Use of Coreference in Automatic Searching for Multiword Discourse Markers in PDT

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Overview

- **Prague Dependency Treebank**
  - PDT 1.0, PDT 2.0, PDT 2.5, PDiT 1.0, PDT 3.0
- **Discourse** in Prague Dependency Treebank
  - PDiT 1.0, PDT 3.0
- **AltLexes** in Prague Dependency Treebank
  - for the next version of PDT

Prague Dependency Treebank

- 3,165 documents, **49,431 sentences**, 833,195 tokens
- (mostly) **manually annotated** Czech journalistic texts from 1990's
  - morphological layer
  - analytical (surface syntax) layer
  - tectogrammatical (deep syntax) layer
  - discourse phenomena

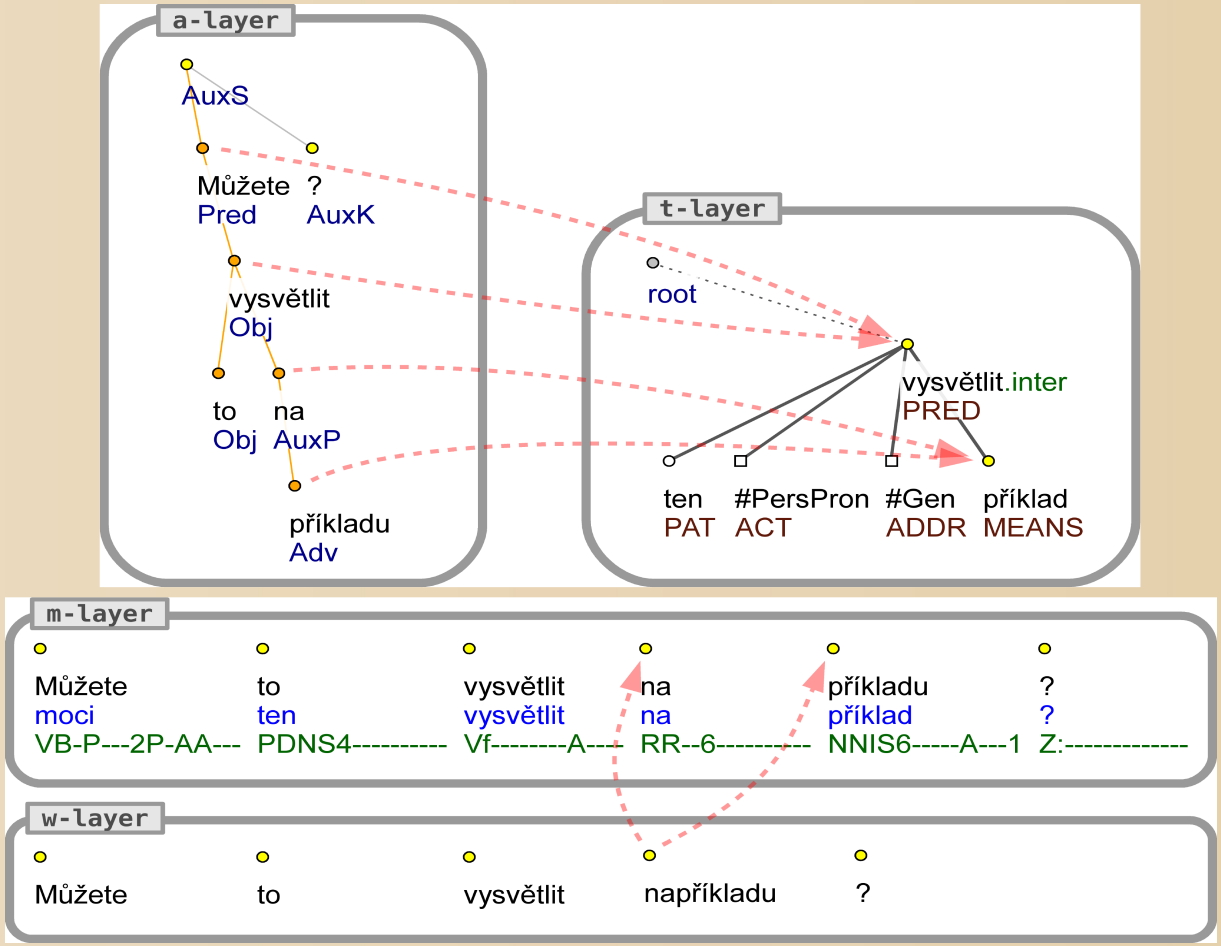
The Tectogrammatical Layer

- **Tectogrammatical layer**
  - sentences represented as **dependency trees**
  - semantic labels called **functors** (approx. 44 labels) represent type of dependency (PRED, ACT, ADDR, ...)
  - some of them further specified by **subfunctors** (functor LOC "where" is further specified by subfunctors *in, behind, under, along* etc.)

The Tectogrammatical Layer

- **Tectogrammatical layer (cont.)**
  - **coreference**
    - grammatical (given by grammatical rules)
    - pronominal textual
    - nominal textual (since PDiT 1.0)
