DATeCH 2017 – PoCoTo Workshop – Profiler

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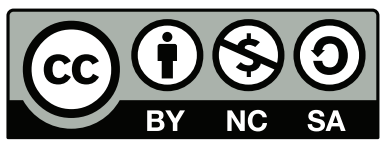

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- OCR'ed historical Documents contain errors.
- Historical documents contain lots of spelling variation.
- If you want to find errors in OCR'ed documents, you need a fitting historical dictionary.
- If you only have a modern dictionary, you will get a lot of false positives (*vnnd*, *Thurm*, ...).

The language Profiler was created to help to find OCR-errors in OCR'ed historical documents and to generate correction candidates for suspected errors[1].

- The profiler tries to distinguish real OCR-errors from historical spelling variants.
- The profiler can detect OCR-errors in historical patterns.
- The profiler uses various modern dictionaries.
- The profiler uses a (language-dependent) pattern list, that describes historical spelling variations.
- The profiler generates a document-dependent profile (the *document profile*).

[1] Ulrich Reffle, *Algorithmen und Methoden zur dokumentenspezifischen Analyse historischer und OCR-erfasster Texte*, 2011

- The profiler is documented in the profiler manual (included in the workshop's data package).
- Its source is available on github.
- The profiling web service, that is used by PoCoTo is also available on github.
- It needs Linux and different C++ development tools (cmake, make, g++, boost, xerces, ...).
- The profiler contains various tools that compile different forms of dictionaries, perform lookup in different dictionaries and generate correction candidates for unknown words.

The profiler uses a so called *language back-end*, that contains the language dependent resources for the profiler. A minimal language back-end contains at least:

- A configuration file
- A collection of historical and modern compiled dictionaries.
- A historical pattern file
- A frequency list of a historical patterns from a ground truth[2]

[2] This is a bug, since this resource should be purely optional.

- Dictionaries must be compiled from plain text files using the `compileFBDic`.
- The historical pattern file is a plain text file that lists various spelling variation patterns in the form: `modern:historical`.
- The frequency list must be compiled from a historical ground truth using the `trainFrequencyList` tool[3]

[3] You can use a small garbage file if you do not have a appropriate historical ground truth.

- The configuration file sets some variables for the profiler.
- Its main purpose is to set up the profiling process.
- It defines which pattern file to use
- It defines the dictionaries to use and the order of their evaluation.
- There is a simple configuration file on github.

```
...
# Dictionary and Pattern settings
[language_model]
patternFile = "${:PATH}/patterns.txt"
...
# RANK 0
[dict_modernExact]
path = "${:PATH}/modern.fbdic"
histPatterns = 0
ocrErrors = 0
ocrErrorsOnHypothetic = 0
cascadeRank = 0
# RANK 2
[dict_modernHypotheticError]
path = "${:PATH}/modern.fbdic"
histPatterns = 3
ocrErrors = 2
ocrErrorsOnHypothetic = 1
cascadeRank = 2
```

- If you work with the profiler you will often recognize missing historical patterns.
- The simplest resource to update is the historical pattern list.
- It is a plain text file that can be edited.
- New patterns can be added easily to the pattern file.
- There are some example pattern files on github.

The pattern file is a plain text file with one pattern per line. Each pattern must be of the form `modern:hist`. You can use `$` to mark end of words. Lines that start with `#` are ignored:

```
# patterns.txt
# cases are ignored!
# turm was often spelled thurm
t:th
# teil was often spelled theyl
ei:ey
# $ marks the end of words
lich$:lig$
bar$:lich$
```

