



PDT: t-layer – t-lemma and grammatemes (for Czech)

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PDT: t-layer

Goal:

- to describe deep, semantic structure of a sentence
~ a sentence meaning
- disambiguated
- dependency 'tree'
- information on
 - lexical items: *t-lemma* (primarily)
 - meaning of morphological categories: *grammatemes*
 - relations between lexical words ~ **deep structure**:
functors + subfunctors
 - coreferential links
 - topic focus articulation: linear order + tfa attribute
(cz: aktuální členění)
- PDT 3.5: multiwords expressions, discourse relations, genre specif.

documentation: <http://ufal.mff.cuni.cz/pdt3.0/documentation>

Digression: Syntactic and lexical derivation



- "traditional" part of speech classification (PoS)
 - morphological tag
 - 8 basic classes (English) vs. 10 basic classes (Czech)



Digression: Syntactic and lexical derivation



- "traditional" part of speech classification (PoS)
 - morphological tag
 - 8 basic classes (English) vs. 10 basic classes (Czech)
- syntactic part of speech classification
 - syntactic nouns, adjectives, adverbs, verbs
 - e.g., Šmilauer "skladebné podstatné jméno"

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 - morphological tag
 - 8 basic classes (English) vs. 10 basic classes (Czech)
- syntactic part of speech classification
 - syntactic nouns, adjectives, adverbs, verbs
 - e.g., Šmilauer "skladebné podstatné jméno"
- semantic part of speech classification
 - syntactic vs. lexical derivation (Kuryłowicz)

Digression: Syntactic and lexical derivation



- FGD theory (**but NOT fully implemented in PDT**):
derived words represented by the t-lemma of the original word

- syntactic derivation

- new syntactic function (change of PoS)
- the same semantics

e.g. *přicházet* → *přicházení*; *to arrive* → *arriving* (not in PDT)
přicházení → *příchod*; *to arrive* → *arrival* (not in PDT)
pěkně [nicely] → *pěkný* [nice]

- lexical derivation

- new syntactic function (change of PoS)
- change in semantics

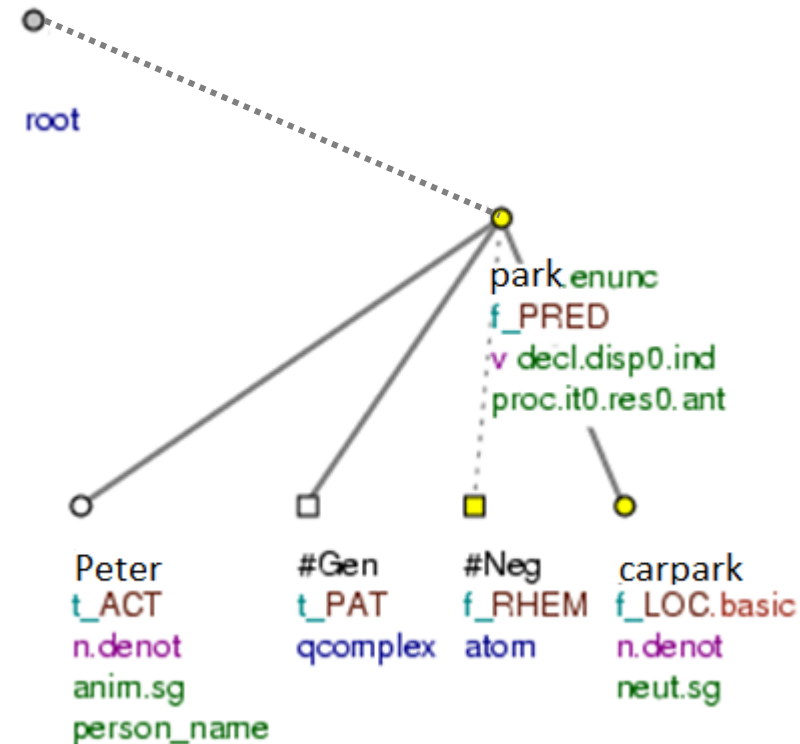
e.g. *učit* → *učitel*; *to teach* → *teacher* (not in PDT)
učit → *učebna* [classroom] (not in PDT)



Lexical information in PDT: t-lemma

- typically: *t-lemma* = *m-lemma*

Petr neparkuje na parkovišti.
Peter is not parking in a car-park.





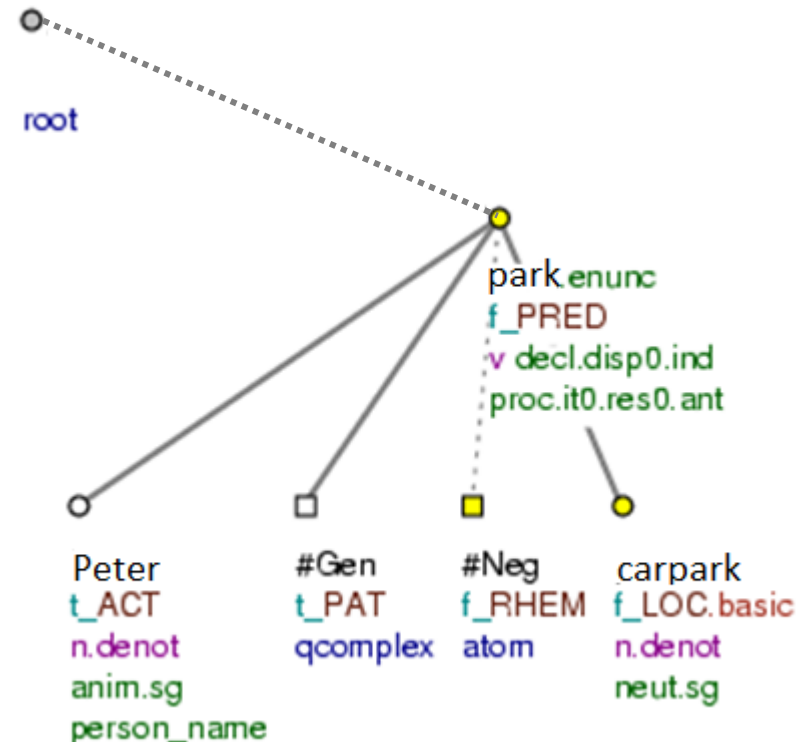
Lexical information in PDT: t-lemma

- typically: t-lemma = m-lemma

BUT:

