Multilingual spell checker based on morphological analyzer for Turkic languages

N.A. Prokopyev

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1. Introduction

- Automatic spell checking task is one of the actual problems in Natural Language Processing
- Especially: development of unified spell checker for all Turkic languages covered on Turkic Morpheme portal

2. Turkic Morpheme portal as a resource for spell checker

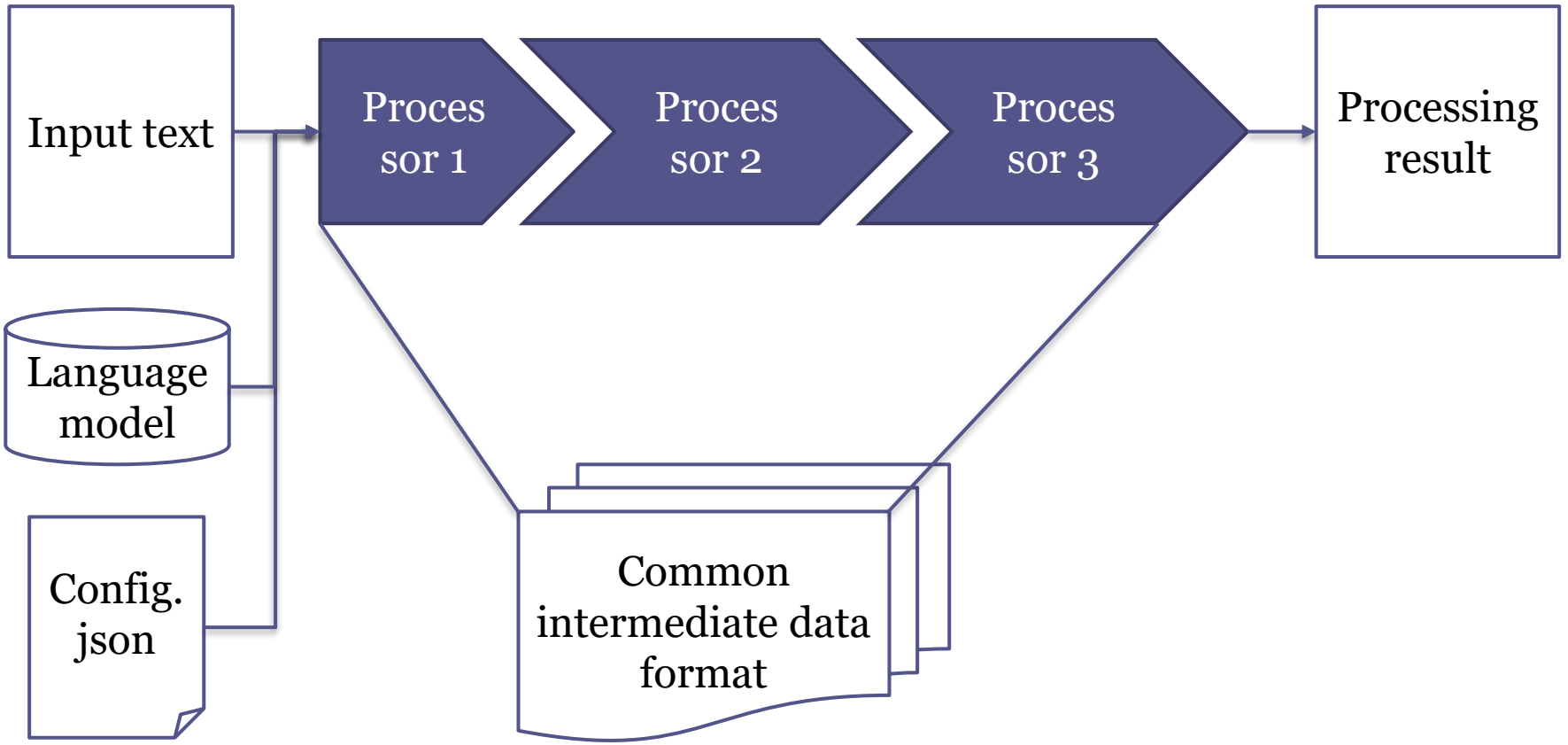
- There is an ongoing research and development of Turkic Morpheme portal database in form of a unified linguistic resource for Turkic languages

