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On the Modal Meaning of Slavic Perfective

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1. Aspect and modality

- Progressive: the complete event exists in some world different from our world
  - inertia worlds (Dowty 1979, Portner 1998)
  - worlds in the continuation branch of the event (Landman 1992)
- Perfect: modal presuppositions
  - Portner 2003: modal presupposition to derive current relevance
  - Katz 2003: modal presupposition to derive temporal properties

? Modal perfective… ?

☺ Modal Slavic perfective!

- To say that the perfective sentence is true in our world we need to make sure that the event does not continue in other (relevant) worlds as long as it falls under the same event description.

- Evidence from aspectual composition

2. Introducing aspectual composition

- **Aspectual composition:** interaction between properties of a verbal predicate and properties of its argument(s) in determining telicity of VP and/or a clause. Aspectual composition has been discussed systematically at least since Verkuyl 1972.
- The verb *eat* can head either telic of atelic VP depending on characteristics of its internal incremental (Krifka 1989, 1992, 1998) argument.

(1) **Telic perfective sentences in English**
a. Indefinite DP based on a singular countable noun
John ate an apple $^{??}$for ten minutes/^{OK}in ten minutes.

b. Definite DP based on a singular countable noun
John ate the apple $^{??}$for ten minutes/^{OK}in ten minutes.

c. (In)definite DP with a cardinal numaral
John ate (the) three apples $^{??}$for ten minutes/^{OK}in ten minutes.

d. Definite plural DP
John ate the apples $^{??}$for ten minutes/^{OK}in ten minutes.

(2) **Atelic perfective sentences in English**
a. Indefinite mass DP
John ate soup ^{OK}for ten minutes/*in ten minutes.

b. Indefinite plural DP
John ate apples ^{OK}for ten minutes/*in ten minutes.

- **Explanations**: mereological theory (Krifka 1989, 1992, 1998)
  PLUG^{+} theory (Verkuyl 1972, 1993, 1999)
  theory of scalar structure (Hay et al. 1999, Kennedy, Levin 2002, 2008, Piñon 2008, Kennedy 2010)
  theory of contextual atomicity (Rothstein 2004)

- Slavic languages (Dahl 1985, Krifka 1992, Verkuyl 1999, Piñon 2001, Paslawska, von Stechow 2003, Filip 1993/1999, 2004, 2005; Padučeva 2004, Romanova 2006, Padučeva, Pentus 2008, a.o.): **prefixed perfective verbs** restrict interpretation of **the incremental theme**.

- Undetermined plural/mass incremental arguments receive the **definite interpretation** whereby they refer to the maximal individual consisting of all entities of a particular type available at the universe of discourse. The verbal predicate is obligatorily telic.

(3) **Perfective sentence; undetermined plural DP**, cf. (1d) and (2b)
Vasja *s''-e-l* jablok-i (za dva čas-a / * dva čas-a).
Vasja PRF-eat-PST.M apple-ACC.PL in two-ACC hour-GEN two-ACC hour-GEN
1. 'Vasja ate all the apples (in two hours).'
2. * 'Vasja ate apples (for two hours).'

- Maximality is an entailment of (3). Explicit indication that there are individuals not involved in the event yields a contradiction:

(4) #Vasja *s''-e-l* jablok-i, no osta-l-o-s' ešče neskol'ko.
Vasja PRF-eat-PST.M apple-ACC.PL but remain-PST-N-REFL more a.few
'Vasja ate (all) the apples, but there are a few more (apples to eat).'

- If the incremental internal argument DP is based on a singular countable noun or a numerical QP, no definiteness effect emerges:

(5) **Perfective sentence; undetermined singular DP; count noun**, cf. (1a-b)
Vasja *s''-e-l* jablok-o (za dva čas-a / * dva čas-a).
Vasja PRF-eat-PST.M apple-ACC.SG in two-ACC hour-GEN two-ACC hour-GEN
'Vasja ate an/the apple in two hours/for two hours.'

