Developing Resources for the Culinary Domain

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Outline

- Introduction and motivation
- Resourses at disposal
  - A corpus
  - Serbian Wordnet
  - Serbian e-dictionaries
- Enrichment of resources
- Problems to solve

Introduction and Motivation

- The culinary domain is one of the rare domains in which the general public and the scientific community are equally interested today.
  - A number of web sites offer a huge number of recipes, in many languages, searchable by different criteria, and often populated by users.
  - Many TV shows, popular magazines, and culinary books and manuals worldwide are devoted to the art of cooking.
  - Various scientific institutions, many scientific publications, and applications from the domain exist.

Introduction and Motivation

- Various aspects of the culinary domain continuously attract the research community. The existence of various scientific institutions and many scientific publications from the domain can serve as evidence.
  - IEHCA – Institut européen d'histoire et des cultures de l'alimentation, in Tours, France.
  - The new application from IBM "Chef Watson with Bob Apetit" uses Watson's capabilities to explore big data to create new recipes.
  - A course at Stanford University held by Dan Jurafsky „The Language of Food"
  - A book by Dan Jurafsky „The Language of Food – A Linguist Reads the Menu" (W.W. Norton & Company, September 2014)

=> *development of the culinary linguistics*

Initiating an informal project – a support for the culinary domain

- It was essential
  - to create the corpus of culinary content in Serbian that can be used for research;
  - to enrich the Serbian lexical resources with the appropriate terms from the domain:
    - Serbian WordNet (SWN) and
    - Serbian morphological electronic dictionaries

  to provide a basis for the development for the culinary domain:
  - An ontology and
  - more complex natural language processing applications.

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Details of the Culinary Text Corpus

- Corpus of Serbian written culinary recipes in the Latin script was formed from web texts.
- Existing programs were adjusted to particular web pages, their content and also the meta-data that can be useful for ongoing work.
- The created text corpus contains approximately 14,000 recipes (approximately 1,600.000 simple word forms).

Serbian WordNet

- The production of the SWN was initiated by the BalkaNet project (2001 – 2004).
- The structure of all SWN is linked to the Princeton WordNet (PWN), through the so-called Interlingual Index.
- Before the beginning of the (informal) culinary project, concepts belonging to the culinary domain were not given special attention.

Serbian WordNet

- However,
  - **393** such concepts were already present in the SWN,
  - **99** of which belong to basic concept sets and
  - **91** to Balkan- or Serbian-specific concepts.

- After enhancement, Serbian WordNet has
  - **1544** sysets from the culinary domain, of which
  - **364** belong to Balkan- or Serbian-specific concepts

Electronic Dictionaries for Serbian

- Follow the methodology and format known as DELA, covering both simple words and multi-word units (MWU).
- The system of Serbian e-dictionaries (SED) covers both general lexica and proper names (approximately 28.5%). All inflected forms are generated from **133,500** simple forms and **13,500** MWU lemmas.

Domain Specific Semantic Markers for Serbian Electronic Dictionaries

- Before starting the enrichment process, there were:
  - **218** simple word entries with the semantic marker **+Food**, and
  - **217** multi-word entries.
- All entries with the **+Food** marker should also have been assigned the **+Conc** marker (for concrete object, as a more general category), but it was not the case.

Conclusion: markers in SED were inconsistently assigned.

Domain Specific Semantic Markers for Serbian Electronic Dictionaries

Semantic marker	Description
+Culinary	culinary domain
+Food	food (e.g. senf 'mustard')
+Alim	aliment (e.g. mleko 'milk')
+Prod	product (e.g. sirće 'vinegar')
+Meal	meal (e.g. doručak 'breakfast')
+Course	course (e.g. puding 'pudding')
+Uten	utensil (e.g. šolja 'cup')
+Ing	ingredient (e.g. so 'salt')
+MesApp	approximate measures (e.g. kašičica 'spoonful')
+Taste	taste (e.g. slatkokiseo 'sweet-sour')
+WoP	way of preparation (e.g. dinstati 'to stew'; dinstanje 'stewing')
+Cond	condition (e.g. bajat 'stale')

Overview of the newly proposed semantic markers, that could be used individually or in combination.