    - bridging anaphora (since PDiT 1.0)
  - **topic-focus articulation** – (contrastively) contextually bound and contextually non-bound elements, comunicative dynamism expressed in node order

Prague Dependency Treebank



Můžete to vysvětlit na příkladu?

[Could you explain it on an example?]

Prague Dependency Treebank Updates

- PDT 1.0 – published in 2001 (LDC)
- PDT 2.0 – published in 2006 (LDC)
- PDT 2.5 – published in 2011 (downloadable from Lindat/Clarin repository, Creative Commons License)
- **PDiT 1.0** – published in 2012 (downloadable from Lindat/Clarin repository, Creative Commons License)
- **PDT 3.0** – published in December 31st, 2013 (...)

Annotation of Discourse in Prague Dependency Treebank

Stage 1 → **PDiT 1.0** (2012)

- discourse relations with **explicit connectives** between **verbal arguments**, **23** discourse types (senses)
- formal definition of connectives (not a list), annotators examined the whole text
- inter-sentential manually, intra-sentential semi-auto
- **AltLexes** only marked in an annotator's comment
- (nominal textual coreference, bridging anaphora)

AltLexes in Prague Dependency Treebank

Connectives vs. **AltLexes**

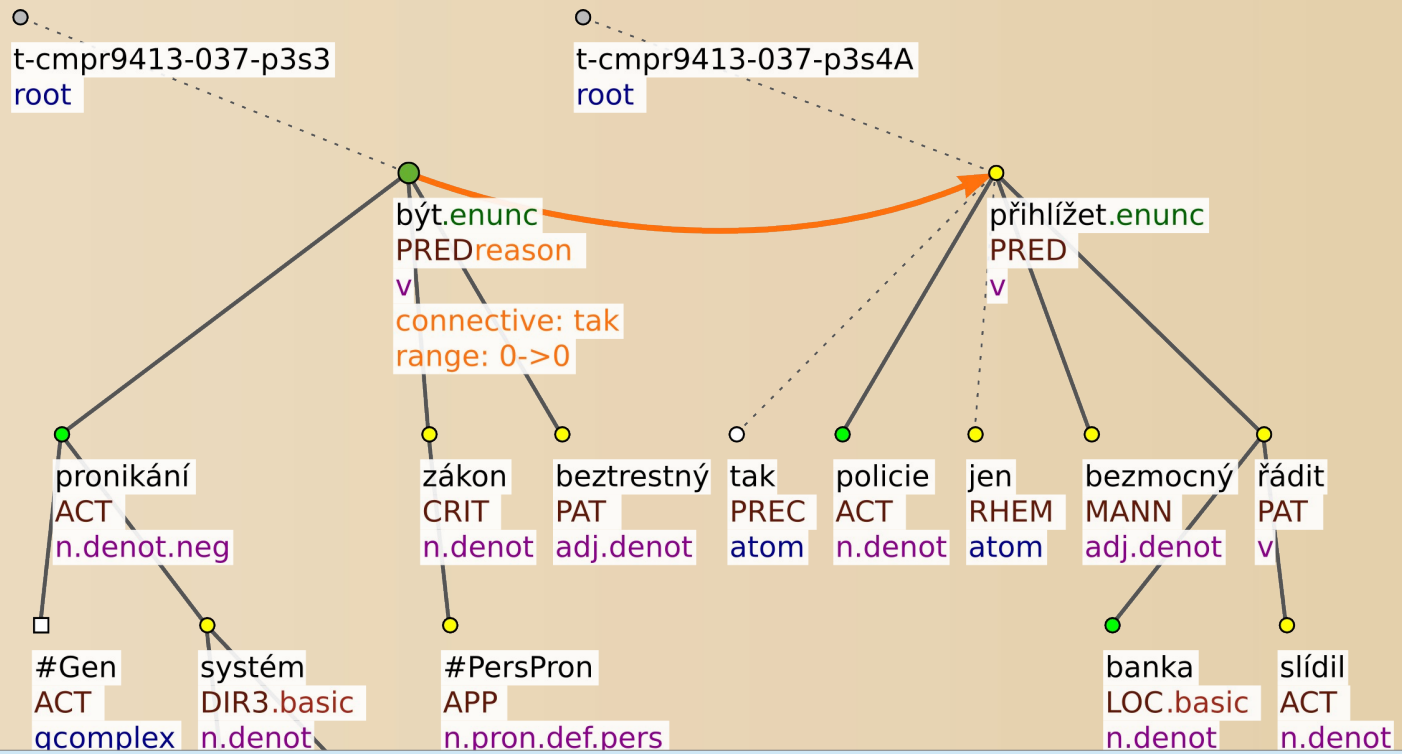
(**Alt**ernative **Lex**icalizations of Connectives)