(6) **Perfective sentence; undetermined DP based on a QP, cf. (1c)**
Vasja *s''-e-l* tri jablok-a (za dva čas-a / * dva čas-a).
Vasja PRF-eat-PST.M three apple-GEN.SG in two-ACC hour-GEN two-ACC hour-GEN
'Vasja ate (the) three apples in two hours/for two hours.'

- **Cumulativity and quantization; predicates of individuals**
  - What nominals like 'the apples', 'the apple', 'three apples', etc., have in common is: if analyzed as predicates, they all are quantized and not cumulative. For instance, no proper part of the any entity which can be described as *three apples* is three apples. Similarly, two entities, each of which is three apples, cannot be described as *three apples*.

(7) A predicate is **cumulative** iff whenever it applies to entities distinct x and y it also applies to their sum.
$\forall P[CUM(P) \leftrightarrow \forall x \forall y\ [P(x) \wedge P(y) \rightarrow P(x \oplus y)] \wedge \exists x,y[P(x) \wedge P(y) \wedge \neg x=y]]$

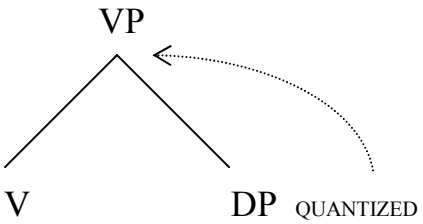
(8) A predicate is **quantized** iff whenever it applies to an entity x, it does not apply to any proper part of x.
$\forall P[QUA(P) \leftrightarrow \forall x \forall y\ [P(x) \wedge P(y) \rightarrow \neg x<y]]$

- **Cumulativity and quantization; predicates of events**
  - Expressions like 'eat the apple', 'eat three apples', 'eat the apples', etc., if analyzed as event predicates, are quantized. E.g., no proper part of an event in which an apple is eaten can be described as (*John) ate an apple*. Quantized event descriptions are telic. Also, they are not cumulative: two events of eating an apple cannot be described as eating an apple.

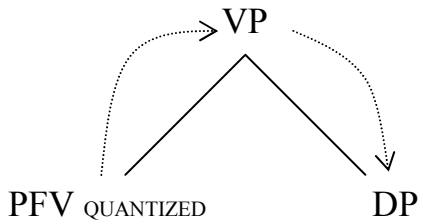
- **Russian vs. English**
  - **Russian is like English:** complex event predicates (denoted by *v*Ps/VPs) are quantized (=telic) iff their incremental arguments are quantized.
  - **Russian is unlike English:** perfective clauses like (3) **must** be quantized/ telic. As a consequence, their arguments must be quantized, too.

- **Intuition behind most current approaches to the typology aspectual composition** (Krifka 1992, Verkuyl 1999, Piñon 2001)
  - In languages like English, it is an argument that decides if the whole VP is quantized (=telic) (Scheme 1).

- In languages like Russian, the perfective declares the whole VP quantized. As soon as the VP is quantized (=telic), an incremental argument cannot escape from being quantized, too (Scheme 2).



Scheme 1. English-type aspectual composition.



Scheme 2. Slavic-type aspectual composition.

- If the perfective is not there, the interpretation of the incremental argument is no longer restricted.

(9) **Imperfective sentence; undetermined plural argument**
Vasja *e-l* jablok-i.
Vasja eat-PST.M apple-ACC.PL
1. 'Vasja was eating the apples.'
2. 'Vasja was eating apples.'

- There must be something about the meaning of the perfective that guarantees that things go wrong if it tries to combine with a cumulative predicate.

3. Approaching perfectivity

3.1. Klein's perfectivity

(10) **Klein 1994** and elsewhere: **reference time includes event time**
$\| \text{PFV} \| = \lambda P \lambda t \exists e[P(e) \wedge \tau(e) \subset t]$

- There is nothing in the semantics of the perfective that prevents its successful application to a predicate no matter what the quantization status of that predicate is.
- Prediction: aspectual compositional effects of the Slavic perfective cannot be derived.

