Hybrid Method for Tagging Arabic Text

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Outline

- Introduction
- Overview of POS Tagging Techniques
- Hybrid Method For Tagging
- Rules-Based Tagging
- Memory-Based Learning
- Evaluation
- Results
- Conclusion
Introduction

- several important approaches to tagging
  - Hidden Markov Models
  - Finite State Transducers

- Drawbacks of these approaches:
  - They are inflexible
  - Based on small amount of information
Introduction

• Approaches based on the position of the word in the sentence are not appropriate for tagging Arabic words.
  ◦ Arabic has a weak positional constraint
  ◦ Ambiguity in Arabic is enormous at every level
  ◦ The absence of the short vowels increase the ambiguity
Overview of POS Tagging Techniques

- There are many methods which can be classified in three groups:
  - Linguistic approach
    - Based on set of rules written by linguists
  - Statistical approach
    - Requires much less human effort
  - Machine learning based approach
    - Acquire a language model from a training corpus
Hybrid Method For Tagging

- Combining more than one method so it get the advantages of each one of them
  - Rules-based tagging
  - Machine learning based tagging
Rules-Based Tagging

- **Affix signs**
  - Proper to nouns
  - Proper to verbs
  - Proper to nouns and verbs

- **The pattern signs**

- **Grammatical rules signs**

- **Other signs**
  - Number
  - Gender
  - Preposition
  - Conjunction
Memory-Based Learning

- Simple learning methods in where examples are massively retained in memory.
- The similarity between memory examples and new examples is used to predict the outcome of a new example.
Memory-Based Learning System

- Contains two components:
  - A learning component which is memory storage
  - A performance component that does similarity-based classification
Memory-Based Learning System

1. Annotated corpus
2. Determination
3. Category of errors
4. Combinaison
5. Word, tag
6. Rules
7. Determined correctly
8. Anomaly cases
9. End

Training

Classification
Evaluation

- Examples when only rules are applied:
  - Example 1:
    - جَمِيْلٌ is a word with same consonant string and same vowels but has different tags: application of rule only produce the same tag for both cases.
    - جَمِيْلٌيَشْرَب ُ here جَمِيْلٌ must take the tag: NCSgMNI
    - اللَّاءِلا جَمِيْلٌ adjective must take the tag: NACScgMNI
Evaluation

- Example 2:
  - دَخَلَتْ بِنْتٌ here بِنْتٌ is a noun but it take the tag: VPSg1

- Example 3:
  - شَتْانٌ، هَيهَاتِ ...etc. show that a very high number of adjective can not be handled correctly and can be tagged as verbs.

- Example 3:
  - مدارسٌ، أَقْلاَمٍ، قُصُورِ and other broken plurals are classified as singular
Results

- Use of memory-based learning allows for easy integration of different information sources and can handle exceptions efficiently and has a number of advantages over statistical POS tagger.
  - Makes the tagging process more robust
  - Development time and processing is faster
  - Involves the disambiguation of word on basis of both sources
Results

- All experiments are performed on text extracted from educational books and some Qur’anic text. The tag set used is derived from APT.
- Rule based method gave 85% of correct result
- The Hyper method gave 98.2% of correct result
Results

- The figure shows some experimental results

Table 3: Results using rules-based and hybrid method

<table>
<thead>
<tr>
<th>Test corpus</th>
<th>Rules only (%)</th>
<th>Rules only with correct pos tag (%)</th>
<th>Hybrid pos tag complete subtags (%)</th>
<th>Hybrid with correct complete subtag (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Original test</td>
<td>84.45</td>
<td>83.98</td>
<td>96.53</td>
<td>94.32</td>
</tr>
<tr>
<td>Test with pre-annotated names</td>
<td>88.06</td>
<td>86.48</td>
<td>98.01</td>
<td>97.00</td>
</tr>
</tbody>
</table>
Conclusion

- This proposed approach allows a new method for tagging Arabic by a combination of based-rules and a memory-based learning.
- This approach is based on linguistic rules and the tag is verified by memory-based learning.
Conclusion

- Rule-based system is quite easy to extend, maintain and modify.
- Such method combined with memory-based learning involved filling the gaps in the lexicon and modifying the POS tag set in order to meet the requirements of NLP tasks.
- The proposed approach can also be applied to other NLP processing such as chunking.
Thank you for listening

- Any Question?