- t-lemma substitutes ... starting with #
 - personal and possessive pronouns: **#PersPron**
 - newly established words (not copied)
#Gen, #Rcp, #Cor ... (ellipses)
#Forn, #ldph, ...
 - negation: **#Neg**
 - punctuation: **#Comma, #Dash, #Slash, ...**

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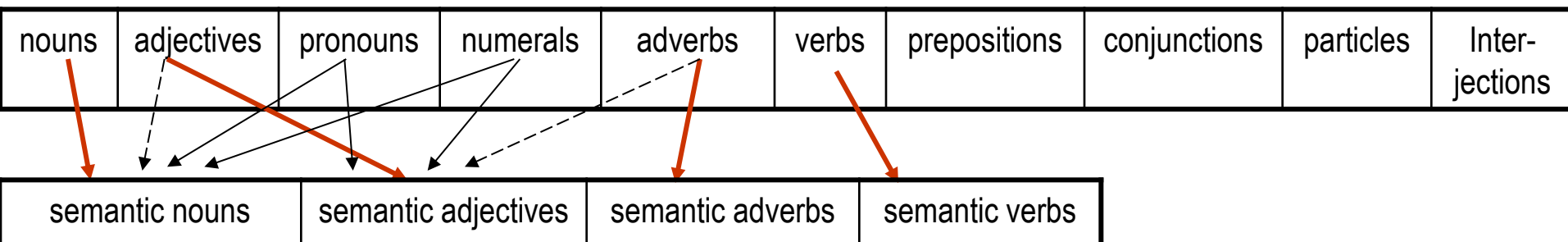


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- t-lemma substitutes ... starting with #
- derived words represented by the *t-lemma of the original word*

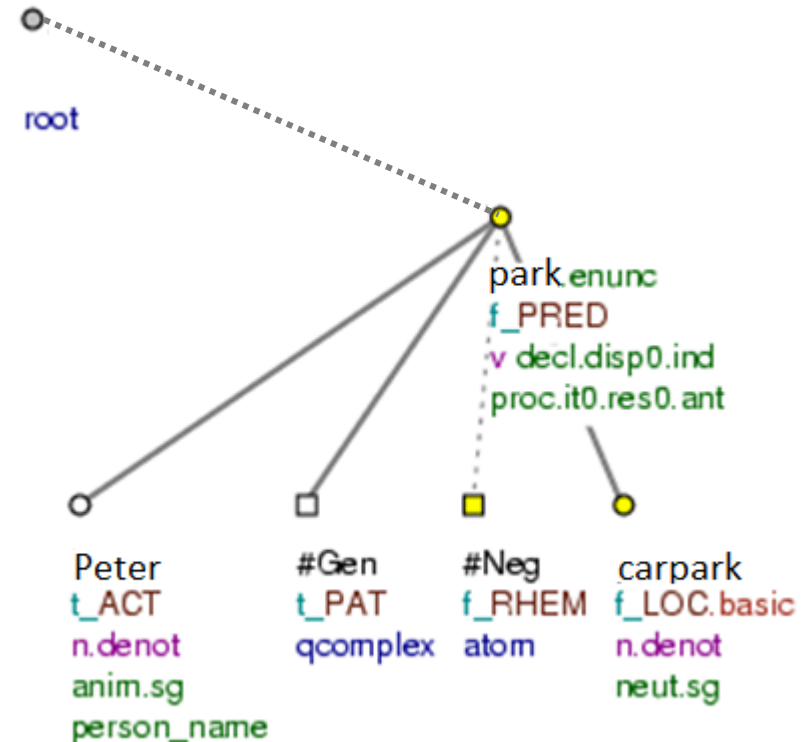




PDT: t-lemma

two types of nodes wrt t-lemma

- individual lexical units (present at surface or 'restored')
⇒ prototypically t-lemma = m-lemma (suffixes are ignored)



Petr neparkuje na parkovišti.
Peter is not parking in a car-park.



PDT: t-lemma for derived words

Implemented in PDT:

- **personal and possessive pronouns**
e.g. *já, mi, tobě, sebe, je* [I, me, you, myself, them] → #PersPron
tvé, jejich, svoje [your, their, refl] → #PersPron
- **possessive adjectives**
e.g. *matčin* [mother's] → *matka* [mother]
Pavlova [Pavel's] → *Pavel*
- **deadjectival adverbs**
e.g. *pěkně* [nicely] → *pěkný* [nice]
- **directional adverbs** (→ locative adverbs)
e.g. *tudy* [this way] → *tady* [here]; *kudy* [which way] → *kde* [where]
- **temporal adverbs** (→ answering *When?*)
e.g. *doted'* [until now] → *ted'* [now]; *dokdy* [till when] → *kdy* [when]
- **short forms of adjectives**
e.g. *zklamán* [disappointed] → *zklamaný*
NOT for passive participles: *pozván* [invited] → *pozvat* [to invite]

syntactic derivation:

m-lemma \leftarrow t-lemma + functor

PDT: t-lemma for derived words



- numerals

ordinal, sort/kind, set and fraction numerals

→ derived from the cardinal numerals

- t-lemma of the cardinal number
- grammateme *numertype*

ord (cz řadové) ... *třetí* [the_third] → *tři* [three]

kind (cz druhové) ... *trojí* [three_kinds_of] → *tři*

set (cz souborové)... *troje* [three_sets/pairs/..._of] → *tři*

frac (cz dílové) ... *třetina* [(one) third] → *tři*

lexical derivation:

m-lemma \leftarrow t-lemma + numertype

PDT: t-lemma for derived words



- pronouns, pronominal numerals and pronominal adverbs
relative, indefinite, interrogative, negative and totalizing