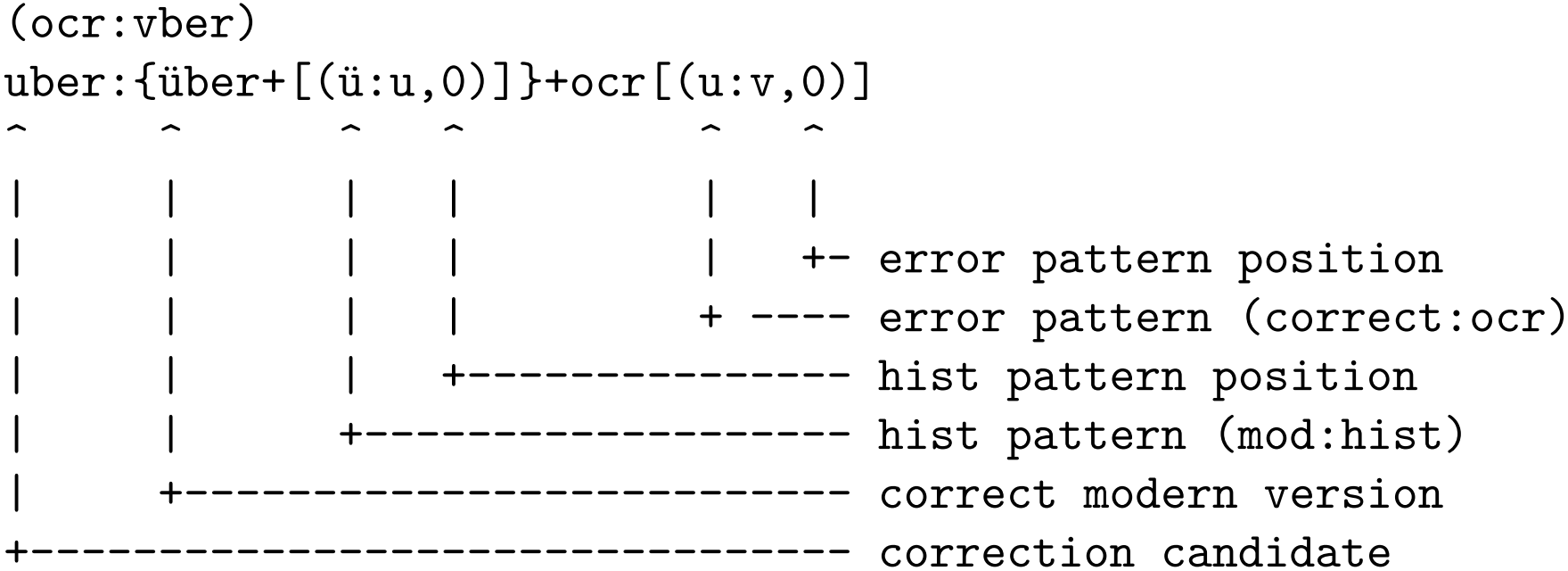
- Dictionaries are compiled from plain text files.
- Each token is on its own line.
- The text files must be sorted in ascending order.
- To add entries to a dictionary, you
  - add the dictionary entry to the file
  - sort the file
  - compile the dictionary from the sorted file
- There are some example dictionaries on github.

```
+-- my-language
|   +-- freqlist.binfrq
|   +-- modern.fbdic
|   +-- patterns.txt
|   +-- weights.txt
+-- my-language.ini
```

- With the profiler you can now profile your own documents.
- First of all you need a minimal language back-end.
- The language back-end contains at least:
  - A configuration file
  - A compiled modern dictionary
  - A pattern file
  - Two files that describe the historical ground truth (`weights.txt`, `freqlist.binfrq`)

- The profiler can profile plain text or `DocXML` documents.
- The command `profiler --config my-language.ini --sourceFile my-doc.xml --out_xml patterns.xml --out_doc my-doc-out.xml` starts the profiling.
- The profiler produces two output files:
  1. `patterns.xml` lists the assumed historical and OCR-error patterns and their occurrences in the document.
  2. `my-doc-out.xml` contains a `DocXML` file with correction suggestions for the unknown tokens.
- The profiler has some more command options (`profiler --help`).

```
<token token_id="16" isNormal="true">
  <ext_id>16</ext_id>
  <wOCR>vber</wOCR>
  <wOCR_lc>vber</wOCR_lc>
  <wCorr></wCorr>
  <cand>vber:{über+[(ü:v,0)]}+ocr[],voteWeight=0.9503,
    levDistance=0</cand>
  <cand>über:{über+[]}+ocr[(ü:v,0)],voteWeight=0.0489158,
    levDistance=1</cand>
  <cand>uber:{über+[(ü:u,0)]}+ocr[(u:v,0)],voteWeight=0.00...
    levDistance=1</cand>
  <!-- ... -->
</token>
```


(ocr:vber)
uber:{über+[(ü:u,0)]}+ocr[(u:v,0)]
error pattern position
error pattern (correct:ocr)
hist pattern position
hist pattern (mod:hist)
correct modern version
correction candidate

- The profiler web-service is a wrapper around the profiler with various language back-ends.
- It offers a SOAP-based web interface to profile documents.
- Its documentation is in the profiler manual
- Its source code is on github.
- PoCoTo can connect to such a web-service to profile a document.

- You can configure the URL of the web-service going to `Tools->Options->Profiler`
- The default URL points to a profiling web-service hosted by CLARIN-D.
- The CLARIN-D web-service has language-back-ends for German, Latin and Greek.

- You can always profile your current project by clicking `Profiler->Order document profiler` in the menu area.
- You will be ask which language back-end to use
- Select a language and click `Order document profile`.
- depending on your document and the settings of the profiler the profiling can take some time.
- After the profiling has stopped, you now will have access to the common error pattern tab in the error area and you will get a list of correction suggestions if you try to correct a token.

If the profiler web-service does not support your language or if you want to improve the language resources, you can profile the document manually and import it back into PoCoTo.

1. Export your project `File->Export->Export as DocXML`.
2. Run the profiler on the `DocXML` file.
3. Import the two output files of the profiler back into PoCoTo.

Thanks for your attention!