Serbian Electronic Dictionaries after the first phase of the informal culinary projest

- Entries with the **+Culinary** marker **3194**
  - **1617** simple word entries, and
  - **1577** multi-word entries.
- Among them
  - **+Food – 2800** (**1296** simple; **1504** MWUs);
  - **+Uten – 173** (**111** simple; **62** MWUs);
  - **+WoP – 137** (**137** simpe)
  - **+MesApp – 105** (**96** simple; **9** MWUs)

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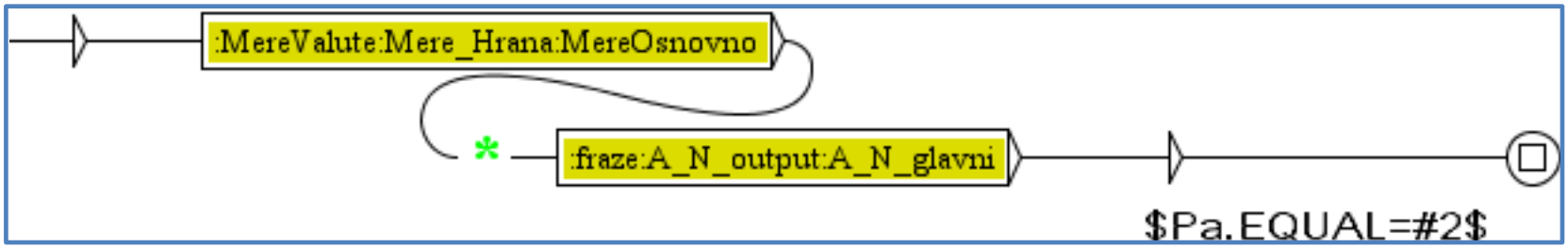
Further enhancement of resources

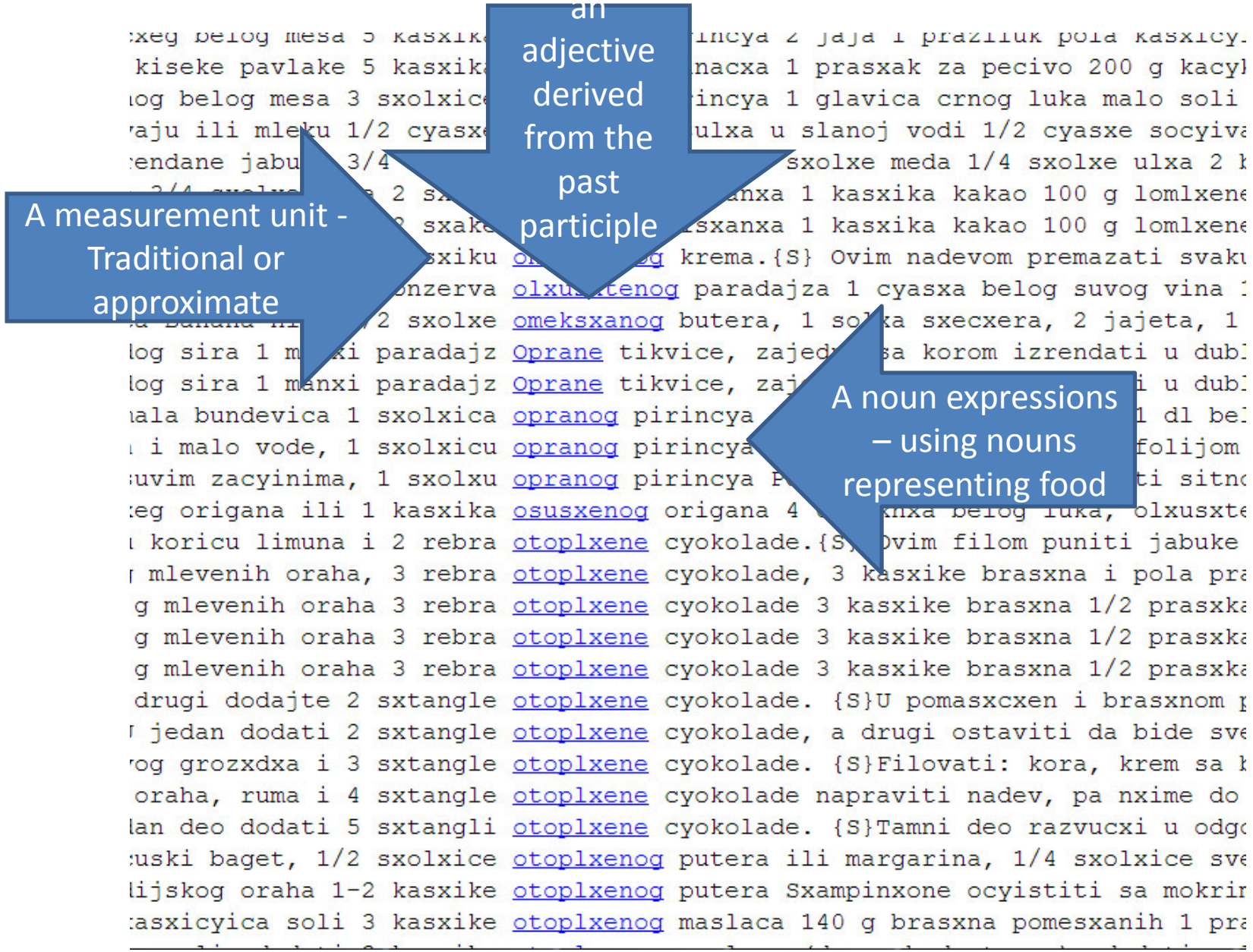
- Detaction of verbs that belong to culinary domain
- Their description:
  - How specific they are?
  - What syntactic properties they have (in the culinary domain)?
  - How can they be classified and marked?
  - Can we retrieve which verbs are used with which food?