⇒ derived from the correspond. interrogative or relative pronoun / numeral / adverb

- t-lemma
- grammateme *indeftype*

e.g. *někdo* [somebody] → *kdo* [who]
nikdo [nobody] → *kdo*
kdokoliv [anybody] → *kdo*
nic [nothing] → *co* [what]
několik [several] → *kolik* [how many]
všechn [all] → *co* [what]
žádný [no] → *který* [which]

lexical derivation:

m-lemma ← t-lemma + indeftype

PDT: t-lemma for multi-word expressions



- reflexiva tantum
 - e.g. *smát se* [to laugh Refl] → *smát_se*
 - setkat se* [to meet] → *setkat_se*
- complex conjunctions and conjunction pairs, operators
 - e.g. *bud' ... nebo* [either ... or] → *bud'_nebo*
 - od ... přes ... do* [from ... via ... to] → *od_přes_do*
 - a nebo* [or] → *a_přes_do*
- numeral expressions
 - e.g. *278 11* → *278_11*
 - 41 letý* [forty-one_years_old] → *41_letý*
- idioms
 - e.g. *nohy na ramena* [legs on shoulders] → *nohy_na_ramena*
- etc.

PDT: t-lemma for multi-word expressions

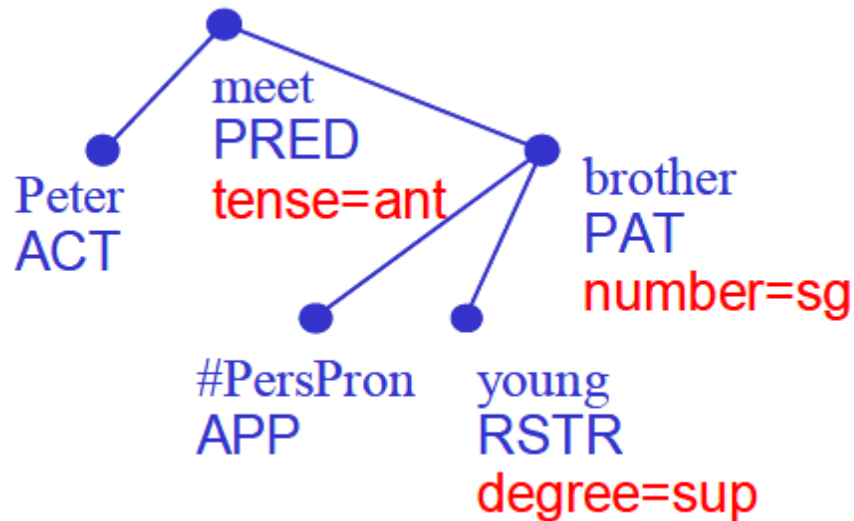


- inherent reflexive verbs (reflexivum tantum)
 - e.g. *smát se* [to laugh Refl] → *smát_se*
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- etc.
- grammatememes
 - e.g. *chtít přijít* [to want to come] → *přijít* [to come] + volitive (deontic modality)
- special functors
 - e.g. CPHR: *mít dojem* [to have the impression]

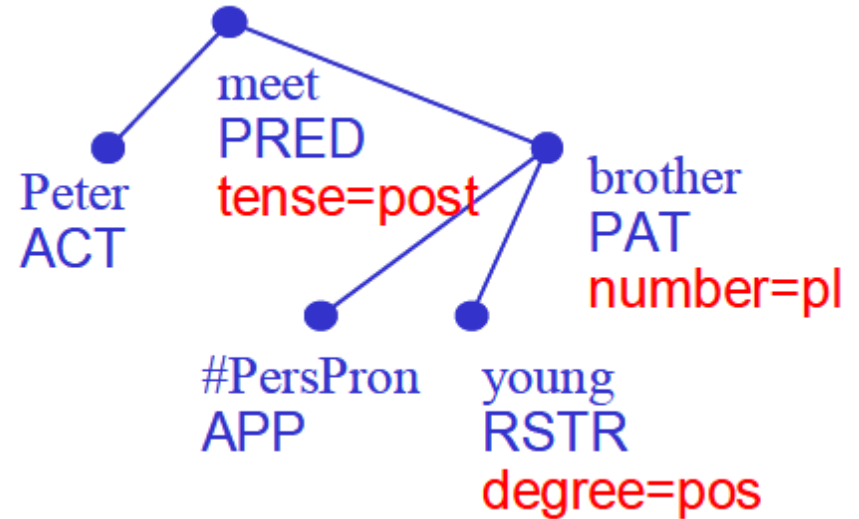


PDT: Grammatemes – motivation

- grammatemes:
 - t-node attribute-value pairs representing morphological meaning (semantically indispensable morphological categories)



Peter met her youngest brother.