(11) **NP denotation: a predicate of individuals**
$\| [_{NP} \text{ apples }] \| = \lambda x.\textbf{apples}(x)$
CUM(**apples**)

(12) **DP denotations**

a. Definite DP

$\| [_{DP} \varnothing_{\sigma} [_{NP}$ apples $]] \| = \sigma x.apples(x)$

where σ is an operator that applies to a predicate and yields the maximal individual from its extension if there is one, undefined otherwise (Link 1983)

b. Indefinite DP

$\| [_{DP} \varnothing_{\exists} [_{NP}$ apples $]] \| = \lambda P \exists x[P(x) \wedge apples(x)]$

(13) **V denotation : a relation between two individuals and events**

$\| [_{V}$ s''jed 'eat' $] \| = \lambda e \lambda y \lambda x \exists s[agent(x)(e) \wedge eat(e) \wedge theme(y)(e) \wedge cause(s)(e) \wedge eaten(s) \wedge arg(y)(s)]$

(14) ***v*P denotation based on (12a)**

$\| [_{vP} \lambda_1 [_{vP}$ Vasja $v_{trans} [_{VP}$ [s''-jed- t_1] $[_{DP} \varnothing_{\sigma} [_{NP}$ jabloki]]]]] $\| =$
$\lambda e \exists s[agent(vasja)(e) \wedge eat(e) \wedge theme(\sigma y.apples(y))(e) \wedge cause(s)(e) \wedge eaten(s) \wedge arg(\sigma y.apples(y))(s)]$

- (14): a set of eating events in which Vasja is the agent and the maximal individual consisting of all the (contextually relevant) apples is the theme; this individual enters a result state of being eaten.

- The event predicate in (14) is quantized (and not cumulative).

(15) ***v*P denotation based on (12b)**

$\| [_{vP} \lambda_1 [_{DP} \varnothing_{\exists} [_{NP}$ jabloki $]] \lambda_3 [_{vP}$ Vasja $v_{trans} [_{VP}$ [s''-jed- t_1] t_3]] $\| =$
$\lambda e \exists y \exists s$ [apples(y) $\wedge$ agent(Vasja)(e) $\wedge$ eat(e) $\wedge$ theme(y)(e) $\wedge$ cause(s)(e) $\wedge$ eaten(s) $\wedge$ arg(y)(s)]

- (15): a set of eating events in which Vasja is the agent and some individual that falls under *apples* is the theme; this individual enters a result state of being eaten.

- The event predicate in (15) is not quantized (and is cumulative).

- The non-quantized event predicate in (15) never shows up in fully inflected perfective clauses like (3). Therefore, the result of the application of PFV to (15) should for some or other reason be ill-formed. But it is not.

(16) **Klein's PFV applied to (14):**

$\| [_{AspP}$ PFV $[_{vP} \lambda_1 [_{vP}$ Vasja $v_{trans} [_{VP}$ [s''-jed- t_1] $[_{DP} \varnothing_{\sigma} [_{NP}$ jabloki]]]] $\| =$
$\lambda t \exists e \exists s[\tau(e) \subset t \wedge agent(vasja)(e) \wedge eat(e) \wedge theme(\sigma y.apples(y))(e) \wedge cause(s)(e) \wedge eaten(s) \wedge arg(\sigma y.apples(y))(s)]$

(17) **Klein's PFV applied to (15)**
|| [$_{AspP}$ PFV [$_{vP}$ λ_1 [$_{DP}$ $\varnothing_{\exists}$ [$_{NP}$ jabloki]] λ_3 [$_{vP}$ Vasja v_{trans} [$_{VP}$ [s''-jed- t_1] t_3]]]] || =
$\lambda t \exists e \exists s \exists y$ [$\tau(e) \subset t \wedge$ apples(y) $\wedge$ agent(Vasja)(e) $\wedge$ eat(e) $\wedge$ theme(y)(e) $\wedge$ cause(s)(e) $\wedge$ eaten(s) $\wedge$ arg(y)(s)]

