Underspecification of 'meaning': the case of Russian imperfective aspect

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Abstract

One main problem for NLP applications is that natural language expressions are underspecified and require enrichments of different sorts to get a truth-conditional interpretaton in context. Underspecification applies on two levels: what is said underdetermines what is meant, and linguistic meaning underspecifies what is said. One instance of this phenomenon is aspect in Russian, especially the imperfective one. It gives rise to a variety of readings, which are difficult to capture by one invariant meaning. Instead, the imperfective aspect is sense-general; its meaning has to be specified in the course of interpretation by contextual cues and pragmatic inferences. This paper advocates an account of the different imperfective readings in terms of pragmatic principles and inferential heuristics based on, and supplied by, a semantic skeleton consisting of a 'selectional theory' of aspect. This framework might serve as basis for a rule-guided derivation of aspectual readings in Russian.

1 Linguistic underspecification

Natural language expressions deliver merely templates for the construction of a contextually relevant interpretation, namely the propositional meaning the hearer ascribes to the respective perceived utterance. What is linguistically given delivers only part of the input necessary for interpretation and has to be enriched and specified by recourse to sentence-level and discourse-level context, as well as to world-knowledge. Propositions, i.e. truth-conditional content, arise only after that enrichment process has taken place.

NLP applications need to capture the meaning of a linguistic input to adequately work with it in the respective applications. But the 'meaning' relevant in this case, viz. the intended interpretation of an utterance, is underspecified by the lexically given input in at least two ways. Linguistic meaning underspecifies propositions, i.e. 'what is said' (Carston, 2002), and 'what is said' in turn underspecifies 'what is meant' (Grice, 1989). Both kinds of underspecification have to be solved by the hearer in natural discourse settings, and by the corresonding algorithms in NLP-applications. As such applications necessarily rely on linguistically given input, they have to be supplemented by a systematic account of the inferential mechanisms needed to enrich and specify the lexical schemes. A further difficulty for NLP applications is that, presuming some form of cooperativity, any utterance can be interpreted by appropriately accommodating the context.

Apparently, computing the contextually relevant interpretation of an utterance requires more than capturing and computing lexical input. It relies crucially on further information and principles of how to derive that information and combine it with what is lexically given. Information – contextual or conceptual – that is not contained in the natural language string currently being processed is subject to pragmatic actions (Perrett, 2000: 102).

This paper is organized as follows: *Section 2* illustrates the assumptions on pragmatic reasoning relevant here. *Section 3* deals with Russian ipf aspect as one example of linguistic underspecification and sketches the semantics and pragmatics involved in the derivation of its read-

ings. Implications for NLP will be given in *section 4*, and *section 5* offers a short conclusion.

2 Pragmatic Reasoning

The twofold underspecification of natural language expressions is resolved by pragmatic reasoning: 'implicatures', derived by inference alone, enrich what is said to what is meant and 'explicatures', derived by decoding plus inference, enrich the lexical input to what is said. Both interact in mutual parallel adjustment, in that the expectation of certain implicatures constrains the possible range of explicatures. Thus, we are dealing with two kinds of semantics – lexical and propositonal – and with two kinds of pragmatics – explicature and implicature (Carston, 2002):
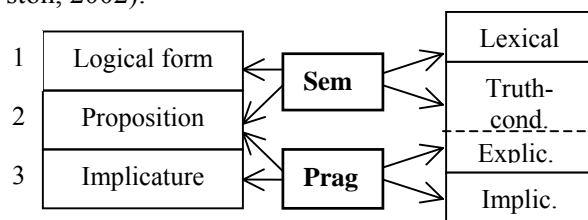

Figure 1. Interaction of Semantics and Pragmatics

The pragmatic actions can be captured by Levinson's (2000) heuristics, whose application gives rise to default interpretations by evoking certain inferences. The heuristics and their corresponding inferences are based on Grice's Maxims of Conversation: Q-heuristics are based on the first quantity maxim ('make your statement as informative as possible') and license inference to the negation or invalidity of a corresponding stronger expression, M-heuristics 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-heuristics are based on the second quantity maxim ('do not say more than necessary') and allow for inference to a stereotype. Contrary to the Gricean view, however, these are assumed to work partly also on the subpropositional level giving rise to 'explicatures' (Carston, 2002), thereby enriching and constraining the underspecified lexical representation.

