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Introduction

- Research on **preposition incorporation in BulTreeBank WordNet for Bulgarian**
- Closed class words > usually missing in wordnets
- substantial role in many NLP tasks, but their polysemy constitutes one of the greatest challenges for this research area
- Seriously benefit the performance of wordnets for semantic annotation, word embeddings, text analysis and generation, word-sense disambiguation, automatic translation, etc.

Classification of prepositions

- The adapted version of the preposition classification (Stoyanov, S. Ed.: *Grammar of contemporary Bulgarian standard language*, 1983; Boyadzhiev, T. Ed.: *Contemporary Bulgarian language*, 1999) contains **15** classes: **location**, **time**, **transition**, **manner** (+ *instrument of action*), **possession**, **quantitative** (+ *degree* and *exceeding of a limit*), **purpose**, **origin** (+ *part of a whole*), **exchange**, **exclusion**, **opinion**, **thought**, **opposition**, **comparison** and **cause**
- **Location** and **time** include both literal and figurative senses

Preposition category	Prepositions
prep.location	в, всред , върху , въз , въръз , до , за , зад, из, низ, изпод, измежду, извън, край, към, между , на , над , насред , о, около , от , откъм, отвъд, отсам, оттам, оттатък, по , под , подир , подире , помежду, посред , пред , през , при , против , след, сред , срещу , спроти , у
prep.time	в , всред , до , за , между , край, към, на , насред , около , от , по , подир , подире , помежду, посред , пред , през , при , с, след, спроти , сред , срещу
prep.manner	без, в , като, на , по , под , посредством, при , с (със), според , чрез
prep.cause	за , заради, от , по , поради , пред
prep.purpose	върху , до , за , заради, към, по , поради
prep.possession	на , от , с (със), у
prep.origin	в , от
prep.quantity	до , за , към, между , на , над , около , от , с (със), свърх
prep.obj.exchange	вместо, за , заради, наместо, срещу , спроти
prep.obj.exclusion	без, освен
prep.obj.opinion	за , по , според , спрямо
prep.obj.thought	върху , въръз , въз , за , заради, около , по , спрямо
prep.transition	в , на , от
prep.comparison	като
prep.opposition	въпреки, против , пряко , спроти , срещу

Table 1. Preposition categories

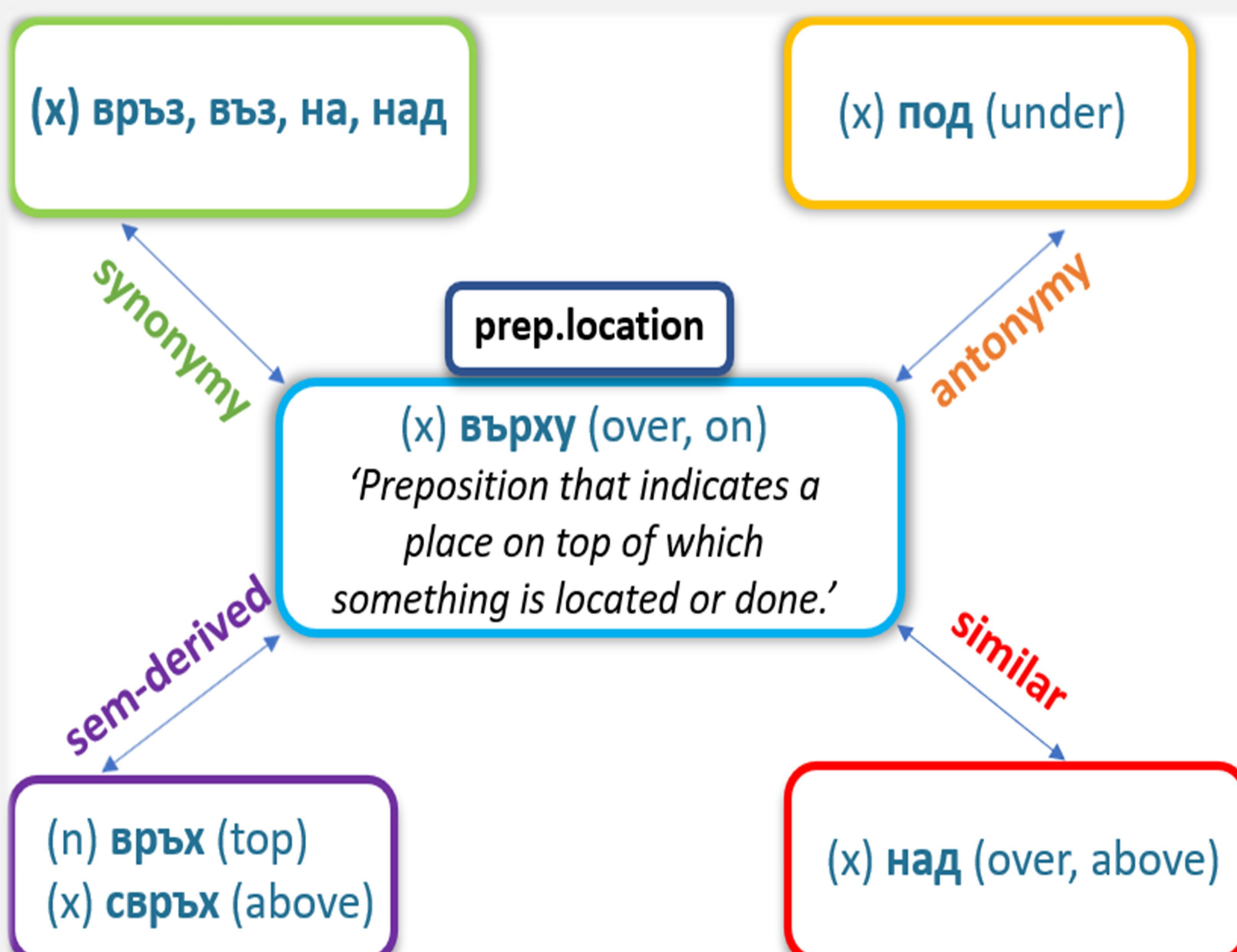


Table 2. Preposition synset model

Model for preposition synset in BTB-WN

- Synset category, detailed definition, synonyms if available and examples
- Relations between prepositions and other parts of speech (for example, the verbs *преструвам се* (*pretend*) and *превърщам се* (*turn in*) combined with *на* (*of*) express transition in new, different state)
- Relations between preposition synsets (**synonymy**, **antonymy**, **derivational relations**, **similar**, etc.)

Conclusion and future work

- Large-scale integration of prepositions in BTB-WN for the benefit of neural models building for Bulgarian and various NLP tasks
- Integration of a closed class part of speech in the structure and hierarchy of wordnet, following the model for any open class word
- The analysis will be elaborated with hierarchy inheritance of the verbs and nouns in wordnet and with the valency lexicon
- Good coverage of prepositions in wordnet > better quality of language models
- A wordnet for Bulgarian which is suitable for semantic annotation will be available in the framework of CLARIN and will provide processing of semantically annotated corpora