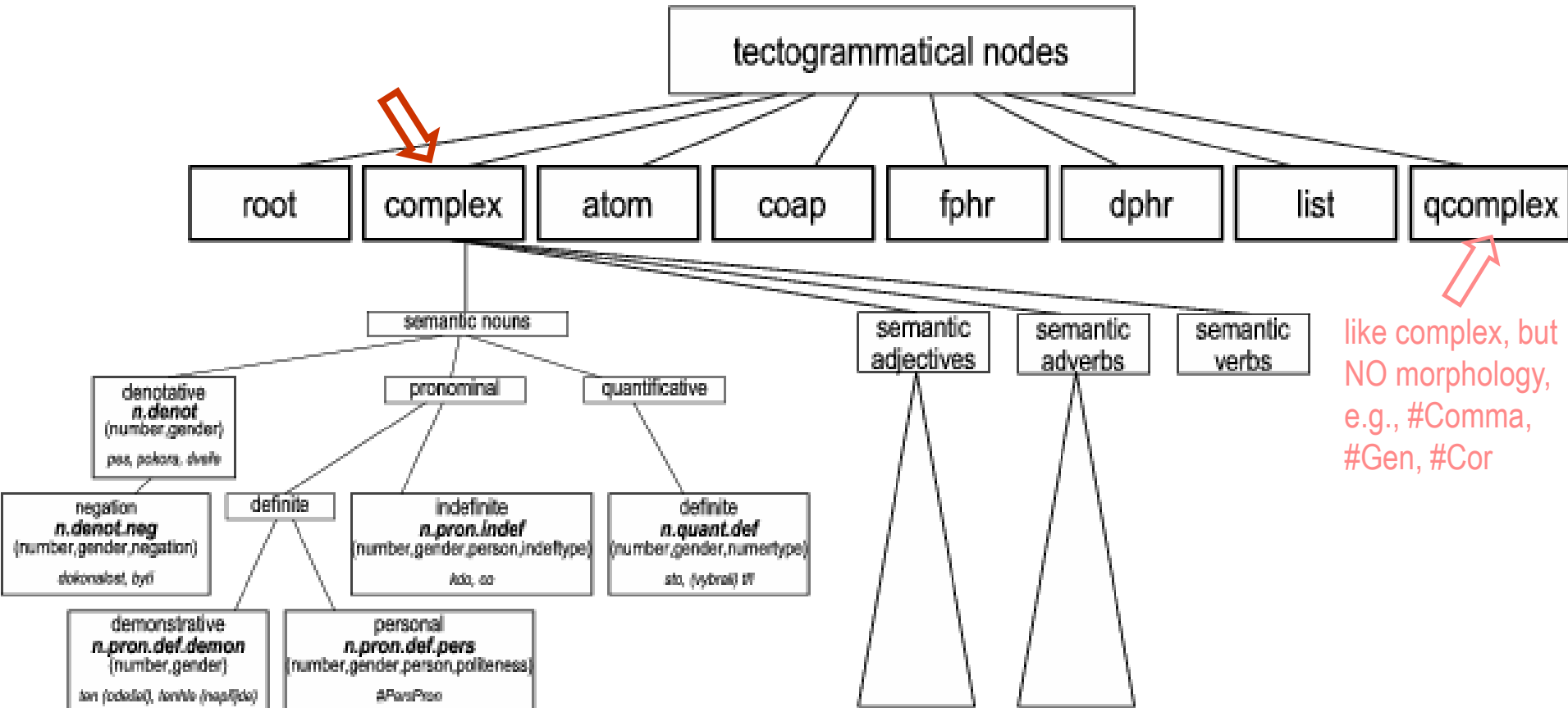
Peter will meet her young brothers.

(example and picture from Žabokrtský, 2003)



PDT: **grammatemes** for complex nodes

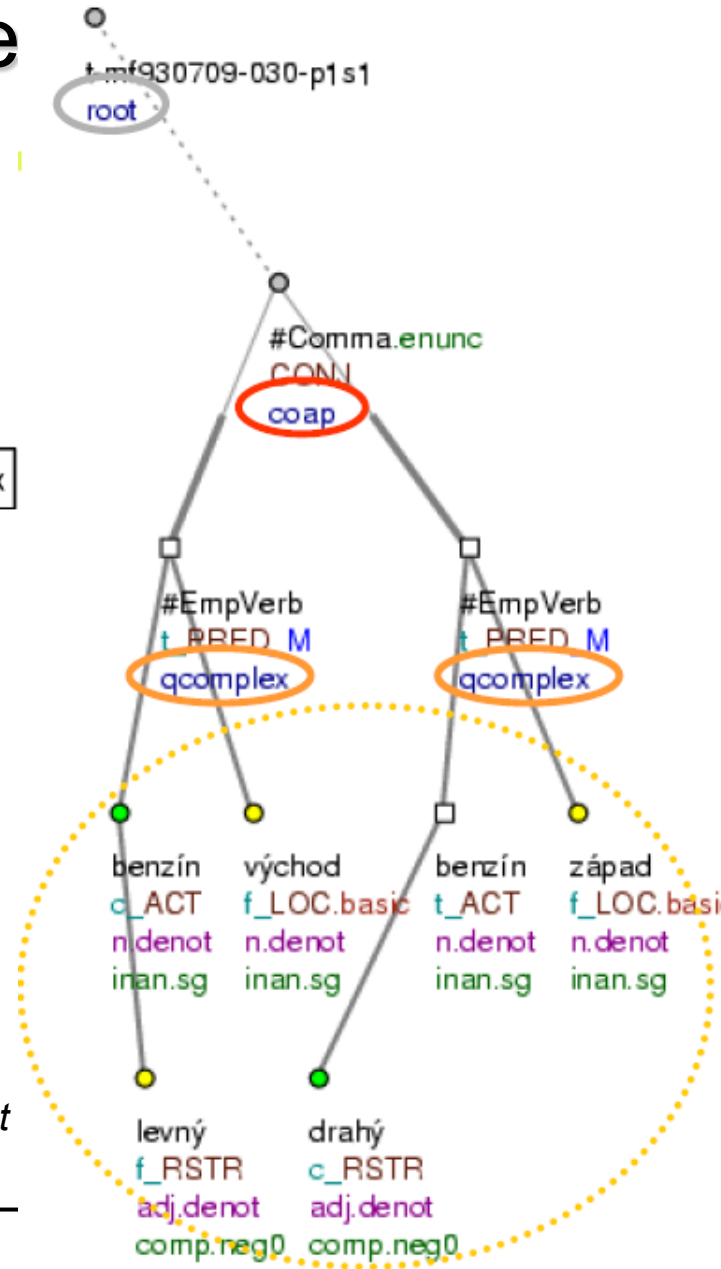
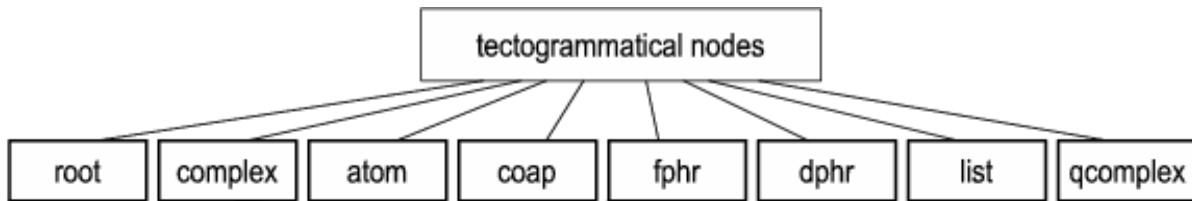
- eight node types ... attribute *nodetype*
- 19 more specific subtypes
 - defined on the basis of a *t-lemma* and/or a *functor*