Detection of verbs used in the culinary domain (1)

- If an **adjective** derived from a **verb past participle** is preceded by **numeric expressions with units of measure** (standard and approximate) and followed by **a noun in the genitive case that refers to food** (and possibly preceded by **an adjective** in the corresponding case, gender, number and animacy) then it can be **an adjective referring to a way of preparation of food**.

A Unitex graph that performs it



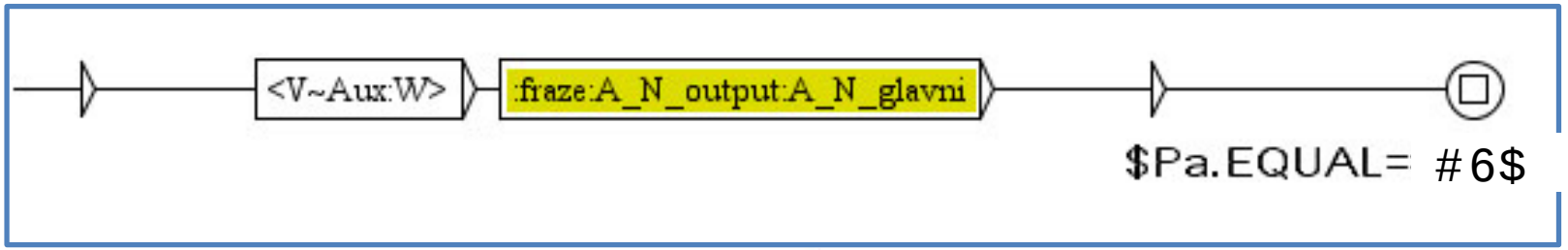

an adjective derived from the past participle
A measurement unit - Traditional or approximate
A noun expressions – using nouns representing food

