The Durm German Lemmatizer

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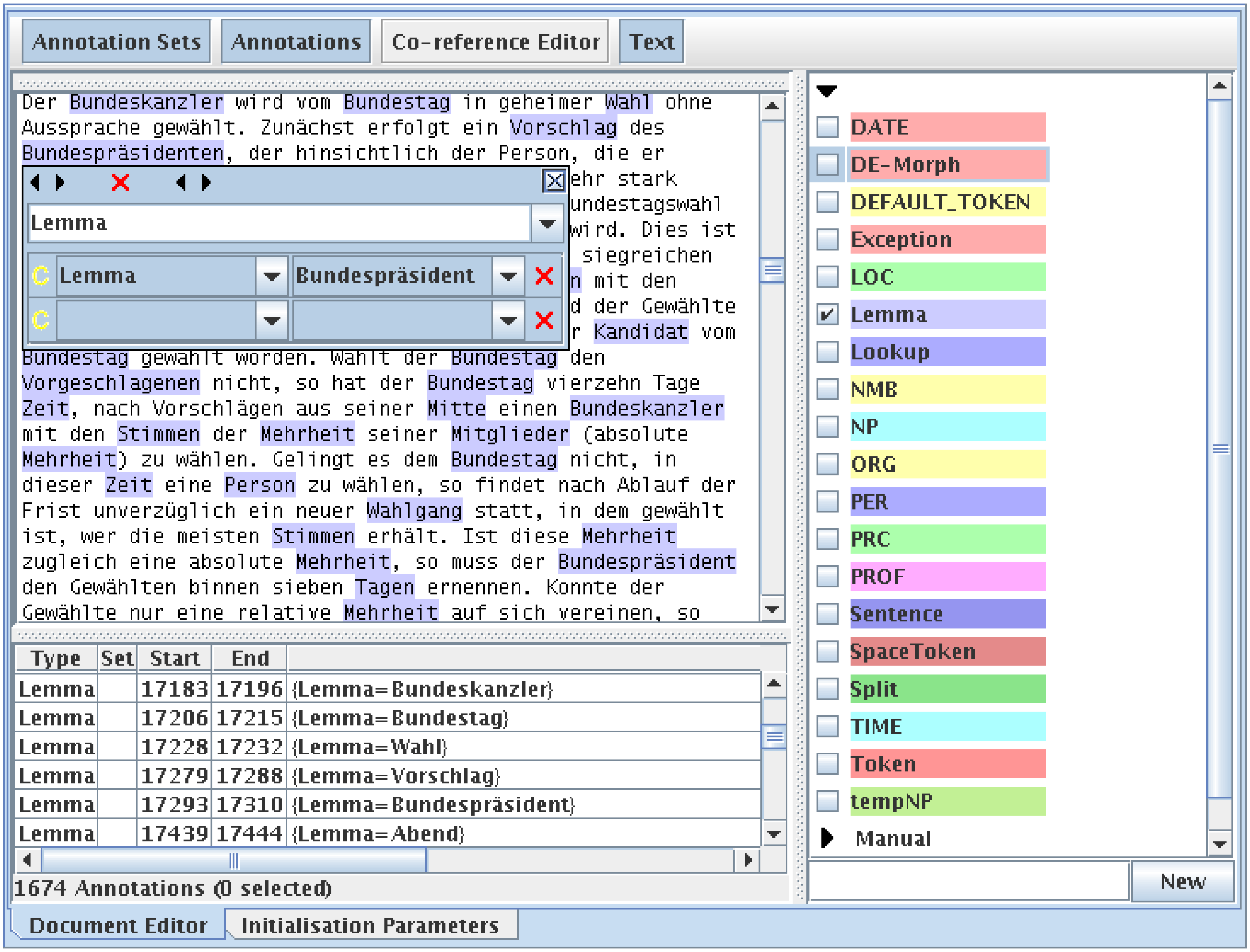


1. Overview

The *Durm German Lemmatization System* consists of a number of GATE components and resources that perform morphological analysis and lemmatization for German nouns. The approach is described in our paper: Perera, P., and R. Witte, "A Self-Learning Context-Aware Lemmatizer for German", *Proceedings of Human Language Technology Conference and Conference on Empirical Methods in Natural Language Processing (HLT/EMNLP 2005)*, Vancouver, British Columbia, Canada : Association for Computational Linguistics (ACL), pp. 636–643, October 6–8, 2005.

It includes:

- The **Case Tagger**, which adds case information *(Nominativ, Genitiv, Dativ, Akkusativ)* to nouns;
- The **POS-based Number Tagger**, which adds number information *(singular, plural)*;
- The **Morphological Analyzer**, which classifies nouns into morphological classes;
- The **Lemmatizer**, which annotates nouns with their lemma.

Additionally, it comes with two main resources:

- **Case Tagger Probabilities**, a set of resource files with statistical information for the HMM module

- **German Lexicon**, an automatically created and updated German lexicon containing lemma, number, and case information for nouns.

All components, as well as the lexicon and the evaluation corpus with manual annotations, are distributed as free/open source software under the GNU GPL license.