- Software tools based on this database inherit unification quality as they work on the same basis, algorithms and data structures

3. Spell checker development methodology

- Morphological analyzer is developed based on the portal database which potentially supports all Turkic languages in database provided they have linguistic data – **it is the base NLP preprocessor for spell checker**
- Morphological analyzer functions as programming library in NLP Pipeline format and as a web-service – **spell checker should have the same structure**
- Morphological analyzer and portal database allows to implement partially correct words analysis and error correction variants generation – **this should be implemented in spell checker**

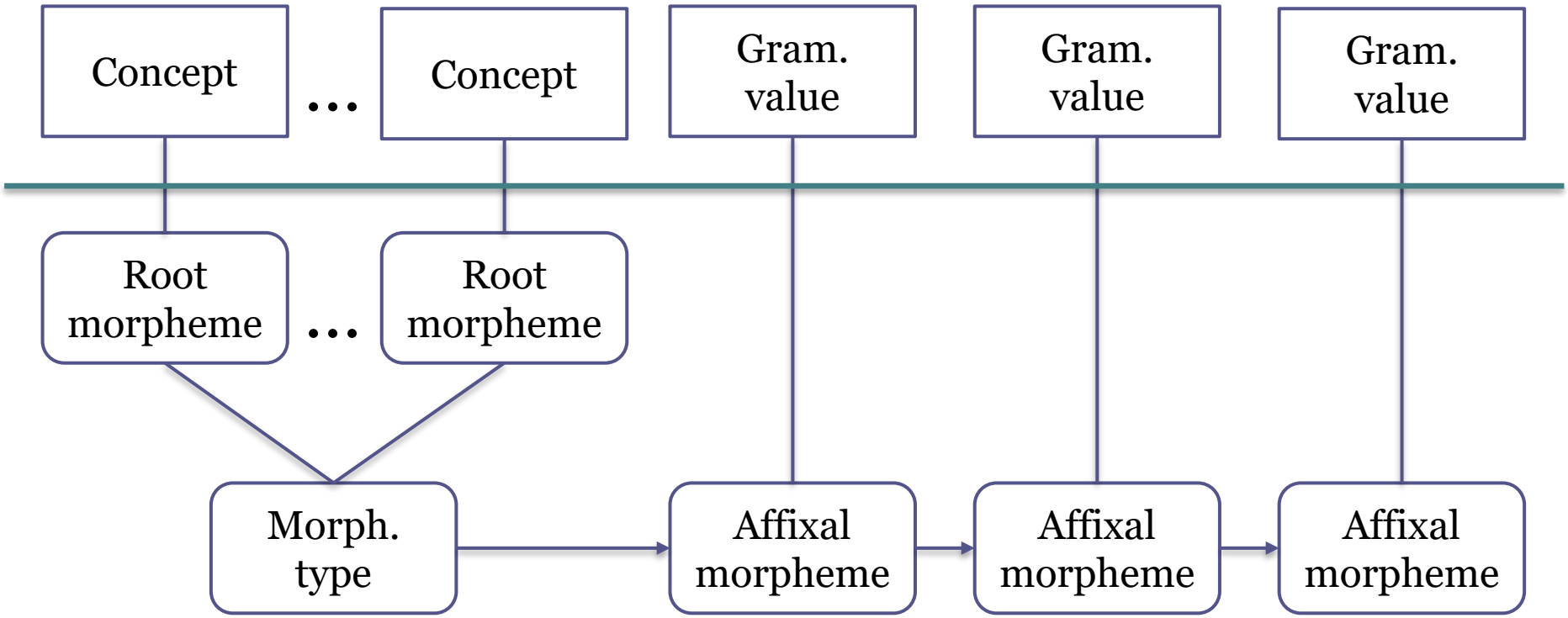
4. NLP Pipeline structure



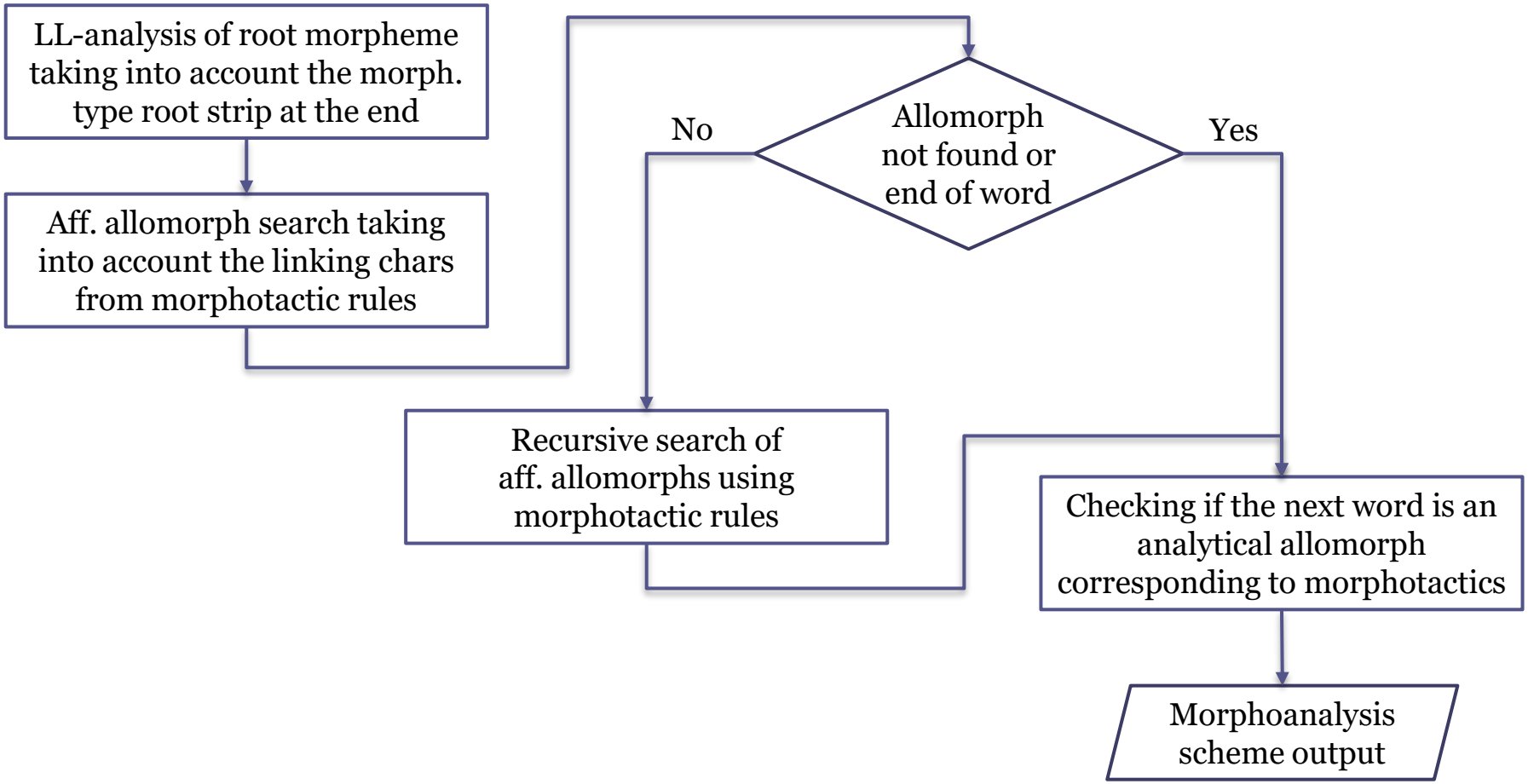
5. The Turkic morphoanalysis library

- **importer.py** – module providing data export from portal database to language model in .sqlite format
- **analyzer.py** – main module of morphoanalyzer with analysis methods
- **generator.py** – module of generator for making all possible word variants from morphoanalysis scheme
- **translator.py** – module that uses analyzer and generator for making all possible word translations of input text