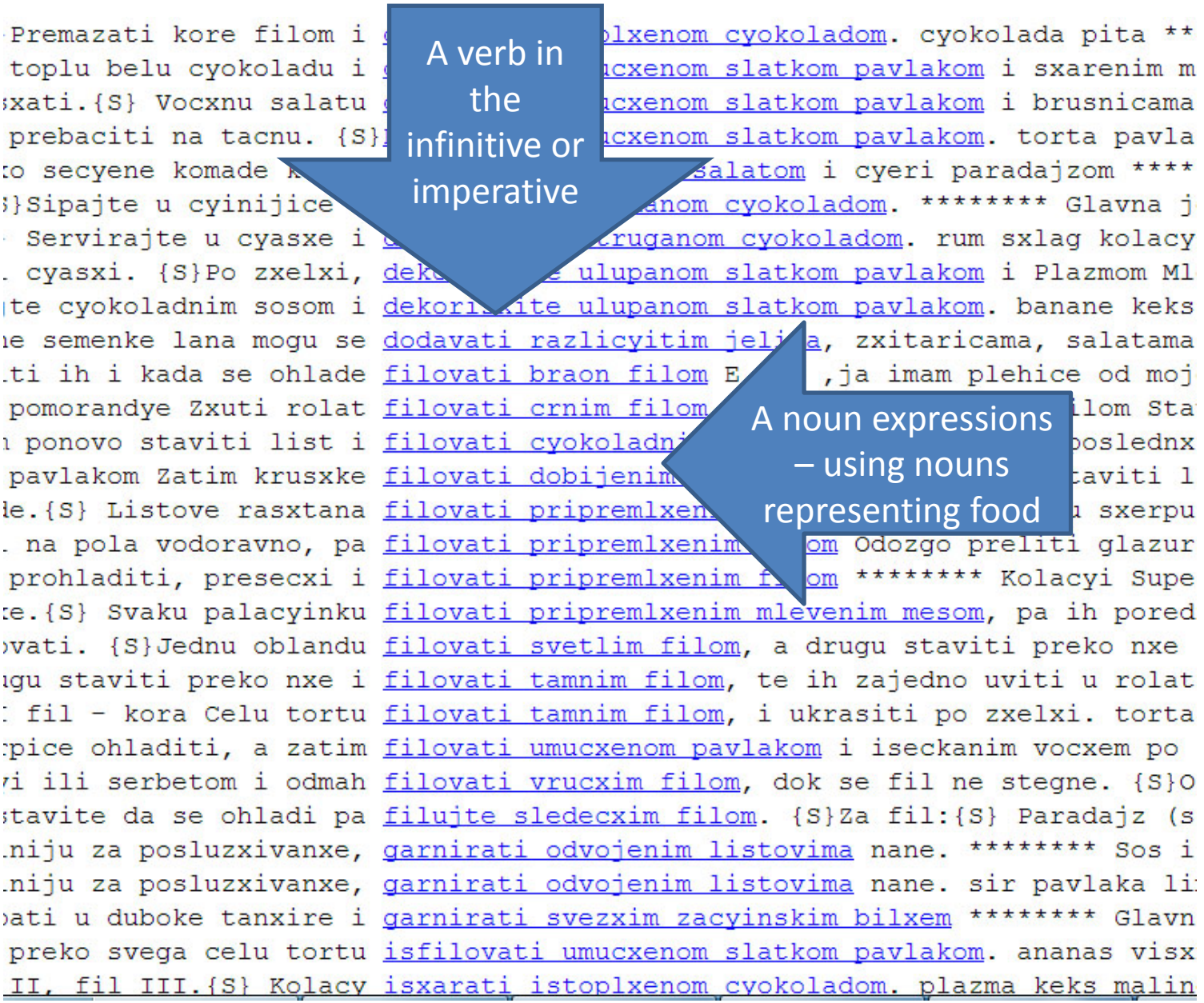
An example

- The verb *otopiti 'to melt'*
- The past participe *otopljen*
  - Used with:
    - (bela, crna) čokolada '(white, black) chocolate'
    - (maslac, puter) 'butter'

Detection of verbs used in the culinary domain (1)

- If a **verb** in the **infinitive** or in the **imperative** (the second person plural) is followed by a **noun phrase** (e.g. Adj_N) from the culinary domain (a noun is marked by +Food) than the verb is the **„way of preparation“ verb** from the culinary domain
- Resulting concordances




A verb in the infinitive or imperative
A noun expressions – using nouns representing food

An example

- The verb *filovati ’to fill; to stuff”*
- To fill with what?
  - Used with:
    - *(braon, crni, svetli, tamni, čokoladni, vruć) fil*
      ’(brown, black, light, dark, chocolade, hot) fill’
    - mleveno meso ’minced meat’
    - (umućena) pavlaka ’(whisked) cream’

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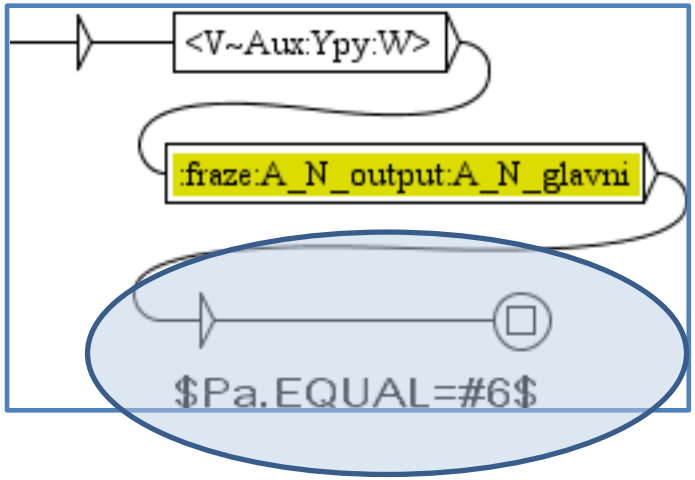
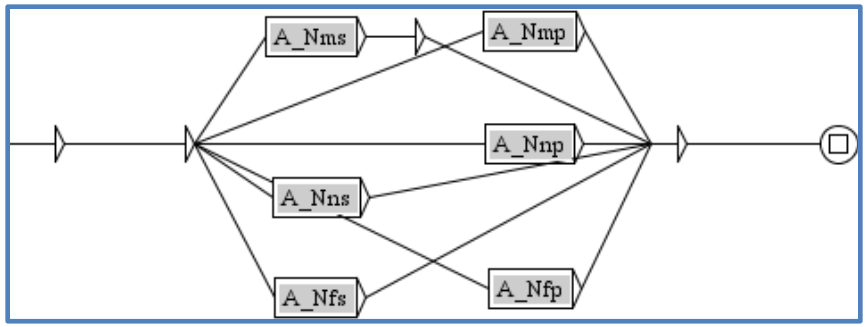
How do this extraction graphs work?