An advantage of using heuristics giving rise to default interpretations is that they capture the fact that real minds have to make decisions under constraints of limited time and knowledge. In hand-ling tasks like interpretation, humans have to use approximate methods like heuristics that guide the search and determine when it should

end, and simple decision rules that make use of the information found. To behave adaptively in the environment in general, and in interpreting utterances in special, humans must be able to make inferences that are fast, frugal and accurate (Gigerenzer et al., 1999). These inferences, or the heuristics they are based on, respectively, work well insofar as they make a tradeoff on the dimension of generality vs. specificity. Their simplicity allows them to be robust when confronted with a change in environment and to generalize to new situations. Such heuristics are rather suitable means for dealing with underspecified, sense-general linguistic expressions that equally make a tradeoff between underdetermination and preciseness. Furthermore, heuristics are of the kind NLP applications can deal with (*section 4*).

Levinson's heuristics, at least the M- and Q-heuristics, are instances of such fast and frugal heuristics that give rise to default inferences which have to be made more specific in the course of interpretation. This is achieved by the rather specific I-heuristics, that give rise to inferences by referring to assumptions provided by a concept being activated by a lexical item in a certain context and discourse setting.

3 Ipf aspect in Russian

One instance of underspecification is aspect in Russian, especially the ipf[1], which gives rise to a considerable variety of readings (1a-g). Their context-dependence and defeasibility indicates their partial pragmatic character.

1a. actual-processual reading
    Šar medlenno podnimalsja.
    balloon slowly ascend:PAST:**ipf**
    'The balloon was ascending slowly.'
1b. inactual reading
    Ran´še on rabotal v universitete.
    in the past he work:PAST:**ipf** at university:LOC.
    'He used to work as a teacher.'
1c. general-factual reading
    Vot na ètoj stene visela kartina.
    there at that wall:LOChang:PAST:**ipf** painting.
    'There was a painting hanging on that wall.'
1d. durative reading
    Ona dolgo smotrela na fotografii.
    she for a long time look:PAST:**ipf** at photographs:ACC
    'She looked at the photos for a long time.'
1e. atemporal reading
    Železo tonet v vode.
    iron go down:PAST:**ipf** in water:LOC
    'Iron goes down in water.'

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[1] 'ipf' = (Russian) imperfective aspect; 'pf' = (Russian) perfective aspect

1f. potential reading
    Chorošij byl slesar´: ljubye zamki otkryval.
    good PAST locksmith:every lock:Pl open:PAST:**ipf**
    'He was a good locksmith: he could open every door.'
1g. habitual reading
    Po subbotam, ona chodila v banju.
    on saturday, she go:PAST:**ipf** to sauna
    'She used to go to the sauna on Saturdays.'

This variety makes it difficult to capture the semantics of ipf with one invariant meaning. Postulating polysemy does not solve the problem either, as this would presuppose the existence of a clearly defined number of discrete readings. This is indeed not the case, in view of the ongoing debat about how many and which readings to postulate. Instead, ipf is best considered as an instance of 'sense-generality' (Atlas 1989), i.e. as having a definite, but highly general meaning that is specified in the course of interpretation by means of context and pragmatic inference. Sense-generality and pragmatic inference constitute the semantic and pragmatic side of utterance interpretation: "[…] Grice's pragmatics without sense-generality is blind, and sense-generality without Grice's pragmatics is empty" (Atlas, 1989: 149).

Accordingly, this paper aims at explaining the derivation of ipf readings by a more pragmatically oriented account, based on a 'selectional theory' of aspect (Bickel, 1996).

3.1 Semantics

As regards semantics, aspect is assumed to contribute to the finite part of an utterance in selecting a certain part of the descriptive content of the verb and relating it to the time an assertion is made about, the topic time TT (Klein, 1995). The relation thus obtained constitutes the aspectual value. The decisive units for this selection are phases and boundaries (Bickel, 1996). Presuming a tripartite event structure (Moens and Steedman, 1988) consisting of a preparation phase (dynamic phase φ_{dyn}), a culmination point (boundary τ) and a consequent state (static phase φ_{stat}), there are three possibilities for aspect to select. English and Turkish both have φ_{dyn}-selecting aspectual markers, Turkish also a marker for explicit φ_{stat}-selection; Russian pf aspect explicitly selects τ. The unmarked members of the aspectual oppositions may assert anything else – Russian ipf aspect may assert anything but the explicit selection of a boundary.