2. Prerequisites

In order to run the components of the Durm Lemmatizer, you'll need:

- a recent version of the GATE system (3.1 or better)
- a POS-tagger for German (currently we only support the STTS tagset as used by the TreeTagger); and
- the MuNPEx noun phrase chunker for German.

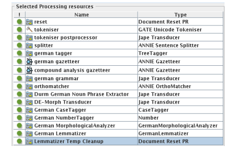
In short, if you have a processing pipeline that can create proper NP (noun phrase) annotations for German documents, you're ready to go.

Note that in the following discussion we assume you know how to work with GATE, for tasks like adding a new CREOLE repository or loading new components into a processing pipeline. If you haven't done this before, please read the GATE user's guide first!

3. Documentation

3.1. Quick Start Guide

You should have a working GATE installation including the TreeTagger as outlined under Prerequisites. Then:



1. Download the complete archive (source code and Java `.class`-files for all components), the German lexicon, and the Case Tagger probabilities file below and unpack them;
2. Load GATE's sample application for German: `german+tagger.gapp` (you can find it under `gate/plugins/german/resources/`). **Note:** this pipeline works on the annotation set "NE," so you'll either have to (a) also use "NE" as the input/output annotation set for all downstream components listed below or (b) (perhaps simpler) remove all references to "NE" within the GATE pipeline to make it work on the default annotation set.
3. Add the [MuNPEx] noun phrase chunker for German (using the main grammar file `de-np_main.jape`)
4. Add a "JAPE-Transducer" component with the grammar file `DeLem/de_morph_main.jape`
5. Add the *Case Tagger* component (`CaseTagger/build`). Here you'll have to set the initialization parameter to the `CaseProbs` directory containing the probability files.
   Note: To add this and the next three components from the GUI, use *File ? Manage CREOLE plugins ? Add a new CREOLE repository* and then select the indicated `build` directory.
6. Add the *Number Tagger* component (`Number/build`)
7. Add the *German Morphological Analyzer* component (`GermanMorphologicalAnalyzer/build`)
8. Add the main *German Lemmatizer* component (`GermanLemmatizer/build`). Here you'll have to set the initialization parameter to the file containing the German lexicon: `DE-Lexicon/delexicon.txt`.
9. (Optionally: add a "Document Reset" component to remove the temp annotations `NPFNP`, `PosNumber`, `Preposition`, `PN`, `Case`, `Num`, and `Gender`)
10. Load some German texts and run the pipeline. Enjoy the new annotations for **Lemma** and **DE-Morph**.

More detailed documentation (pdf) is also available.

3.2. The Lexicon

The lexicon is part of the Durm Lemmatizer. It is automatically created by processing German documents. Additional functionality implemented in the *GermanLemmatizer* component allows it to self-correct some errors that are introduced by the system. Typical entries in the lexicon look like this:

```
Mensch      Sg    Masc    Akk    Mensch   1    4/11/2005 15:10:26 4/11/2005 15:10:26   115
 unlocked
Menschen    Sg    Masc    Akk    Mensch   6    4/11/2005 15:8:16 4/11/2005 15:10:11   116
unlocked
```

The lexicon stores full forms of words with their lemma, morphological features and some additional information. Here, *Sg* means that the number of the entry is singular. *Masc* specifies that the entry's gender is masculin and *Akk* says that its case is accusative. Next, it stores the lemma. Here, you can see that the lemma of the noun *Menschen* is *Mensch*. The number *1* in the entry states that it has been found once, when generating the lexicon. The two entries with the timestamp record the insertion and last modification time of the entry. The number *115* is a reference to a document, which specifies where the entry has been found. At the end the string *unlocked* specifies that the entry's lemma can be updated automatically and has not yet been manually corrected.

4. Evaluation

We manually annotated several texts from the German Wikipedia for **Lemma, Number,** and **Case**. You can use them to evaluate the lemmatizer's performance (download). These texts, including our annotations, are distributed under the GNU Free Documentation License (FDL).

For more details on the evaluation, have a look at our paper and the GATE user's manual.

5. Download

Latest version is v1.0 from 22.02.2006. Download:

- the complete gzipped tar archive with source code and pre-build Java `.class`-files for all components, including the the Case Tagger parameter files, the additional JAPE grammars, and the lexicon: DurmLemmatizer-1.0.tgz
- only the German lexicon version 20060222 with 84320 entries (note: in Unicode UTF-8 encoding!)
- only the technical documentation (PDF format)
- our research paper on German lemmatization
- our manually annotated texts (distributed under the GNU FDL)
- the GNU GPL license, under which you can use all the components and their resources (including the lexicon)

6. Version history

- 1.0: 22.02.2006. Initial public release.

7. Feedback

For questions, comments, etc., please use the Durm Forum.

8. Acknowledgments

Development of the German Lemmatizer has been supported by the German research foundation (DFG) within the project "Entstehungswissen" (LO296/18-1). The TIGER Treebank (Version 2) has been used for training and evaluation of the Case Tagger.

Source URL (retrieved on *2025-12-08 00:33*): https://www.semanticsoftware.info/durm-german-lemmatizer