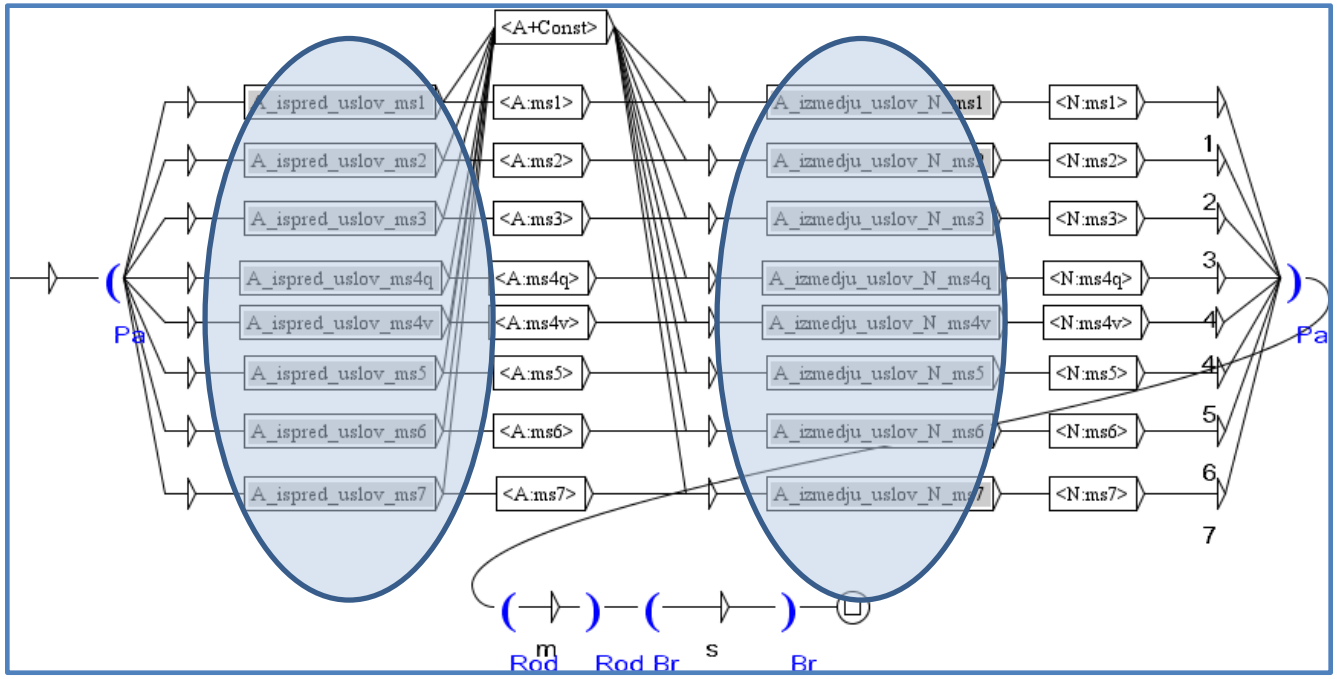




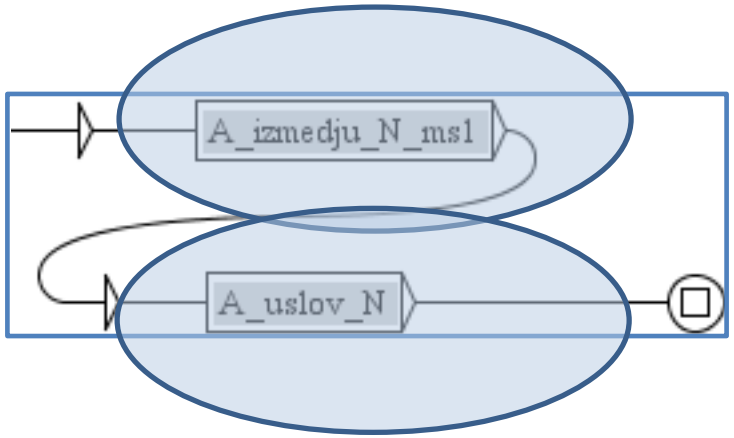
- It invokes a general graph for the Adj_Noun phrases that is placed in the repository
- This graph invokes six subgraphs, each for a pair of values for the number and the gender.
- We are looking only for Adj_Noun phrases that are in the instrumental case.