As truth-evaluation and assertion have to be kept apart, the selected and asserted parts have to be related an interval of time, the validation interval, where they are asserted to hold and truth-conditionally evaluated. Padučeva (1996) refers to this interval with the notion of *točka otsčeta* (henceforth TO), an aspectual reference interval, which can be retrospective or synchronous (bounded or unbouded) with respect to the asserted part. TO is decisive for constraining the range of possible interpretations of ipf as it classifies the readings into three groups. In most cases TO is lexically given, predominantly by adverbials, and therefore constitutes an essential contextual feature for the derivation of the relevant reading. *Table 1* shows the classification of ipf readings according to TO[2]. The 'relation' constitutes the aspectual value:

	TO	Relation	Reading of the ipf
I.	synchronous, bounded	TT included in φ_{dyn}	actual-processual
II.	synchronous, non-bounded	TT simultaneous with $(\varphi_{dyn}\ \tau\ \varphi_{stat})$	habitual, inactual, potential, permanent, atemporal
III.	retrospective	TT includes $(\varphi_{dyn}\ \tau\ \varphi_{stat})$	general-factual, durative

Table 1. A classification of ipf readings

What has been said so far provides the semantic skeleton that has to be accompanied and fleshed out by pragmatic reasoning. Note, that pragmatics does not apply 'after' semantics, but rather interleaves with it.

3.2 Pragmatics

As already mentioned before, the principles assumed to guide the pragmatic inferencing are the heuristics proposed by Levinson (2000), which are assumed to apply also at the subpropositional level giving rise to 'explicatures' (Carston, 2002) that enrich and constrain underspecified lexical representations to yield full-fledged propositions.

Q-inferences are involved in deriving the meaning of unmarked forms by giving rise to scalar implicatures from the scale <pf, ipf>, meaning that if the speaker uses the weaker element of the scale (ipf) the hearer is enteteled to infer the invalidity of the stronger expression (pf): Using the pf aspect explicitly marks the selection of a boundary, using the ipf does not exclude that selection and thus gives rise to the

three possible values stated above in *table 1*. This pragmatically derived meaning of ipf is captured by the metavariable '*IPF*', that comprises the possibilities for ipf listed in *table 1*. By contextual, discourse pragmatic or general pragmatic principles (which fix TO), this metavariable gets disambiguated as to what kind of relation it expresses. As one TO allows for several readings (cf. 2a-c), the relation obtained by the disambiguation is sense-general and needs further enrichment to yield the contextually relevant reading. This process is an instance of the drawing of I-inferences referring to a certain concept. Encyclopaedic knowledge makes certain assumptions more likely than others, and if these assumptions lead to a relevant interpretation, all other lines of interpretation are dismissed. Often encountered concepts are more likely to get accessed, as they require less effort in getting activated.

2a. *Moj otec govoril po-turecki.*
   my father speak:PAST:**ipf** Turkish
   'My father could speak Turkish.'
2b. *Perevodčik govoril po-turecki.*
   translator speak:PAST:**ipf** Turkish
   'The translator was speaking Turkish.'

As the potential reading (2a) is not relevant with (2b) – translators are supposed to be able to speak a certain language –, other interpretations are looked for, here the actual-processual.

2c. *Perevodčik govoril i po-turecki.*
   translator speak:PAST:**ipf** also Turkish
   'The translator could also speak Turkish.'

The insertion of *i* ('also') in (2c), however, creates the appropriate context for the potential reading to be relevant.

The reasoning stops as soon as a relevant interpretation is achieved.

Note that lexical content of the verb and aspect strictly have to be kept apart; ipf requires a certain input and if a verb is only providing a τ in its semantic representation, the required phase has to be induced – again, by means of context or pragmatic reasoning. This may result in an iterative reading, or in 'zooming in' in the (inferred) preparation phase φ_{dyn}, (cf. 3a-b; cf. also 9a-b below):

3a. *Ivan vyigral gonku.*
   Ivan win:PAST:**pf** race:ACC
   'Ivan won the race.'

The pf is applied to a verb *vyigrat′* ('win') that provides a boundary in its semantic representation and therefore no interpretational rearrangements are necessary.

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 in (3b) requires a φ_{dyn}; the verb does not provide one, thus it has to be induced by iteration, or by inferring and 'zooming in' on it, e.g. in a context fixing a certain moment within φ_{dyn}, e.g. a *when*-clause.