proto (therefore) vs. ***z toho důvodu (for that reason)***

proto (therefore) vs. ***za tím účelem (for that purpose)***

protože (because) vs. ***důvodem je (the reason is)***

Annotation of Discourse in Prague Dependency Treebank



*Pronikání do cizích počítačových systémů je podle našich zákonů beztrestné. Policie **tak** jen bezmocně přihlíží, když v bankách řádí slídilové.*

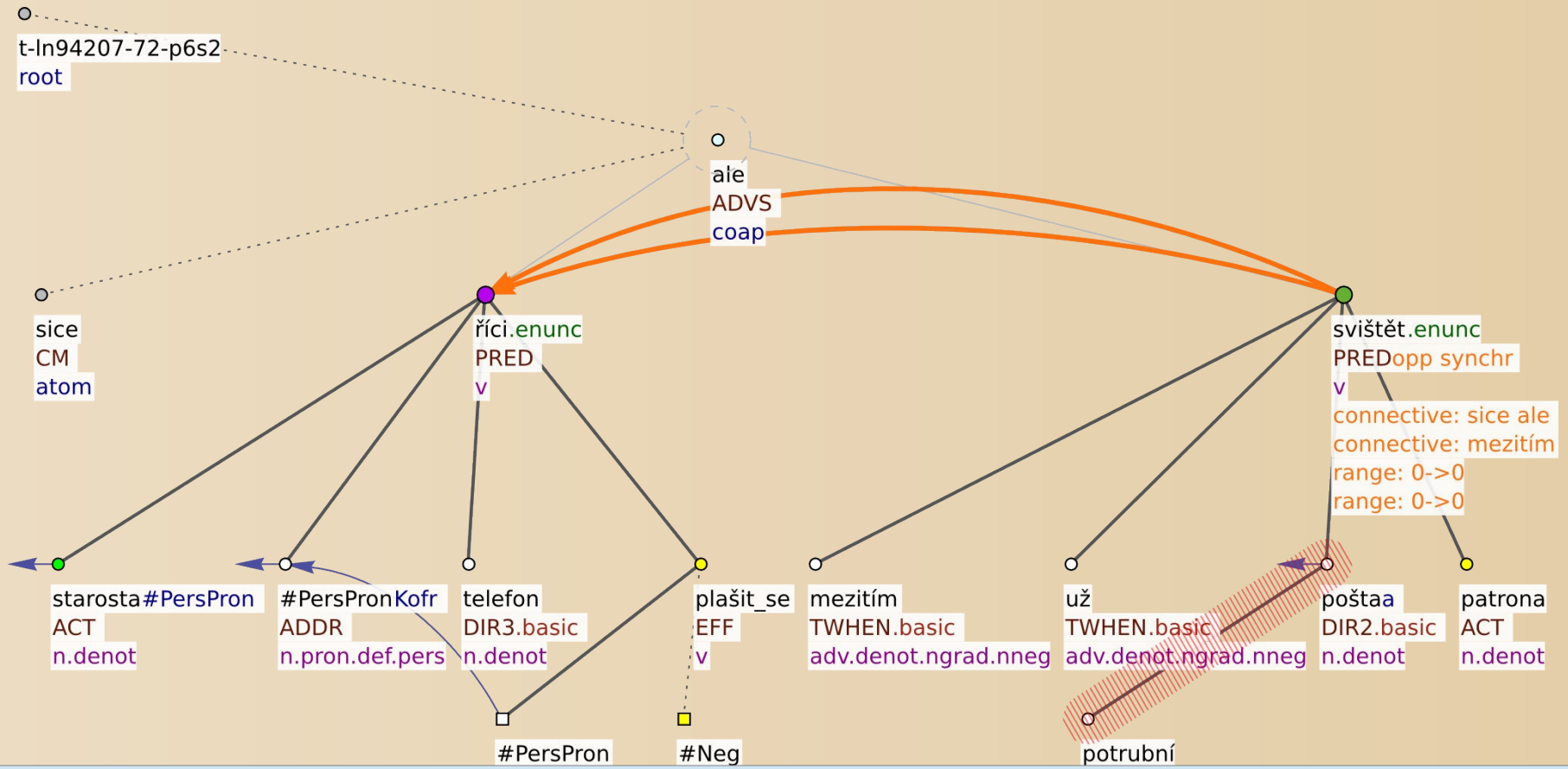
[Infiltration into other computer systems is according to our laws not a criminal act.
***Thus** the police only helplessly watches, as snoopers rage in banks.]*