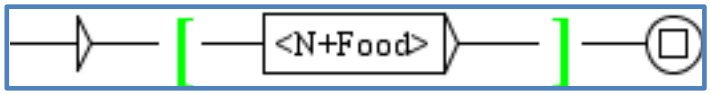
One of six subgraphs

- It takes care about the agreement in the case
- Subgraphs take care about
  - Insertions;
  - Conditions on adjectives or nouns.
- They remember grammatical categories as output variables



One insertion subgraph

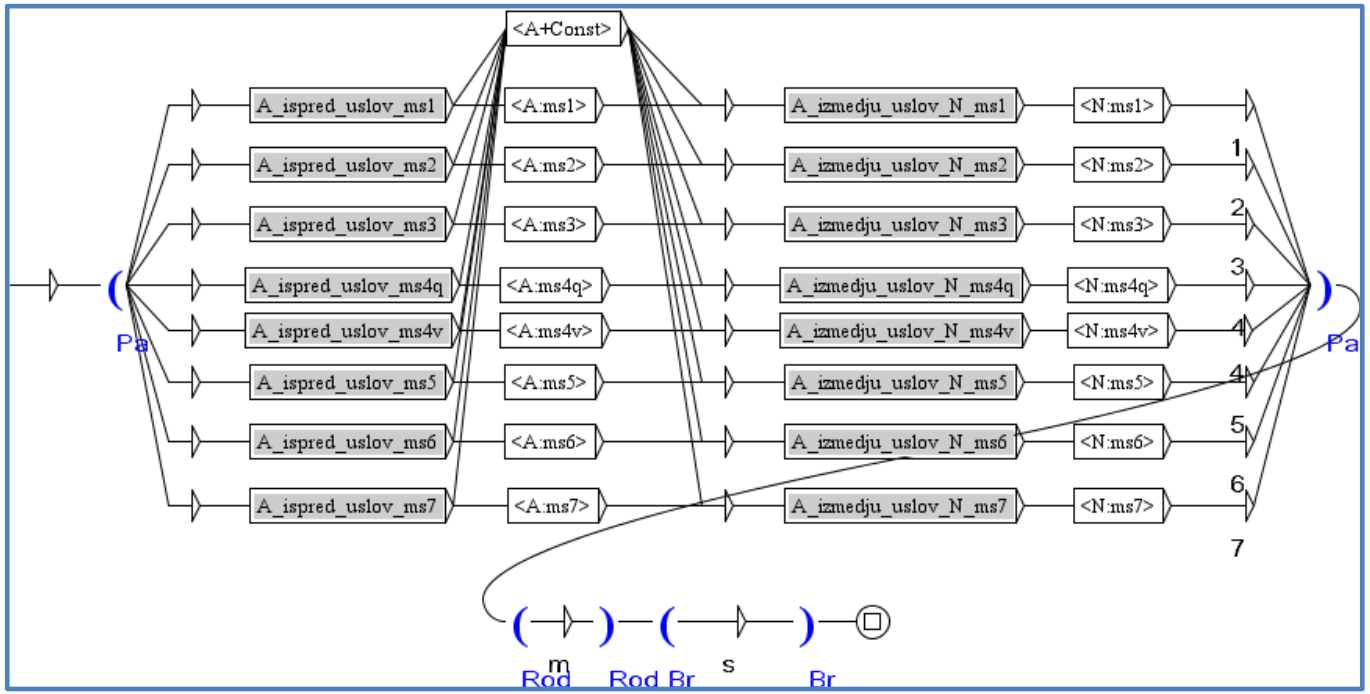




- It invokes two subgraphs:
  - The first one is for possible insertion between the adjective and a noun.
  - In this case this subgraph is Empty.
  - The seconde one is for the condition the noun has to satisfy.
  - In this case a noun has to represent a food.

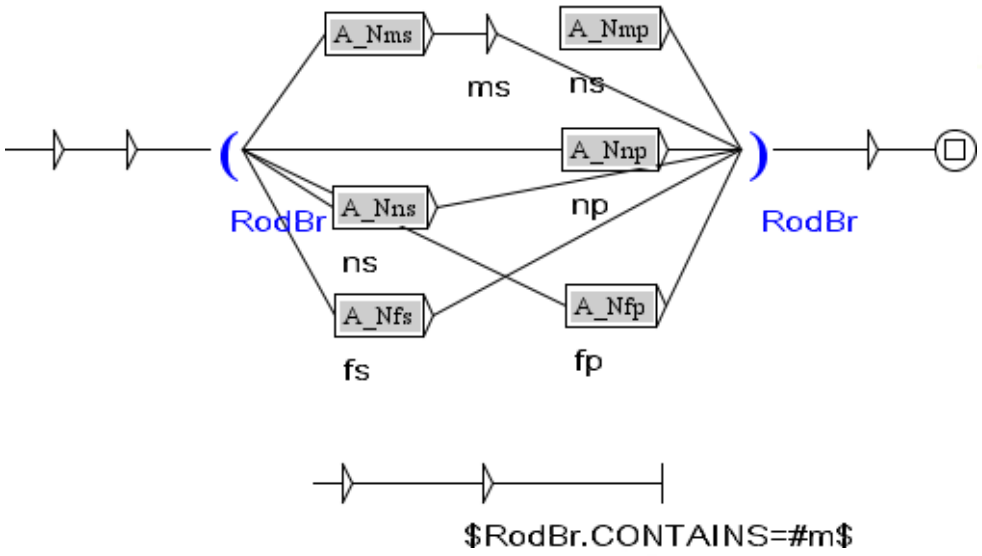
The first problem

- The values of grammatical categories are remembered at the lower level (in subgraphs) – repetion of the same nodes.
- It would be better to do it at the higher level.