This coercion process is to be located at the transition from 1 to 2 (*figure 2*) and may be captured in terms of M-inferences: marked expressions warn 'marked situation'. Again, we are dealing with an interaction of implicature and explicature: 'Marked situation' is the implicature, that gives rise to the explicatures that explain the markedness[3] of the situation in deriving a relevant reading, i.e. steps 2 and 3 are carried out as in the non-coercion case. Note further that this reasoning process is not carried out step by step, but in parallel adjustment, which may be modelled within a game-theoretic framwork or

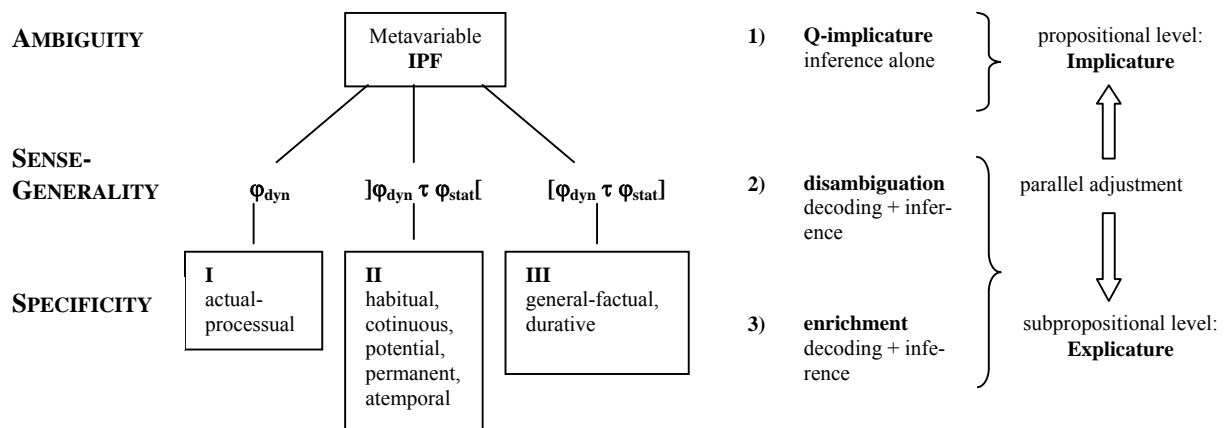| AMBIGUITY	Metavariable **IPF**			1)	**Q-implicature** inference alone	propositional level: **Implicature**
SENSE-GENERALITY	φ_{dyn}	$]\varphi_{dyn} \tau \varphi_{stat}[$	$[\varphi_{dyn} \tau \varphi_{stat}]$	2)	**disambiguation** decoding + inference	parallel adjustment
SPECIFICITY	**I** actual-processual	**II** habitual, cotinuous, potential, permanent, atemporal	**III** general-factual, durative	3)	**enrichment** decoding + inference	subpropositional level: **Explicature**

Figure 2. Pragmatic reasoning behind the derivation of ipf readings

within bidirectional optimality theory.

Q- and M-inferences differ crucially from I-inferences in that the latter arise from the interplay of semantic representation with context, while Q- and M-inferences do not need any context for derivation, but are based on sets of alternates with essentially the same form and contrastive semantic content in the case of Q-inferences, and with contrasting forms but essentially the same inherent semantic content in the case of M-inferences. That is, Q- and M-inferences can be drawn on the basis of what is lexically given and on the sets of possible alternates. They give rise to utterance-type meaning as they are based on general expectations on how language is normally used (Levinson, 2000). This property is useful for NLP applications as will be shown in *section 4* below. It is due to this difference, that Q-/M- and I-implicatures come into play at different levels of meaning composition, inference and interpretation.

Figure 2 sketches the pragmatic processes involved in the derivation of the specific readings. What becomes obvious from *figure 2* is the fact that there is one level at which ambiguity is to be postulated and one level where we are dealing with sense-generality: The three relations the *IPF* meta-variable may give rise to are instances of ambiguity; the disambiguated relations, however, are still sense-general and have to be further specified in the course of interpretation. Once detected, the ambiguity is easy to handle, as in most cases it gets disambiguated by lexical means specifying TO. The specification of the sense-generality involved is more difficult to deal with.

3.3 Interaction

What has been outlined so far suggests that a more pragmatically oriented analyses of closed classes of morphemes, aspect in the present case, yields interesting insights and resolves puzzles that arise from the apparently elusive and variable content of these expressions (Levinson, 2000: 98).