- (16) is what we want to account for (3.1) repeated in (18). But (17) predicts incorrectly the reading in (3.2)/(18.2)

(18) **Perfective sentence; undetermined plural DP**
=(3) Vasja *s''-e-l* jablok-i (za dva čas-a / * dva čas-a).
Vasja PRF-eat-PST.M apple-ACC.PL in two-ACC hour-GEN two-ACC hour-GEN
1. Vasja ate all the apples (in two hours).
2. *Vasja ate apples (for two hours).'

- Klein's perfectivity does not suffice.

3.2. Krifka's perfectivity

(19) **Krifka 1992:50 on Slavic perfectivity:**
At least part of the meaning of the perfective can be captured by the modifier $\lambda P \lambda e[P(e) \wedge QUA(P)]$

📖 "If we assume the normal transfer of properties for the object role of verbs like *eat* and *drink*, then we see that only with a quantized object the complex verbal predicate will be quantized as well. If the perfective aspect forces a quantized interpretation of the complex verbal predicate, the complex verbal predicate will again force a quantized interpretation of the object NP."

- Piñon 2001: Similar idea, but **non-cumulativity** instead of quantization

(20) **Perfective verb according to Piñon:**
prze-czytać 'read' =
$\lambda \underline{Q} \lambda \underline{P} \lambda e[\underline{P}(e, \lambda x \lambda e'[\underline{Q}(e', \lambda y \lambda e''[Read^{+}(e'', x, y)])]) \wedge$
$\forall x[\neg \mathbf{CUM}(\underline{Q}(\lambda y \lambda e'[Read^{+}(e', x, y)]))] \wedge$
$\forall y[\neg \mathbf{CUM}(\underline{P}(\lambda x \lambda e'[Read^{+}(e', x, y)]))]]$
where $\underline{Q}$ and $\underline{P}$ are generalized quantifier arguments of 'read'
(of type <<e, vt >, vt>), and
$Read^{+}(e, x, y) = Read(e) \wedge Agent(e, x) \wedge Patient(e, y)$

- (19)-(20) look more like a re-description of facts rather than an explanation.

3.3. Filip' s perfectivity

📖 "I propose to represent the semantics of perfective verbs (simple or prefixed) by means of the *TOT* predicate modifier, standing for 'totality of the event', or *celostnost' dejstvija* in traditional Russian linguistics" (Filip 2005)

(21) **Perfectivity as 'totality'**
PERF: (P)(e) → TOT(P)(e).

(22) **Totality operator: Filip 1995**
TOT(P)(e), e is a total (atomic) event of type P if P(e), and for all e′ with P(e′) and e<e′, it holds that every e′′ with e′′<e′ and ¬e⊗e′′ is not adjacent to e.

(23) **Adjacency**: Krifka 1998
∞_A, *adjacency,* is a two-place relation in U_A such that
$\forall x,y \in U_A[x \infty_A y \rightarrow \neg\, x \otimes_A y]$
$\forall x,y,z \in U_A[x \infty_A y \wedge y \leq_A z \rightarrow x \infty_A z \vee x \otimes_A z]$

- Assume that the predicate P is cumulative, that is, that there are distinct e and e′ such that P(e) and P(e′) and P(e⊕e′) all hold. e is a proper part of e⊕e′ (as is e′), hence overlaps with e⊕e′. By definition of adjacency, e and e⊕e′ are not adjacent. Hence, both fall under TOT(P)(e), contrary to the fact.

- Given the definition of adjacency, (22) can hardly be a story about perfectivity.