PDT: **grammatemes** for comple

- eight node types ... attribute *nodetype*
- 19 more specific subtypes



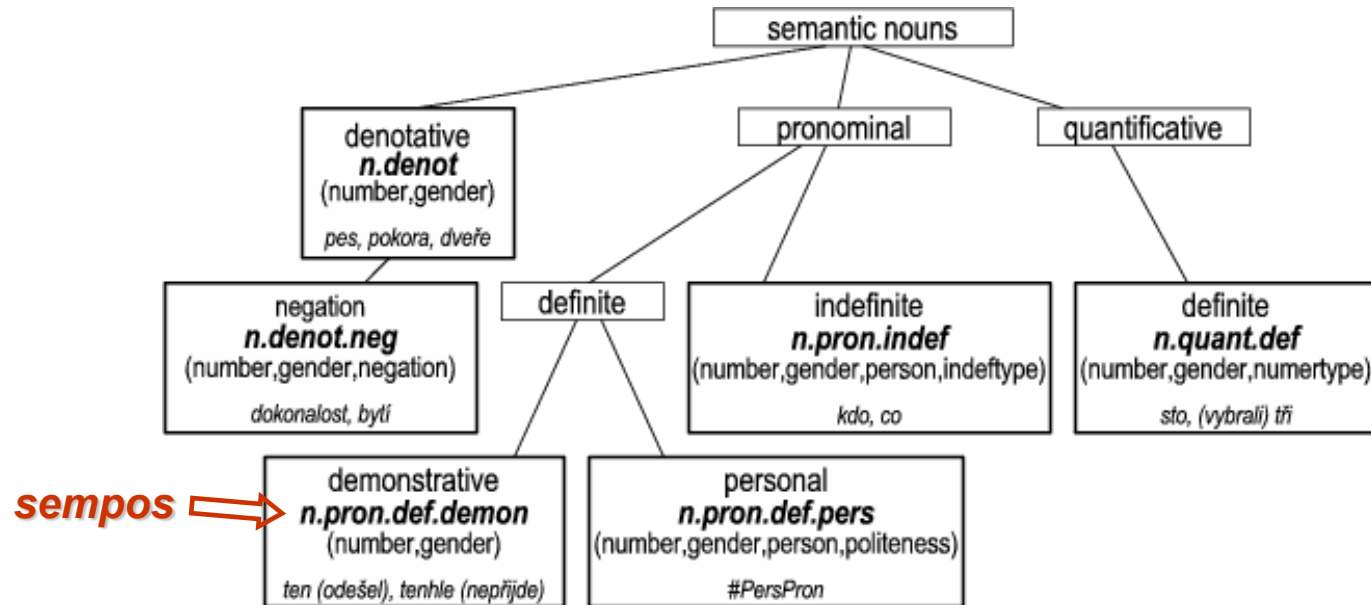
Levnější benzín na Východě, dražší na Západě
Cheaper gasoline in the East, more expensive one in the West
 (example and picture from Žabokrtský, 2003)

PDT: system of grammatememes (for Czech)



- only for *complex nodes*
- to capture meaning of morphological categories
- complex nodes
- attribute *gram/sempos*
 - semantic nouns
 - semantic adjectives
 - semantic adverbs
 - semantic verbs

} further classified



PDT: system of grammatememes (cont.)



based on a value of *sempos*

⇒ 15 grammatememes:

- number, gender, person, politeness, *typgroup** (SemN)
- numertype (SemN, SemAdj)
- indeftype, negation (SemN, SemAdj, SemAdv)
- degcmp (SemAdj, SemAdv)
- ~~verbmod~~ → *factmod**, deontmod, aspect, tense, iterativeness, *resultative*, *dispmod*, *diatgram** (SemV)

(attribute gram ... technical attribute gathering all grammateme attributes)

+ sentmod

* PDT 3.0, 3.5

PDT: system of grammatememes (cont.)



values of grammatememes:

- **basic values** ... values inherent to an individual grammateme
 - two (or more) values
e.g. *Viděl jen dva.* [gender=anim|inan] (not fem,neut) [He saw only two of them.]
- **special values**
 - **nr** ... all values may be assigned to
(i.e., all basic values are possible in the given case)
e.g. *Vypral si kalhoty.* [number=nr] [He washed his pants]
 - **nil** ... none of the basic values is suitable (limited)
 - **inher** ... the value is inherited from the coreferred node
(for grammatical coreference)
e.g. reflexive *se*, *svůj*, relative pronouns