Much of the confusion within aspectology, and presumably within further grammatical categories, arises due to a neglect of pragmatics and to definitions of aspect that take pragmatic inferences as part of its semantics (Bickel, 1996). The division of labour advocated in this paper keeps the semantics of aspect rather simple, but has to be supported by general pragmatic principles. Such an analysis is cross-linguistically applicable

and facilitates systematic comparison of different aspectual systems. Furthermore, such a simple semantics provides a suitable input for NLP applications.

The division of labour between semantics and pragmatics, i.e. the relation between the input provided by the lexicon and the contribution of pragmatic reasoning, varies from language to language, but the semantics stated in the selectional theory, and the inferential heuristics themselves remain stable across languages.

4 Implications for NLP

Without a principled account of pragmatic, i.e. inferential, principles, applications in natural language processing will necessarily fail. This means, that the lexically given facts currently being processed have to be combined with information from former parse-states – as the interpretation is modelled as processing incrementally from left to right (Kempson et al., 2001) –, with general heuristics of pragmatic reasoning and with access to conceptual knowledge.

To make the findings so fare suitable for NLP, the decisive input factors have to be stated as well as the principles of their interaction. Contrary to human interpretation of underspecified forms, where meaning is constructed predominantly by abductive reasoning, in computer driven interpretation meanings have to be selected from an a priori established list of possibilities (cf. Sonnenhauser, 2004). For ipf this means that a list of readings has to be compiled (see *table 1*), the factors involved their derivation have to be fixed and rules of interaction have to be stated that can be expressed in the deductive, propositional logic form $A \rightarrow B$ (cf. Vazov and Lapalme, 2000), where A is the premise, i.e. it states the conditions for the rules to apply, and B the conclusion, i.e. the derived reading.

4.1 The input

Input factors for algorithms are the following: Verbs indexed for the φ and τ they contain[4]; lexical items indexed for whether they add φ or τ, and aspectual selectors indexed for what they select and for their status within the language specific semantic markedness relation. That is how Q-inferences are drawn. TO constrains the possible interpretations of the unmarked aspec-

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[4] Languages differ as to whether this lexical specification already gives rise to 'default aspect' (Bohnemeyer and Swift, 2001) as in Russian, or not, as in Turkish.

tual partner in disambiguating *IPF*. As it is in most cases lexically given, adverbials are to be annotated as to what kind of TO they fix.

To capture M-inferences, the default combinations of base and selector have to be stated, as well as rules for resolving possibly occurring mismatches. The M-inferences then can be pinned down by coercion operators (Pulman, 1997; Thomas and Pulman, 1999). As pointed out above, the metalinguistic Q- and M-inferences can be handeled purley on the basis of the lexically given input and on the basis of the possible alternatives that have to be stated as well.

The presumably most difficult problem is how to specify verbs for the conceptual knowledge they provide access to, which is indespensable for I-inference to be drawn. One means is corpus analysis in order to detect regularities and coocurrences of lexical items that might hint to a conceptual connection[5]. As the factor 'probability' cannot be completely eliminated, a condition has to be implemented preferring the shortest line of reasoning (Thomas and Pulman, 1999).

Furthermore, a mechanism must be implemented that parallels the stop mechanism in human interpretation, i.e. a mechanism that stops the search for information to be built in in the interpretation process. The reasoning stops as soon a truth-conditional interpretation is achieved, i.e. as soon as the requirement for that propositional content is achieved. It is this requirement that crucially drives the interpretation process (cf. the requirement '?Ty(t)' in the Dynamic Syntax approach as advocated by Kempson et al., 2001).

Interpretation of aspectual forms processes incrementally, i.e. information once provided and processed cannot be undone.

4.2 The 'default' case

The default case is a match of basis and marker[6], where the verbal basis provides the necessary input for the marker to apply. For ipf, the conditions have to be stated under which the three possibilites (*figure 1*) get activated. Here, TO – primarily specified by temporal or manner adverbials (e.g. *vse bol´še* 'more and more', *chorošo* 'well') – is decisive. Adverbials of car-

dinality and duration fix TO as retrospective and the reading as being out of *group III*. The rule for this line of interpretation can be stated as follows (adopted from Vazov and Lapalme, 2000):

4. IF ipf is applied to a verb providing a phase
   AND if there is an adverbial fixing TO as retrospective
   THEN the reading is out of group III.

5a. general-factual reading
   Ja uže rasskazyval vam ėtu istoriju.
   I already tell:PAST:**ipf** you:DAT this story:ACC
   'I already told you this story.'