4. Entering modality

4.1 Impossibility and maximality

- Two significant (related) intuitions about the meaning of the perfective:

  📖 "Whenever verbs are used to describe some state of affairs, a decision must be made whether it is to be expressed by a perfective verb, and represented **as a maximal event**." (Filip 2008:241)

  📖 "It is not the existence of a boundary <of the event — S.T.> in the real (or narrated world) which matters but **whether the action could go on** after this boundary… It has to do with which meaning components are packed into the lexical content of the expression to which aspectual marking applies." (Klein 1995: 679, discussing Timberlake's (1984, 1985) theory of aspect)

- The perfective is about:
  - **maximality** ("represented as a maximal event")
  - **(im)possility** ("whether the action could go on")

- Similar intuitions: huge literature on Slavic aspect going back to Černy 1877, Agrell 1908, Miklosich 1883,

4.2. Best worlds

- The Slavic perfective asserts that an event e of event-type P occurs in the evaluation world and that no continuation of e occurs in any accessible world provided that the continuation falls under P as well.

  - This idea allows, among other things, to think of the perfective and progressive (Dowty 1979, Landman 1992, Portner 1998) along similar lines. We can say that the progressive looks at accessible worlds trying to find those where the event continues (and culminates), while the Slavic perfective makes sure that the event does not continue in the accessible worlds.

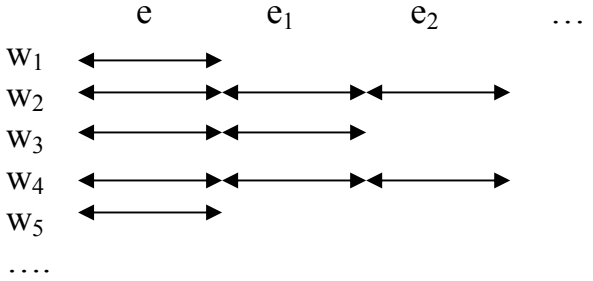
(24) **Semantics of PFV** (to be adjusted):
PFV(P)(t) is true of a world w iff
there is an event e in w such that
P(e) and t includes τ(e) and **(Klein's perfectivity)**

w is a member of the set p of best worlds
for e relative to P,
p = BEST(Circ, Cont, P, e, w) **(Modal component)**

where Circ is a circumstantial modal base and
Cont is an event-maximizing ordering source

- The perfective says that our world, where a P-type event e occurs, is among the best worlds for P-type events.

(25) **One continuation stretch of e:**



- In (25), worlds w_1, w_2, w_3, w_4, w_5 are all worlds where our event e occurs
  e stops in w_1 and w_5 and is continued by e_1 in w_2, w_3, w_4
  $e \oplus e_1$ stops in w_3 and is continued by e_2 in w_2 and w_3, and so on.

- We want to say that worlds w_2, w_3 and w_4 are better for e than w_1 and w_5, and that worlds w_2 and w_4 are better than w_3.

- We also want that e, while extending, still be an event of type P in any world where it extends.

- **Modal base** and **Ordering source**: double relative theory of modality (Kratzer 1977, 1987, 1991 and elsewhere)

- **Three main ingredients:**
  - the BEST relation,
  - the circumstantial modal base Circ,
  - the event-maximizing ordering source Cont.

- **Best worlds for a P-type event e occurring in a world w:**
  - **CIRC** picks out a set relevant worlds. Those are all worlds where our P-type event e occurs. If we are talking about an apple-eating event, we are only interested in those worlds where our event continues as apple-eating.

  - **CONT** imposes a strict partial order on this set. The more our P-type event extends in a world, the better this world is. If we reach a world w where our P-event still occurs, but cannot find a world w′ where it extends yet a bit more, then w is (one of) the best worlds.

(26) **The BEST relation**
BEST(Circ, Cont, P, e, w) = the set of worlds w′ in ∩Circ(w) such that there is no w′′ in ∩Circ(w) where $w'' <_{Cont(e,P)} w'$

- In words: the BEST relation picks out the set of worlds from the modal base (more precisely: from the intersection of all propositions in the modal base (∩Circ(w)) that come closest to the ideal established by the ordering source Cont(e, P).