SemN, SemAdj: Grammateme *numertype*



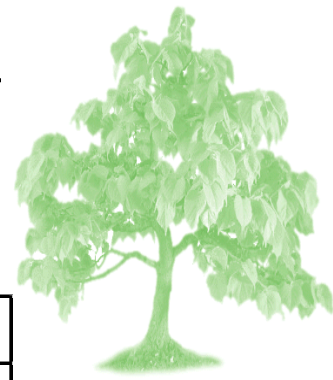
- lexical derivation ... ordinal, sort, set, and fraction numerals
- quantitative sem. nouns and sem. adjectives
- t-lemma + numertype \Rightarrow m-lemma
- values
 - basic: cardinal numbers
(cz základní) ... *tři, sto, kolik* [three, hundred, how many]
 - **set**: (cz souborové) ... *troje, stery, kolikery*
 - **kind**: (cz druhové) ... *trojí, stery, kolikerý*
 - **ord**: (cz řadové) ... e.g. *třetí, stý, kolikátý*
 - **frac**: (cz dílové) ... *třetina, setina*

SemN, SemAdj: Grammateme *indef*type



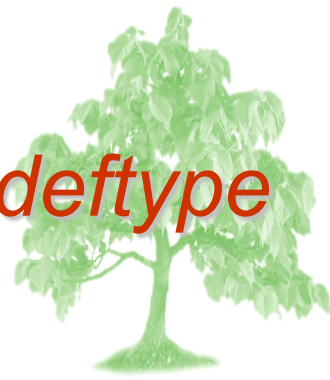
- lexical derivation:
pronouns, pronominal numerals and pronominal adverbs
(indefinite, interrogative, negative and totalizing) ...
derived from the correspond. interrogative or relative pronoun /
numeral / adverb
- t-lemma + indeftype \Rightarrow m-lemma
- values
 - **relat, indef1 ... indef6, inter, negat, total1, total2**

SemN, SemAdj: Grammateme *indef*type



t-lemma:	<i>kdo</i>	<i>co</i>	<i>který</i>	<i>jaký</i>
hodnota gramatému indef type:				
relat	<i>kdo</i>	<i>co</i>	<i>který, jenž</i>	<i>jaký</i>
indef1	<i>někdo</i>	<i>něco</i>	<i>některý</i>	<i>nějaký</i>
indef2	<i>kdoši, kdosi</i>	<i>coši, co</i>	<i>kterýsi</i>	<i>jakýsi</i>
indef3	<i>kdokoli(v)</i>	<i>cokoli(v)...</i>	<i>kterýkoli(v)</i>	<i>jakýkoli(v)</i>
indef4	<i>ledakdo, leckdo...</i>	<i>ledaco, lecco...</i>	<i>leckterý, ledakterý</i>	<i>leccjaký, ledajaký</i>
indef5	<i>kdekdo</i>	<i>kdeco</i>	<i>kdekterý</i>	<i>kdejaký</i>
indef6	<i>málokdo, kdovíkd...</i>	<i>máloco...</i>	<i>málokterý...</i>	<i>všelijaký...</i>
inter	<i>kdo, kdopak...</i>	<i>co, copak...</i>	<i>který, kterýpak</i>	<i>jaký, jakýpak</i>
negat	<i>nikdo</i>	<i>nic</i>	<i>žádný</i>	<i>nijaký</i>
total1	<i>všechn</i>	<i>všechn, všechno, vše</i>	—	—
total2	—	—	<i>každý</i>	—

SemN, SemAdj: gram. *numertype* and *indefitype*



t-lemma: *kolik* [how many]

hodnota gramatému numertype:	basic	set	kind	ord
hodnota gramatému indefitype:				
relat	<i>kolik (klíčů), kolikery (dveře)</i>	<i>kolikery (klíče)</i>	<i>kolikery</i>	<i>kolikátý</i>
indef1	<i>několik (klíčů), několikery (dveře)</i>	<i>několikery (klíče)</i>	<i>několikery</i>	<i>několikátý</i>
indef2	–	–	–	–
indef3	–	–	–	–
indef4	–	–	–	–
indef5	–	–	–	–
indef6	<i>kdovíkolik (klíčů), kdovíkolikery (dveře)...</i>	<i>kdovíkolikery (klíče)...</i>	<i>kdovíkolikery...</i>	<i>kdovíkolikátý...</i>
inter	<i>kolik (klíčů), kolikery (dveře)</i>	<i>kolikery (klíče)</i>	<i>kolikery</i>	<i>kolikátý</i>
negat	–	–	–	–
total1	–	–	–	–
total2	–	–	–	–

Grammateme *sentmod*



sentential modality

... whether the sentence expresses an assertion, a question, a demand etc

- **enunc:** declarative *Petr tam nepřišel.* [*Petr didn't come.*]
Škola. [School.]
- **excl:** exclamative *Vyhráli jsme!* [We won!]
Auto! [Car!]
- **desid:** desiderative *At' se vám daří!* [*I wish you all the best*]
Hodně štěstí! [Good luck!]
- **imper:** imperative *Přijďte včas!* [Come in time!]
Pozor! [Warch out!]
- **inter:** interrogative *Kdy dnes přijdete?* [When do you come?]
Škola? [School?]

nodes representing the main verb or noun ~~and the coordination roots~~

root nodes of subtrees representing direct speech;

root nodes of subtrees representing a parentheses (PAT)

root nodes of title subtrees (labeled with the functor *ID*),

SemV: Grammateme *factmod* in PDT 3.0



- whether an event is presented by the speaker

as ***given*** or ***hypothetical***

correlate of the morphological category of verbal modality (cz slovesný způsob)

- applicable for verbal predicates

PDT 2.0 ... *vebmod*

- **ind:** (indicative)
- **imp:** (imperative)
- **cdn:** (conditional)
- **nil:** (for infinitives, transgressives)

PDT 3.0 ... *factmod*

- **asserted:** (given)
- **appeal:** (required, imperative)
- **potential:** (present conditional)
- **irreal:** (perfect conditional)
- **nil**

When a mistake occurs.asserted, it is.asserted possible to ask.nil the new owner that he would remit.potential money to the right owner of securities.

