class

At the level of aspectual class, M-inferences come into play. In the aspectual domain they occur with mismatches between aspectual selector and verbal basis, i.e. with the application of a phase or boundary selector on a basis that does not provide the respective feature. This feature may be induced by semantic composition, or it may be induced pragmatically. This enrichment of logical structure is restricted by the conceptual knowledge about prototypical events that consist of a tripartite structure <preparation phase – culmination point – consequent state> (Moens&Steedman 1988; Passonneau 1988). The process of modification of the base eventuality can take place within these conceptual boundaries that provide the basis and frame for pragmatic inference processes. M-inferences can be systematically captured and formalized by 'coercion operators' as proposed by Pulman 1997. Insofar as the interpretation process here affords more efforts, such predicates can be said to be marked. Let's have a look at some examples to illustrate this point.

- (11)a. Ivan vyigral gonku.
 Ivan win:PAST:pf race:ACC
 'Ivan won the race.'

Here, the pf. aspect is applied to a verb that provides a boundary in its semantic representation, and therefore no interpretational rearrangements are necessary.⁸

⁸ This is in fact an "Aktionsart-verb" (understood in the Slavistic tradition, i.e. as modifier of the basic lexical meaning of the verb) derived from the simplex verb *igrat* 'to play'. As Aktionsart-verbs do not constitute aspectual partners of their ipf. base verb, but rather new lexical

- b. Ivan vyigryval gonku (četyre raza).
 Ivan win: PAST:ipf race:ACC four times.
 ‘Ivan won the race four times / was winning the race.’

The application of the ipf. aspect in (11b) requires the induction of a phase, but as the verb ‘vygrat’ (to win) does not provide one, it has to be induced by iteration or by ‘zooming in’ on the preparation phase. The coercion operators proposed by Pulman (1997) would be ‘*iterate/stretch: point* → *process*’.

- c. V vosem časov ona uže vyšla.
 At eight o'clock she already leave:PAST:pf
 ‘At eight o'clock, she had already left.’ (= she was gone)

For the consequent-state reading in (11c), a boundary has to be present or induced for the pf. aspect to apply and select that boundary. It is important to note that in Russian, the induction of a phase cannot be achieved by pragmatic means alone (Bickel 1996) but requires a prefix that creates the necessary semantic representation. So, first the prefix has to be added and only after that the pf. aspect can apply. The consequent-state reading arises due to the particle *uže* ‘already’. The coercion operator here is “*add-cstate: X* → *<X, state>*”, where *X* is *point* or *process*”.

- d. On rešal zadaču.
 He resolve:PAST:ipf exercise:ACC
 ‘He was resolving / tried to resolve / resolved the exercise.’

Here, the ipf. aspect is applied to a simplex pf. verb, which requires the induction of a phase. If TO is retrospective, the event is stated as a fact and we get the general-factual reading (with explicit external bounds imposed by temporal adverbials, we would get the durative reading). If TO is synchronous, TT is placed within that phase, which would yield the actual-processual reading or conative reading.

So while the ipf. applied to a simplex pf. verb is marked morphologically, with suffixes like *-a-* as in *rešat* (‘solve’), derived from of *rešit*; or *-yva-* as in *otkryvat* (‘open’), derived from pf. *otkryt*, as well as concerning interpretational effort, the unmarked semantic status of the ipf. aspect is not affected.

What is important to stress here is the interactive character of the interpretation of the complete verbal form: at the VP-level, the level of aspectual class, the input for the grammatical aspect is fixed, but when it does not meet the requirements of the selector located at the IP-level, compositional semantic or inferential pragmatic processes of eventuality-type modification

items that do not stand in a purely aspectual relationship to the verb they are derived from, *vyigrat* can be regarded as base verb from which an aspectual partner can be derived by means of secondary imperfectivization, cf. *vyigrivat* in (11b).

have to come into play. This is not incremental step-by-step reasoning, but rather constitutes an instance of what Wilson&Sperber (1998b) call a “process of parallel adjustment”.