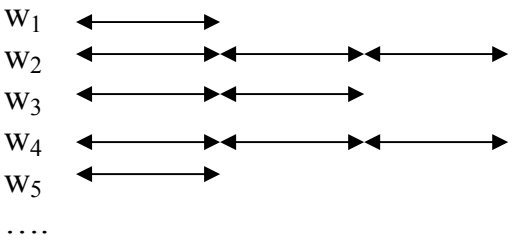
- **The modal base** (of type <s, <st, t>>) is a circumstantial conversational background that assigns to a world w a set of propositions. One of these propositions is a set of worlds w′ such that our event occurs in w′ while still falling under the event description P in w′. The conversational background is realistic.

(27) **Modal base (for a world w)**
Circ(w) = {…, {w′ | P(e) in w′}, … }

- **Ordering source**, of type <vt, <v, <st, t>>> is relative to an event and an event description. It takes an event description P and an event e and returns a set of propositions that express continuations of e. We keep track of any continuation of e in any world w from the modal base provided that e falls under the extension of P in w.

(28) **One continuation stretch of e:**

=(25) e e_1 e_2 …



- In (28), worlds w_1, w_2, w_3, w_4, w_5 is now a subset of $\cap$Circ(w)

- Remember, we want to say that worlds w_2, w_3 and w_4 are better than w_1 and w_5, and that worlds w_2 and w_4 are better than w_3.

(29) **The ordering relation**

For any w, w′, $w' <_{Cont(e,P)} w$ iff

$\{p \in Cont(e, P) | w \in p\} \subset \{p \in Cont(e, P) | w' \in p\}$

(30) **Ordering source:**

$Cont(e, P) = \{ \{w | P(e) \text{ in } w\}, \{w | P(e \oplus e_1) \text{ in } w\}, \{w | P(e_1 \oplus e_2 \oplus e_3) \text{ in } w\}, \ldots \}$

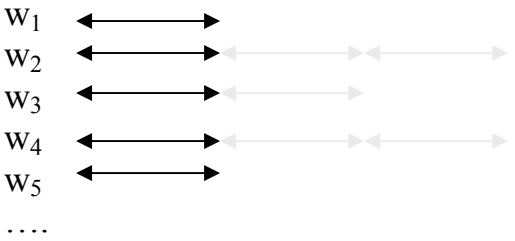
- This makes the perfective dependent on the quantization status of the event predicate P.

4.3. Continuation and quantization

- **Case 1: P is quantized**
  - Assume P is quantized and e falls under P in a world w.
  - Then $e \oplus e_1$ does not fall under P for any e_1 distinct from e itself.
  - For if P(e) and $P(e \oplus e_1)$ both hold, and $e \neq e_1$, P applies to $e \oplus e_1$ and to its proper part e, that is, is not quantized, contrary to the assumption.
  - Therefore, sets of worlds $\{w | P(e \oplus e_1) \text{ in } w\}$, $\{w | P(e \oplus e_1 \oplus e_2) \text{ in } w\}$, and so on are all empty. Our event cannot continue as a P-type event (although can possibly continue as an event of some other type). The ordering source reduces to a singleton set of propositions:

(31) **Degenerate ordering source for quantized Ps**
Cont(e, P) = {{w| P(e) in w}, ∅, ∅, …}

(32) **One continuation stretch of e:**
=(25) e e_1 e_2 …



- Hence, the BEST function picks out {w| P(e) in w} as the set of best worlds. For (28) these would be {w_1, w_2, w_3, w_4, w_5}.