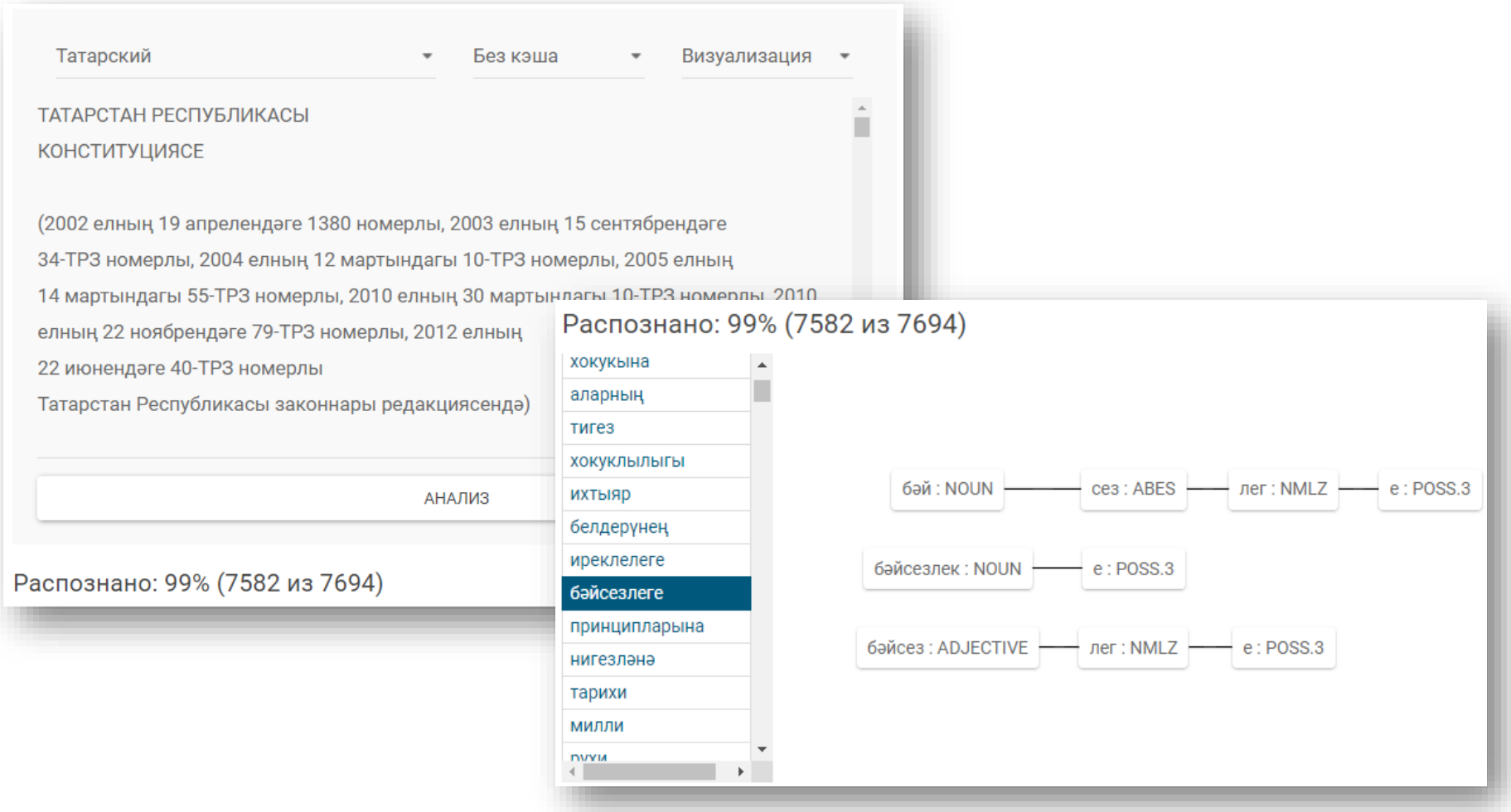
6. Morphotactic rules model from Turkic Morpheme portal