Annotation of Discourse in Prague Dependency Treebank

Stage 2 → **PDT 3.0** (2013)

- **second relations** (fully annotated as two independent relations)
- annotation of **genres** of documents (20 genres for 3,165 documents)
- attribute *discourse_special* for article headings, metatext, and captions
- annotation of **focalizing particles** in structures with conjunction
- (textual coreference of 1st and 2nd person)

Annotation of Discourse in Prague Dependency Treebank



*Starosta mu **sice** do telefonu řekl, ať se neplaší,*
***ale mezitím** už potrubní poštou svištěly patrony.*

*[The mayor **may have** told him on the phone not to freak out*
***but in the meantime** bullets already whistled through the tubular post.]*

AltLexes in Prague Dependency Treebank

Stage 3 → **a future PD(i)T issue (2015?)**

- annotation of **AltLexes**
- annotated **partially manually, partially automatically** based on the annotator's comment from Stage 1

AltLexes in Prague Dependency Treebank

49,431 sentences in PDT, over **20 thousand** discourse relations with explicit connectives

but:

only **306** cases of annotator's comment "AltLex"

AltLexes in Prague Dependency Treebank

however:

AltLex *díky* (*thanks to)* appears in PDT in **14** instances although it was marked in the annotator's comment just in **one** case.

AltLexes in Prague Dependency Treebank

Three types

1) AltLexes with a **key word** occurring **in several collocations**

2) **Fixed collocations** functioning as AltLexes only in given combinations and forms

3) AltLexes obligatorily containing an **anaphoric reference** to previous context (on the surface layer)

AltLexes in Prague Dependency Treebank

1) AltLexes with a key word occurring in several collocations

- ***důvod* (*reason*):** *důvodem je* (*the reason is*), *jako důvod uvádí* (*he gives us this reason*)…

- ***příklad* (*example*):** *příkladem je* (*the example is*), *uvádí několik příkladů* (*he states several examples*), *příkladem toho bylo* (*the example of this was*)…

AltLexes in Prague Dependency Treebank

2) Fixed collocations functioning as AltLexes only in given combinations and forms