To draw the game would be.potential a success.

Take.appeal the phone and call.appeal (us).

Of course, the majority of Bangladesh Muslim inhabitants would not have noticed.irreal the interview in question under common circumstances at all.

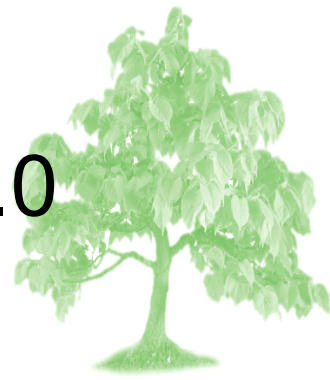
The saint drunkard Joseph Roth would celebrate.potential his 100th birthday today.

SemV: Grammateme *deontmod* (modality)



- an event is understood as necessary, possible, permitted etc
- applicable for all verbal forms
- values:
 - **deb:** necessity, i.e. *muset* [must, have to]
Musíme zaplatit fakturu včas. [We have to settle the invoice in time]
 - **vol:** volition, i.e. *chtít, hodlat* [to want, to intend]
Chtěl na sebe upozornit. [He wanted to turn the attention to himself]
 - **perm:** permission, i.e. *smět, moci* [may, to be allowed]
Nesmíš kouřit. [You are not allowed to smoke]
 - **hrt:** obligation, i.e. *mít* [should, to be obliged]
Petr ti měl ty podklady poslat. [Petr was supposed to send you the documents]
 - **poss:** possibility, i.e. *moci, dát se* [may, can, to be possible]
To se dá zjistit. [It is possible to find out]
 - **fac:** ability, i.e. *dovést, umět, moci* [can, to be able]
Umí se výborně přetvařovat. [He can/is able to pretend very well]
 - **decl:** without a modal verb (or if a modal verb has its own node)

SemV: Grammateme *diatgram* ... PDT 3.0



- **diathesis** ~ a way how a sentence is structured
i.e., “from perspective of which complementation of the predicate”
John ate the cake. vs. *The cake was eaten.*
- applicable for verbal predicates (not imperative)
- values:
 - **act** I bought a book. I prepared a dinner for my mum.
 - **pass** The book was bought. The dinner was prepared (by me) in advance.
 - **res1** *Obchod je otevřen.* (past participle) [The shop is open.]
 - **res2** *Obchod má otevřeno.* (past participle) [The shop is open.]
Babička má oběd uvařen.
Babička má uvařeno.
 - **recip** *Děti dostali vynadáno od rodičů.*
 - **disp** *Kniha se (mi) dobře čte.*
Spí se mu tam dobře. Tančilo se skvěle.
 - **deagent** *Čeká se tuhá zima.*
Knihy se kupují v knihkupectví.

SemN, SemAdj, SemAdv: Gram. *negation*



- applicable for:
 - nouns with the endings *-ní, -tí, -ost*
 - all adjectives
 - some adverbs
 - (**NOT** for verbs ... node for negation, functor RHEM)
- (positive) t-lemma + negation \Rightarrow m-lemma
- values:
 - **neg1**: (negative)
nezralost (dítěte) [immaturity (of the child)], *nepěkný* [not-nice], *nedodržování (pořádku)* [non-maintenance (of order)], *nepříliš* [not-very], *nedaleko* [not-far], *nebytí* [not-being]
 - **neg0**: (affirmative)
zralost (dítěte) [maturity (of the child)], *pěkný* [nice], *dodržování (pořádku)* [maintenance (of order)], *příliš* [very], *daleko* [far], *bytí* [being]

Grammatemes reflecting other morph. categories



SemN: Grammateme *number*



- values ... **sg**, **pl**
- prototypically corresponds to the morphological number
- BUT
 - pluralia tantum
e.g. *jedny kalhoty.sg* [one pair of trousers], *dvoje kalhoty.pl* [two pairs of trousers]
 - polite form (cz 'vykání')
e.g. sg: *vy.sg *jste přišel**

SemN: Grammateme *typgroup*



- the semantic opposition of the pair/group meaning
vs. meaning of single entities

kalhoty [trousers], *ruce* [hands, arms], *klíče* [keys], *boty* [shoes]

- plural forms refer rather to a pair/group than to a larger amount of single entities
- combination with numerals → grammaticalized
dvoje boty [two-pairs-of shoes] set numeral vs. *dvě boty* [two shoes] cardinal
- values:
 - **group:**
 - **single:**

semi-automatical annotation

→ the annotation of number is affected

sg.group: one pair/group, a plural form of nouns ... (a pair of) trousers; cigarettes (a package)

pl.group: more pairs/groups, a plural form of nouns ... (more pairs of) trousers; cigarettes
(more packages)

nr.group: one or more pairs/groups, a plural form of nouns,

sg.single: one entity, a singular form of nouns

pl.single: more entities, expressed by a plural form of nouns

SemN: Grammateme *gender*



- denotative, pronominal and quantitative nouns
- prototypically corresponds to the morphological gender
 - **anim**: *soused* [neighbor], *pes* [dog], (*přišli*) *tři* [three (of them came)]
 - **inan**: *hrad* [castle], *nápad* [idea], *tisíc* [thousand]
 - **fem**: *dívka* [girl], *děti* [children], *dveře* [door], *miliarda* [billion]
 - **neut**: *děvče* [girl], *dítě* [child], *kolo* [wheel], *ono* [it], *sto* [hundred], *co* [what]