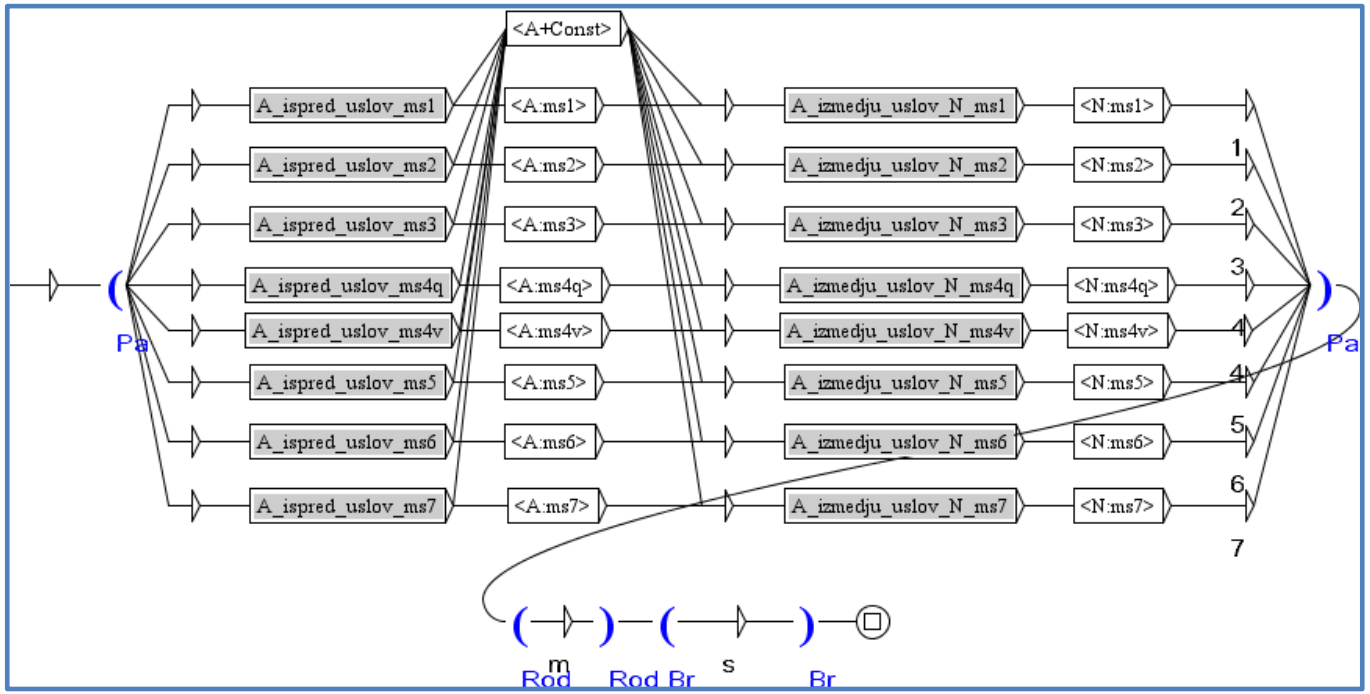
The solution to the first problem

- The values of grammatical categories can be remembered in the higher graph in a „compound varaible“.
- The test on this value could be done with a new test like: **$RodBr.CONTAINS=#m$** (if it would exist).
- I learned two days ago in MLV that such a test actually exists but is not yet documented as **$RodBr.SUBSTRING=#m$**



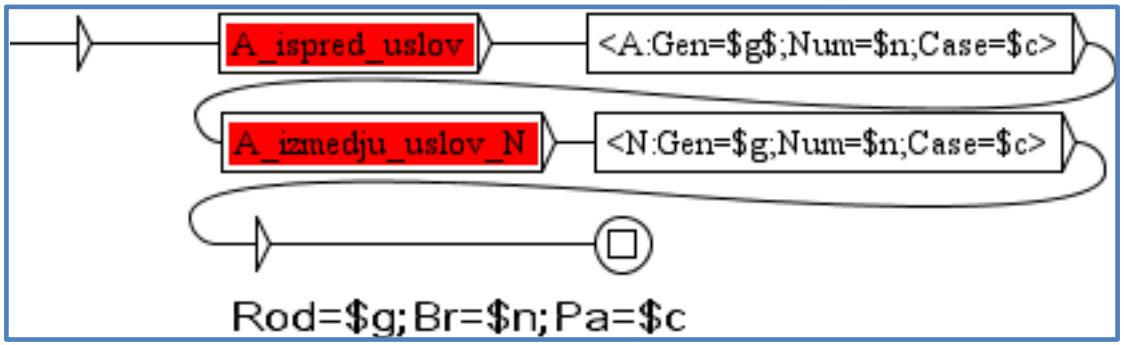
The second problem

- The graphs that test agreement are very complex.
- Every correction or enhancement in one path and one subgraph has to be redone for all paths (and all subgraphs).