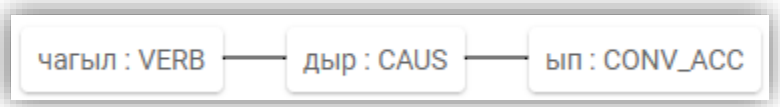
7. Morphoanalysis algorithm

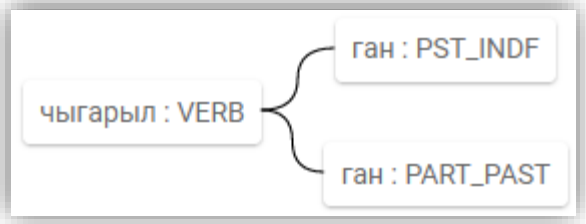


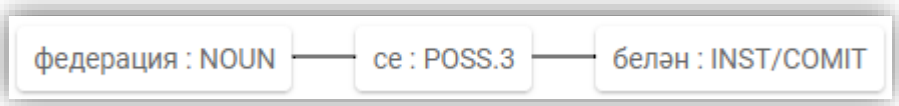
8. Morphoanalysis interface

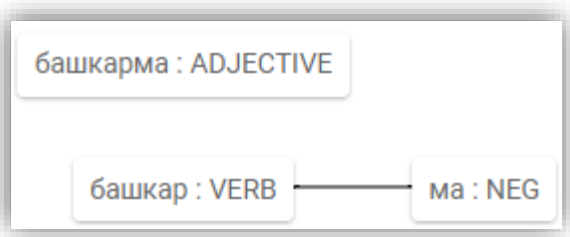


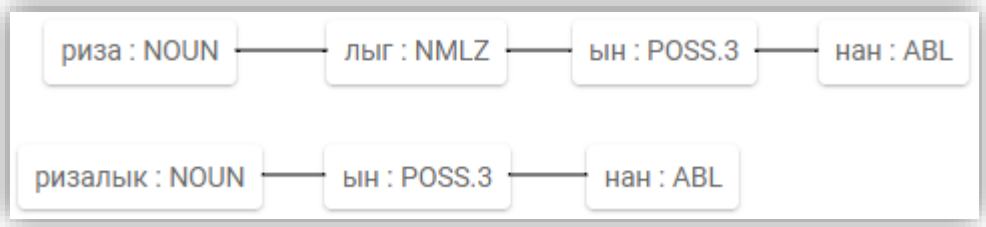
9. Analysis scheme examples



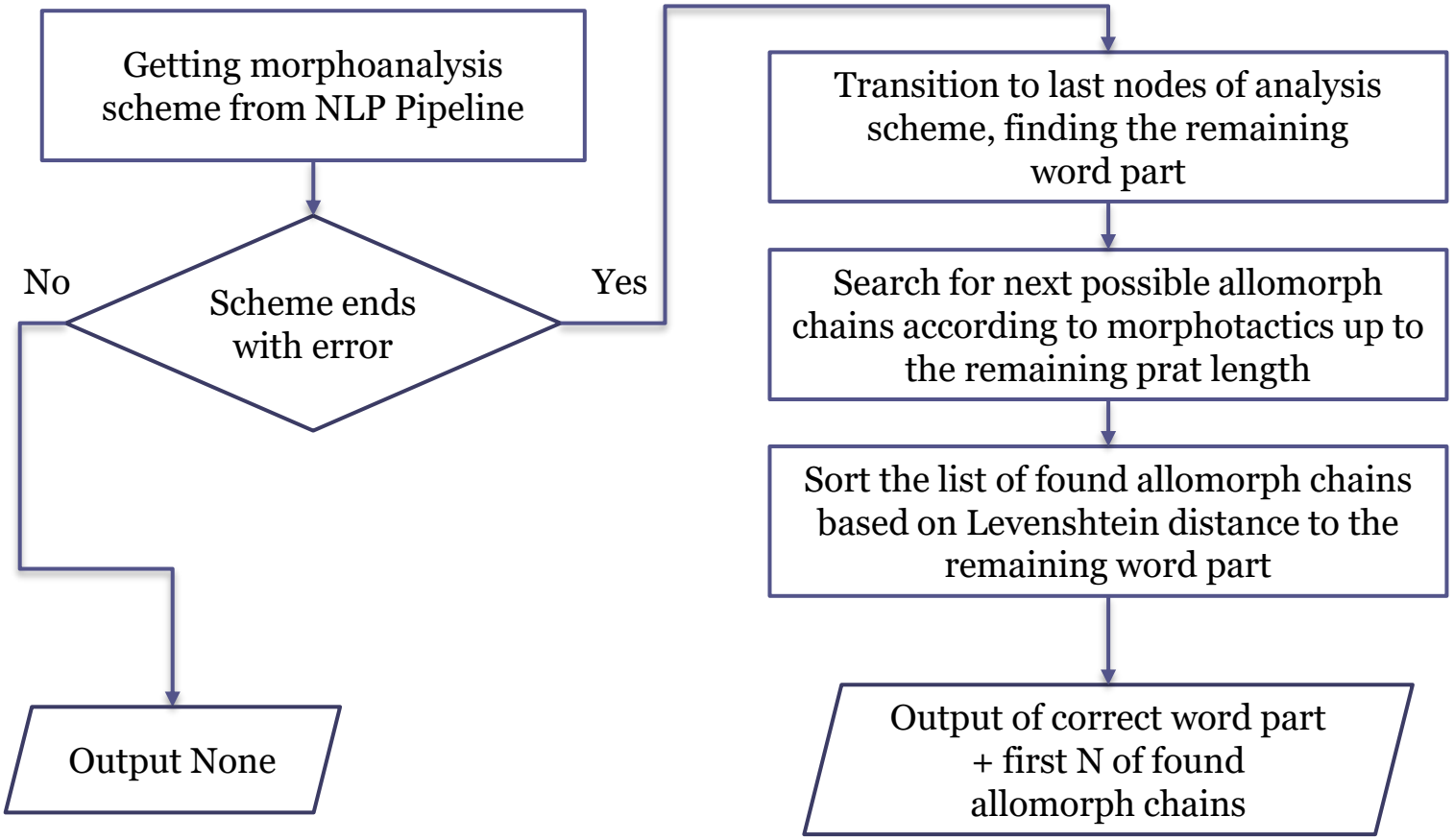






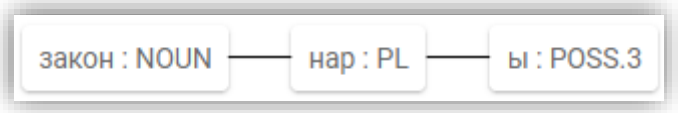


10. Spell checker algorithm

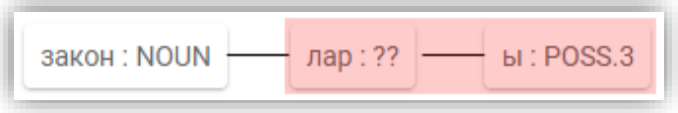


11. Error correction example

Correct: *законнары*



Error: *законлары*



According to morphotactics after *закон* root can be the next allomorphs:
-сыз, -нан, -ны, -га, -чыг, -чык, -ча, -ны, -ның, -ка, -кай, etc. (38 variants)

Taking into account the remaining word part *-лары*:
1. Longer length allomorphs are discarded;
2. Other allomorphs are connected with next morphotactics allomorphs until remaining word length reached;
3. Obtained allomorph chains are compared with the remaining word part by the Levenshtein distance;
Output: Correct word part + up to N closest allomorph chains.

11. Conclusion

- A task is given to develop the programming library and web-service tools for automatic spell checking of Turkic languages in a unified architecture
- It can be solved using the already created databases and morphoanalysis software based on Turkic Morpheme portal
- Quality of spell checker functioning for some specific language is correlated to completeness of database for this language

Thank you for attention!

Игътибарыгыз өчен рәхмәт!

Спасибо за внимание!