SemN: Grammateme *person*



- definite personal and indefinite pronominal semantic nouns, i.e. pronouns referring to an object of communication (third person), to the speaker or hearer (first and second person)
- values:
 - 1: *Já tam nepůjdu.* [I will not go there.], *naš návrh* [our suggestion];
 - 2: *Tvůj názor nesdílím.* [I don't share your view]
Vy už jste se přihlásili. [You.pl have already registered]
Vy už jste se přihlásil. [You.sg have already registered]
 - 3: *On sem nepřijde.* [He will not come], *jeho názor* [his opinion]
- indefinite semantic nouns
 - typically the value 3
unless different subject-predicate agreement

e.g. *Verše, které kdekdo známe...* [Poems which everybody/whoever know.**1.pl**]
Zachraň se, kdo můžeš [Save yourself who can.**2.sg**]

SemN: Grammateme *politeness*



- pronominal semantic nouns
- polite form of addressing (cz 'vykání')
- t-lemma #PersPron
- values
 - **polite:** ('vykání')
Vy už jste se přihlásil. [You.sg have already registered]
 - **basic:**
Já tam nepůjdu / On tam nepůjde. [I / He will not go there],
Ty bys tam neměl chodit. [You.sg should not go there]
Vy už jste se přihlásili. [You.pl have already registered]

SemAdj, Sem Adv: Grammateme *degcmp*



degree of comparison

- applicable for
 - denotative semantic adjectives
 - gradable denotative semantic adverbs ...*blízko* [near] vs. *dnes* [today]
- correlate of the morphological category of degree
- values
 - **pos**: *příjemná hudba* [nice music]
 - **comp**: *příjemnější hudba* [nicer music], *později* [later]
 - **sup**: *nejpříjemnější hudba* [the nicest music], *nejblíže* [the nearest]
 - **acomp**: (absolute comparative)
muž tmavší pleti [a man of darker skin], *starší žena* [an elder(ly) woman]

SemV: Grammateme *tense*



- correlate of the morphological category of tense (cz. slovesný čas)
- time relation between two events (relative tense)
 - btw an event and a moment of speech (absolute)
- applicable for all finite non-imperative verbal forms and transgressives
- values:
 - **sim**: (simultaneous, the same time as another event / moment of utterance)
Píše dopis. Psal dopis. [He is writing a letter. He was writing a letter.]
 - **ant**: (prior to the time of another event / moment of utterance)
Nasal dopis. [He wrote a letter]
 - **post**: (after the time of another event / moment of utterance)
Napíše dopis. [He will be writing a letter]
 - **nil**: (imperative, infinitive)

SemV: Grammateme *aspect*

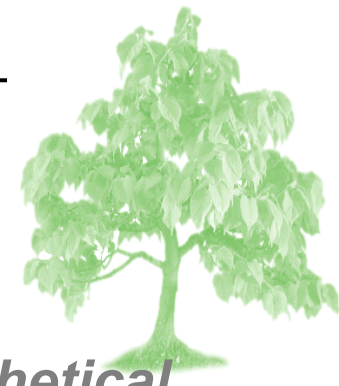


- correlate of the morphological category of verbal aspect (cz slovesný vid)
- applicable for all verbal forms
- values:
 - **proc**: (progressive, imperfective aspect)
Nejraději kupuje / nakupuje nábytek. [He likes to buy furniture best]
 - **cpl**: (complex, perfective aspect)
Koupil / nakoupil už vše potřebné. [He already bought everything he needed]
 - biaspectual verbs
 - proc**: *Operace byla blokována až do konce 80. let.*
[The operation was blocked until the end of the 80's]
 - cpl**: *K 31. lednu 1995 registroval úřad 75 tisíc nezaměstnaných.*
[By January 31st 1995, the agency registered 75 thousands of unemployed people]

SemV: Grammateme *iterativeness*



- applicable for all verbal forms
- values:
 - **it1**: (multiple/iterated/repeated action)
only verbs with suffixes *-ívát/-ávat*, *-ívávat/-ávávat*
kupovávat → t-lemma *kupovat* + it1
 - **it0**:
incl. lexically expressed repetition
Každé pondělí chodí nakupovat. [He used to go shopping each Monday]



Grammateme *verbm*od in PDT 2.0

- whether an event is presented by the speaker as *given* or *hypothetical*
correlate of the morphological category of verbal modality (cz slovesný způsob)
- applicable for verbal predicates

PDT 2.0

- **ind:** (indicative)

Přišli včas. [They came in time].

Kdy přišli? [When did they come?]

- **imp:** (imperative)

Přijďte tam včas! [Be there in time!]

- **cdn:** (conditional)

Přišli bychom určitě včas. kdyby ... [We would definitely come in time if ...]

- **nil:** (for infinitives, transgressives)

Každý má povinnost poskytnout člověku první pomoc.

[Everybody has the obligation to give first aid to the ones who need it]

Hlasitě nařikajíc, odcházela. [Loudly crying, she was leaving]

Grammateme *dispmod* ... PDT 2.0



- dispositional modality (spec. construction in Czech)
- applicable for verbal predicates (not imperative)
- the agent's attitude towards the event is expressed

Tato studie se studentům četla dobře.

[It was easy for the students to read the article]

Spalo se nám tu výborně.

[We slept very well here]

- agent in dative (may be omitted) + refl. form of verb + manner +
+ (compl. in accusative → compl. in nominative)
- values
 - **disp1**
 - **disp0**
 - **nil** (imperative, infinitive, transgressive)

Grammateme *resultative* ... PDT 2.0



- applicable for all verbal forms
- resultative diathesis
- *být / mít* + passive participle
- values:
 - **res1**: (resulting state)
Oběd je uvařen. Je uvařeno. [The lunch is prepared.]
Má uvařen oběd. Má uvařeno.
 - **res0**:
Uvařil a uklidil. [He cooked (the dinner) and cleaned (the house)]

References

- Manual for Tectogrammatical Annotation
<http://ufal.mff.cuni.cz/pdt3.0/documentation>