5b. durative reading
   Ja guljala ot trech to pjati.
   I go-for-a-walk:PAST:**ipf** from three:Gen to five:Gen
   'From three to five, I went for a walk.'

Both interpretations can be overridden if TO is turned into a synchronous one by adverbials of the type *vsegda* ('always') or *obyčno* ('usually'):

6a. habitual reading
   Ja obyčno guljala ot trech to pjati.
   I usually go-for-walk:PAST:**ipf** from three to five
   'I usually went for a walk from three to five.'

This shows the incremental way of interpretation, whereby the inner parts are left intact:

6b. [$_{syn.unbounded}$obyčno [$_{retro}$ot...do[$_{syn.bounded}$ gujal]]]

The outermost TO is the one relevant for discourse advancement or non-advancement, respectively.

A synchronous TO may be bounded or unbounded (group I and II, *table 1*), cf. (7) and (8):

7. IF ipf is applied to a verb providing a phase
   AND if there is an adverbial fixing TO as synchronous bounded/unbounded
   THEN the reading is out of group I/II

8a. actual-processual reading
   V vosem´ časov, ja čitala knigu.
   at eight o´clock, I read:Past:**ipf** book:Acc
   'At eight o´clock, I was reading a book.'

8b. inactual reading
   Ran´še, on rabotal v universitete.
   before he work:PAST:**ipf** at university
   'He used to work at university.' (= 'He was working as a teacher.')

Depending on the semantic representation of the verb, implicatures or presuppositions may arise. Ipf with the structure $[\varphi\ \tau]$ leaves the reaching of the boundary as an implicature, ipf with $[\tau\ \varphi]$ leaves the initial boundary as presupposition. That is how the semantic representations of verbs provide background and frame for pragmatic reasoning.

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[5] Assuming an associative organization of memory, where related things are probabilistically associated reflecting generalizations about regularities in an organism's perception of and interaction with its environment (Robinson, 1997), this statistical approach indeed seems to be on the right track.

[6] 'Marker' is the general term that subsumes also cases of default aspect, where there is no overt morphological marking, as frequently encountered in Russian.

4.3 The 'coercion' case

Whenever an aspectual marker is applied on a basis not providing the relevant feature (φ or τ) for it to apply, that feature is semantically or pragmatically induced in order to eliminate that mismatch. Coercion operators capture this re-categorization process (Pulman, 1997):

9a. *Ivan vyigral gonku.*
    Ivan win:PAST:**pf** race:ACC
    'Ivan won the race.'

Here, pf is applied to a verb that provides a τ, no coercion is necessary.

9b. *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 ipf in (9b) requires a φ, which the verb *vyigrat'* ('win') does not provide. So it has to be induced by iteration or by zooming in on φ_{dyn}. Two coercion operators may be applied: "iterate / stretch: point $\rightarrow$ process" (Pulman, 1997). In most cases, context provides the necessary cues for disambiguation (e.g. an iterative adverbials or a *when*-clause), if not, one has to rely on the 'probability-condition'.

9c. *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 (9c) to arise, the prefix *vy-* first has to induce the boundary required for pf to apply. *Uže* ('already') here triggers the application of the coercion operator "add-cstate: X $\rightarrow$ <X, state>, where X is point or process" (Pulman 1997). The rules for (9b) are:

10a. IF ipf is applied to a verb providing no phase, AND a lexical item indicating iteration is present
    THEN induce the phase by application of '*ite-rate*'

10b. IF ipf is applied to a verb providing no phase AND and adverbial/clause indicating incidence is present
    THEN induce the phase by application of '*stretch*'

The application of ipf onto a verbal basis providing merely a τ (prior to coercion) is both pragmatically and morphologically marked, but ipf does not lose its semantic unmarkedness. Though interpretation in terms of coercion is compositional, the specific reading this coercion gives rise to depends on linguistic context and world-knowledge (de Swart, 1998); cf. (11)[7]:

11. *On rešal zadaču.*
    he solve:PAST:**ipf** exercise:ACC

11a. actual-processual reading
    'He was solving the exercise.'

11b. conative reading
    'He tried to solve the exercise.'

11c. general-factual reading
    'He (*solved)[8] the exercise.'