4.3 I-inferences: enrichment of lexical meaning

As indicated above, TO is fixed at this level, whereby the possible readings are constrained to one of the three groups of *table 1*. But within these groups one can further distinguish more specific readings, that have to be derived mainly by recourse to conceptual knowledge that facilitates inferences to stereotypes. Lexical representations function as pointers to encyclopedic concepts that provide the basis as well as the frame for processes of lexical enrichments. As concepts encountered frequently are more likely to get activated, they can be understood as constituting the stereotypes to which I-inferences are drawn, all the more as their activation requires less efforts in deriving a contextually-relevant interpretation.

Glovinskaja (1982: 47-59), who is primarily concerned with the actual-processual, the habitual and the potential reading of the ipf. aspect, states that native speakers of Russian tend to rank these readings as follows: the preferred reading of an ipf. sentence⁹ is the actual-processual, followed by the habitual and the potential readings. This ordering is of course heavily context-dependent and can easily be overridden by conceptual knowledge, as illustrated by the following examples:

- (12)a. Moj otec govovil po-turecki.
My father speak:PAST:ipf Turkish
▪ possible readings: actual-processual, habitual and potential
▪ preferred ranking: potential > actual-processual > habitual
'My father could speak Turkish.'
- b. Perevodčik govovil po-turecki.
Translator speak:PAST:ipf Turkish
▪ possible readings: actual-processual, habitual and potential
▪ preferred ranking: actual-processual > habitual > potential
'The translator was speaking Turkish.'

The concept of speaking a language makes the assumption of “being able to speak a certain language” highly accessible, so this is the first interpretation to be reached by minimal interpretational efforts. As in (12a) this interpretation also meets the principle of relevance, all other possible interpretations are dismissed. This is quite different with (12b), where the potential reading would sound rather odd, somehow redundant, for the conceptual knowledge of “translators” strongly implies that they can speak a certain language – that’s simply their job. So the potential interpretation would not be relevant and other

⁹ presumably uttered out of the blue; otherwise all three readings would not be equally possible

interpretations are looked for. Here, the actual-processual one would be the next one to reach. Of course, the potential reading is not excluded; it just needs a context that would make it relevant:

- c. Perevodčik govovil i po-turecki.
 Translator speak:PAST:ipf also Turkish
 ‘The translator could also speak Turkish.’

Insertion of *i* ‘also’ marks the knowledge of Turkish as something additional to the presupposed abilities of the translator, who might be a translator for Russian and English, but also understands some Turkish. And this provides the adequate context for the potential reading.

5. Conclusion

In this paper I have tried to state the common denominator of ipf. aspect in Russian and to fix some of the relevant factors for deriving and computing aspectual readings in Russian. The former can be captured by the Q-inference derived from the scale <pf.; ipf.> (section 4.1). Among the input factors for applications are the following: verbs indexed for the phases and the boundaries they contain and lexical items indexed for whether they add phases (like temporal adverbials or adverbials indicating iteration) or boundaries (e.g. prefixes or certain direct objects). Aspectual selectors have to be indexed for what they select and for their status within the language-specific markedness relation within the relevant semantic field. That is how Q-inferences can be formally captured and computed. To constrain the interpretations of the unmarked aspectual partner, TO has to be fixed. This means that one has to search for lexical hints that serve to specify that TO and assign temporal values to them.

More difficult is the problem of how to specify verbs for the commonsense knowledge they provide access to, which is indispensable in order for I-inference to be drawn. One of the means to achieve this would be extensive corpus analysis to detect certain regularities and co-occurrences of lexical items that might hint at a conceptual connection.

It is also important to state the default combinations of base and selector and rules for resolving the mismatches. M-inferences then can be pinned down by coercion operators as proposed by Pulman (1997).

Generally, the selectional-theoretic assumptions and the pragmatic principles described are assumed to be cross-linguistically valid. Their concrete realization and contribution depends on language-specific grammatical and lexical features that have to be taken into account to systematically flesh out the semantic and pragmatic skeleton presented here. Languages differ in their respective contribution of semantics and pragmatics. Without a principled

account of pragmatic – i.e. inferential – principles, applications in natural language processing will necessarily fail.

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