- *jak je vidět* (*as seen*)
- *rozumějme* (*to understand*)
- *krátce/jednoduše řečeno* (*shortly/simply speaking*)
- …

AltLexes in Prague Dependency Treebank

3) AltLexes obligatorily containing an anaphoric reference to previous context (in the surface layer)

- prepositional phrases:
  - *díky* <u>*tomu*</u> (*thanks to* <u>*this*</u>)
  - *kvůli* <u>*tomu*</u> (*because of* <u>*this*</u>)
  - *kromě* <u>*toho*</u> (*apart from* <u>*this*</u>)
  - *navzdory* <u>*tomu*</u> (*despite* <u>*this*</u>)
  - ...

AltLexes in Prague Dependency Treebank

Only interested in anaphoric reference to a verbal argument

Itálie ***šetří****.*

Kvůli tomu *tam přestanou vycházet některé deníky.*

[Italy ***saves****.*

Because of this*, some journals will no longer be published.]*

AltLexes in Prague Dependency Treebank

Using all available anaphoric links

- grammatical coreference
- textual coreference
- bridging anaphora
- coreference to segment

PML-TQ Query

```
t-node $t :=
[ (1+x coref_gram.rf t-node
      [ gram/sempos = "v" ] or
   1+x coref_text/target-node.rf t-node
      [ gram/sempos = "v" ] or
   1+x bridging/target-node.rf t-node
      [ gram/sempos = "v" ] or
   1+x coref_gram.rf t-node
      [ nodetype = "coap", t-node
          [ gram/sempos = "v" ] ] or
   1+x coref_text/target-node.rf t-node
      [ nodetype = "coap", t-node
          [ gram/sempos = "v" ] ] or
   1+x bridging/target-node.rf t-node
      [ nodetype = "coap", t-node
          [ gram/sempos = "v" ] ] or
   coref_special = "segm"),
  a/lex.rf|a/aux.rf a-node
     [ m/form ~ "^[Vv]inou$" ] ];

>> give $t.id
```

AltLexes in Prague Dependency Treebank

Results

1,482 cases of prepositions selected on the basis of Stage 1 (annotator's comment)

89 instances automatically selected as AltLexes

(**9** of them marked as AltLex in Stage 1 in annotator's comment)

AltLexes in Prague Dependency Treebank

Preposition	Instances as AltLexes	Total
díky (thanks to)	14	191
kromě (in addition to)	44	309
kvůli (due to)	5	130
na rozdíl od (unlike)	1	95
na základě (on the basis of)	7	167
navzdory (despite)	2	30
přes (in spite of)	9	389
vinou (due to)	1	14
vzhledem k (considering)	6	157
Total	**89**	**1,482**

AltLexes in Prague Dependency Treebank

Reliability

191 instances of ***díky (thanks to)*** checked manually

- **14** with reference to a verbal node (OK)
- **21** with reference to a non-verbal node (OK)
- **156** without a reference
  - 3 disputable cases where a coreference could be annotated

Discourse in PDT
Future Plans

- **finish** the annotation in **AltLexes** (so far >700)
- study a possibility to annotate **implicit relations**
- study a possibility to **automatically** (based on the current annotation of discourse, coreference and bridging anaphora):
  - mark places with no discourse relation (**NoRel**)
  - mark places with entity based relation (**EntRel**)

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Thank you for your attention!

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I) Discourse connectives vs. their alternative lexicalizations (= AltLex's)

Connectives = expressions with connecting function at the level of discourse description

a) Coordinating conjunctions: *and* (*a*), *but* (*ale*), *therefore* (*proto*);
b) subordinating conjunctions: *although* (*ačkoliv*);
c) particle expressions (including rhematizers): *even (dokonce), too (také);*
d) adverbs: *then* (*potom*);
e) certain uses of pronouns: *except for this* (*kromě toho*);
f) idiomatic multiple-word connective means formed by linking of different expressions: *on the one hand* (*na jedné straně*);
g) elements formed by letters or numbers expressing enumeration: *a), b), 1., 2.;*
h) two punctuation marks: colon and dash.

Expressions with the same function but from other classes = **alternative lexicalizations of discourse connectives (= AltLex's)**