Whereas (11c) can be disambiguated by fixing TO as retrospective, (11a) and (11b) cannot be distinguished by TO alone as both require it to be synchronous. The distinction between the possible readings is left to contextual disambiguation and world-knowledge. Gaining probability values and assigning them to interpretations by a statistical approach taking into account judgements of native speakers seems to be a possible way (cf. Glovinskaja, 1982 for the habitual, potential and actual-processual reading), but the probability rankings can be overriden by the lexical content of verbal phrases.

5 Concluding remarks

The framework presented here allows for taking also pragmatic reasoning processes into account in computing interpretations. Without a principled account of inferential principles NLP applications have to fail. The rather sketchy picture presented here might serve as a starting point for identifying semantic and pragmatic factors in the aspecto-temporal system of Russian. A lot of problems remain to be solved. Corpus analyses and the appropriate annotation of verbs, aspect markers and adverbials are the prerequisite for formulating rules that enable the systematic derivation and computation of the readings. Furthermore, the interaction of the different factors has to be studied in a wider domain, i.e. on the paragraph level.

The selection-theoretic and pragmatic assumptions outlined in this paper can be claimed to be cross-linguistically valid, but languages differ in their respective contribution of semantics and general pragmatic reasonig.

This approach, that combines generality of linguistic expressions with systematic pragmatic principles, can be extended to further instances of grammatical underspecification. The system established in this paper allows for a systematic

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[7] The readings listed here involve different degrees of context-dependency.
[8] Note that this general-factual reading arises only in special contexts, and in the present example is difficult to translate into English.

comparison of languages on a uniform basis that permits a systematic derivation of the respective readings and a principled account account of the differences.

References

Jay Atlas. 1989. *Philosophy without Ambiguity*. Oxford, Clarendon Press

Balthasar Bickel. 1996. *Aspect, Mood and Time in Belhare*. Zürich, ASAS

Jürgen Bohnemeyer and Mary Swift. 2001. *Default Aspect: The Semantic Interaction of Aspectual Viewpoint and Telicity*. Talk delivered at the conference "Perspectives on Aspect". Utrecht

Robyn Carston. 2002. *Thoughts and Utterances*. Oxford, Blackwell

Gerd Gigerenzer et al. 1999. *Simple Heuristics That Make Us Smart*. Oxford, Oxford University Press

Marija J. Glovinskaja. 1982. *Semantičeskije Tipy Vidovych Protivopostavlenija Russkogo Glagola.* Moskva, Nauka

Paul Grice. 1989. *Studies in the Way of Words*. Cambridge, Harvard University Press

Ruth Kempson et al. 2001. *Dynamic Syntax*. Oxford, Blackwell

Wolfgang Klein. 1995. A Time-Relational Analysis of Russian Aspect. *Language* 71(4):669-695

Stephen C. Levinson. 2000. *Presumptive Meanings*. Cambridge, London, MIT Press

Marc Moens and Mark Steedman. 1988. Temporal Ontology and Temporal Reference. *Computational Linguistics* 14(2):29-43

Elena V. Paducheva. 1996. *Semantičeskije Issledovanija*. Moskva, Jazyki Russkoj Kul´tury

Denise Perrett. 2000. *The Dynamics of Tense Construal in Haddiyya*. Ph.D. dissertation, University of London

Stephen Pulman. 1997. Aspectual Shift as Type Coercion. *Transactions of the Philological Society* 95(2):279-317

Edward A. Robinson. 1997. The Cognitive Foundations of Pragmatic Principles: Implications for Theories of Linguistic and Cognitive Representation. Jan Nuyts and Eric Pederson. *Language and Conceptualization*. Cambridge, Cambridge University Press: 253-271

Barbara Sonnenhauser. 2004. *Rules for the Derivation of Aspectual Readings in Russian.* Ms. University of Leipzig

Barbara Sonnenhauser. 2003. Aspect and the Semantics-Pragmatics Interface. *Proceedings of RANLP 03*. Borovets

Henriette de Swart. 1998. Aspect Shift and Type Coercion. *Natural Language and Linguistic Theory* 16(2):347-385

James Thomas and Stephen Pulman. 1999. Bidirectional Interpretation of Tense and Aspect. In: Harry Bunt et al. (eds). 1999. *Proceedings of the 3rd International Workshop on Computational Semantics*. Tilburg: 247-263

Nikolai Vazov and Guy Lapalme. 2000. Are the Temporal Strucures of Texts Algorithms? *Proceedings of the 7th International Conference on Principles of Knowledge Representation and Reasoning.* Breckendridge: 76-86