- **Case 2: P is cumulative**

  - Assume P is cumulative and e falls under P in a world w

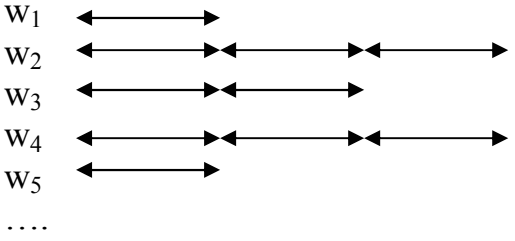
  - Then e ⊕ e_1 does falls under P as well (as long as e_1 falls under P); similarly for any other continuations of e.

(33) **Ordering source for non-quantized Ps**
Cont(e, P) = { {w| P(e) in w}, {w| P(e ⊕ e_1) in w}, {w| P(e_1 ⊕ e_2 ⊕ e_3) in w}... }

- If P(e ⊕ e′) holds in w, P(e) holds in w, too, for any P, e, e′ (down to atomic parts of P if P is atomic). Hence

(34) if w ∈ {w | P(e_i) } and w′ ∈ {w | P(e_i ⊕ e_j) }, w′ $<_{Cont(e,P)}$ w

(35) **One continuation stretch of e:**
e e_1 e_2 …



- E.g., in (35): w_2 and w_4 are better than w_3 since P(e), P(e ⊕ e_1), P(e_1 ⊕ e_2 ⊕ e_3) are all true in w_2, w_4, but P(e), P(e ⊕ e_1) are only true in w_3.

- The bigger continuation we take the better the world in which this continuation occurs is.

- Therefore, for our world, where our event stops, there is no way of being among the best ones. Given (33) and (34), we can see immediately that there are worlds better than ours.

- Moreover, since Cont(e,P) does not take care about the degree of similarity of a world where a continuation of e occurs to the evaluation world, the continuation of our event will never stop. The BEST function will then return an empty set of worlds.

4.4. Modal presupposition

- Given semantics in (24), our initial sentence in (3) comes out false on the atelic reading with a bare interpretation of the internal argument.

(36) **Perfective sentence; undetermined plural object DP**
=(3) Vasja *s''-e-l* jablok-i (za dva čas-a / * dva čas-a).
Vasja PRF-eat-PST.M apple-ACC.PL in two-ACC hour-GEN two-ACC hour-GEN
1. Vasja ate all the apples (in two hours).
2. *Vasja ate apples (for two hours).'

- But we may rather want its truth value to be undefined (as a result of the presupposition failure).

- Evidence that the meaning component responsible for the maximality is a presupposition: sentences like (36) (=(3)) under negation:

(37) **Perfective negated sentence; undetermined plural object DP**
Vasja ne *s''-e-l* jablok-i.
Vasja NEG PRF-eat-PST.M apple-ACC.PL
1. 'Vasja did not eat the apples.'
2. *'Vasja did not eat apples.'

(38) **Modal presupposition of the perfective:**
A sentence of the form PFV(P)(t) presupposes that
for any world w and for any P-type event e occurring in w there exists a set of worlds p such that p = BEST(Circ, Cont, P, e, w)

- Given (38), the predicted interpretation of (37) would be:
  - (37) is true in a world we iff
  - by (38), there are best worlds where apple-eating events are maximally realized and
  - by (24)+ negation, our world is not one of those.

- This correctly predicts that the definite interpretation of the incremental DP survives under negation.

5. Conclusions and possible extensions

- The modal analysis I attempted to develop seems to derive aspectual compositional effects of the Slavic perfective without stipulating quantization / non-cumulativity conditions and to capture significant intuitions about maximality entailments associated with perfective sentences.

- If the above reasoning is on the right track, its possible extensions would include:

  - other types of incremental predicates (e.g., degree achievements like *udlinit'* 'lengthen')

  - non-incremental accomplishments and achievements (e.g., *razbit'* 'break')

  - (apparently) non-telic perfective clauses based on delimitative (*poguljat'* 'walk for a while') and perdurative (*prosidet' ves' den'* 'sit the whole day long') verbs

  - restrictions on co-occurrence with phasal verbs like *načat'* 'begin, start',….

- **… and a lot more.**

Selected references

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