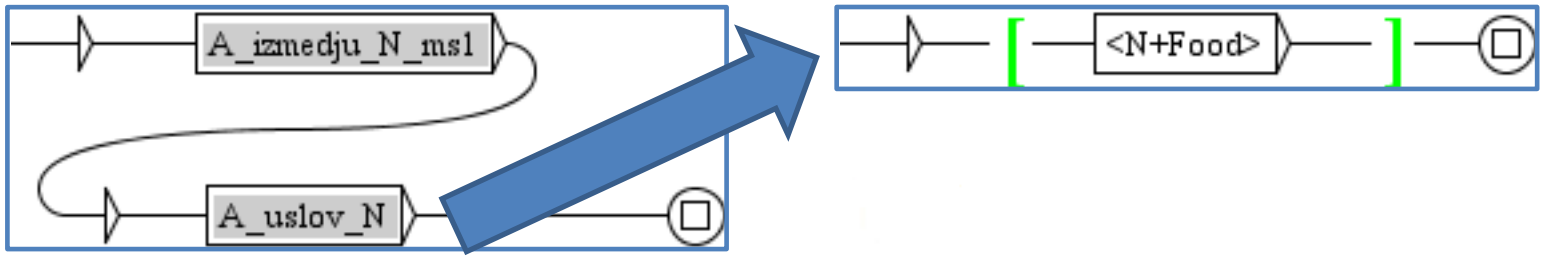
The wishful solution to the second problem

- They could be made much simpler if graphs could use unification variables (in a way similar to **Multiflex**)
- In that case used grammatical categories would have to be documented (like **Morphology** and **Equivalence** files).



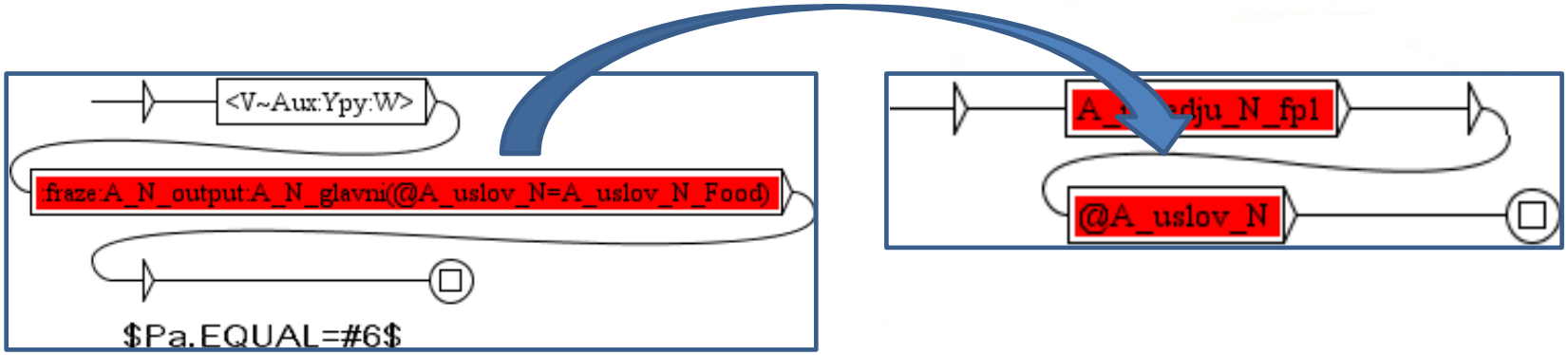
The third problem

- We wanted to make the **Adj_N** graph as general as possible so that it can be used in different context for different tasks.
- For that reason, the special conditions on nouns and adjectives, as well as possible insertions are put in separate graphs.
- However, the graph is not general enough because for different puroposes we must have different copies of it (and all its subgraphs) with all inconveniences that follow from this.



The wishful solution to the third problem

- It would be easier if we could invoke subgraphs with parameters – subgraph names.
- These subgraph names would replace „formal graph names“.



The more realistic solution to the third problem

- Use the morphological mode to extract from the dictionary the semantic markers;
- Remember these markers in an output variable;
- Test for these values with the use of a **CONTAINS** or a **SUBSTRING** test.
- The cost of using the morphological mode!

Thank you for your attention!

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