UTA and SICS at CLEF-IP

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Outline

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2. Our Approach to Query Generation
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University of Tampere (UTA) and Swedish Institute of Computer Science (SICS) joined forces in CLEF-IP

Our first try with patent retrieval – The goals were:
- Getting a retrieval system up and running
- Study the automatic query generation process

For two topics, the extracted query words were compared to query keys selected by three human experts

We participated in the main task with 8 XL runs
Automatic Query Generation

- Three approaches for picking query words from the topics
  - RATF-formula (e.g. Pirkola et al 2002) – does not account for the word frequencies in the topics
  - The “standard” \( tf \cdot idf \) weighting of the topic words
  - Modified RATF-formula that accounts for the topic word frequencies
- Topic words were weighted using one of the previous formulas
- The top \( n \) words were then selected to form the query
Manual Queries by Patent Experts

We had the opportunity to employ three patent engineers to analyse two of the topics (EP1186311 and EP1353525).

We are aware that not much can be claimed based on an analysis of two topics only . . .

. . . but we were hoping to get some first indications on how patent examiners work

our automatic query generation procedure could be improved

The manual queries were formed from the words that the patent engineers selected to be the top 10 representative words for the topic
System Details – Overview

- Topic XML (3 languages)
  - Title
  - Abstract
  - Description
  - Claims
  - IPC

  Extract words
  - Extracted + translated words additional lang
  - Query in target lang 1
  - Retrieval from the target lang 1 index

  Extraction process:
  - Extracted words main lang
  - IPC query
  - Retrieval from the IPC index

  Result list merging

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Indexing

- “Virtual patent” based approach to indexing
  - Only the central fields (title, abstract, description and claims) were indexed and only the most recent version of each of the fields was indexed
- Separate monolingual index for each of the languages
  - Words were stemmed using the popular Snowball stemmer
- The IPC codes were indexed separately into a language independent index
  - The IPC codes were truncated after the fourth character
Retrieval

- Three monolingual queries and an IPC code query were run for each of the topics.
- All the natural language queries in all runs were set to include 50 words, based on training results.
- Missing patent fields were in some experiments translated from the main language's field using Google Translate.
- The IPC queries included all the IPC codes present in a topic document.
- Each index returned the top 2,000 best matches.
Result List Merging

- The results from the four different queries were merged at query time using MAD (Mean Average Distance) merging model (Wilkins et al 2006)
  - Enables query based index weighting
- The scores of each index were min-max normalized before merging
- After merging top 1,000 docs were returned
Implementation

- A framework to study patent retrieval with the following properties:
  - Search engine independent – currently supported engines: Lemur, Lucene (experimental)
  - Environment for studying automatic query generation
  - Supports both query and document translation approaches for CLIR
- Implemented using Java-programming language
- Lemur-backend was used as a search-engine backend in our CLEF-IP runs
Results for the XL Runs

<table>
<thead>
<tr>
<th>Run ID</th>
<th>P10</th>
<th>MAP</th>
<th>nDCG</th>
</tr>
</thead>
<tbody>
<tr>
<td>UTASICS_abs-des-ratf</td>
<td>0.0945</td>
<td>0.1237</td>
<td>0.4722</td>
</tr>
<tr>
<td>humb_1</td>
<td>0.1776</td>
<td>0.2802</td>
<td>0.5877</td>
</tr>
</tbody>
</table>

Table: Our best run compared to the run by the Humboldt University, humb_1.
Results for the XL Runs

- The combination of the abstract and description fields seemed to be a better source of query keys than the other combinations.
- Abstracts in general were the most promising source of query keys when no proper translation resources were available:
  - All topics contained the abstracts in all of the three target languages.
- Using GT was not useful in general and seemed to perform especially badly on translation of the description fields.
- $RATF_{\text{mod}}$ and $tf \cdot idf$ performed very similarly, and clearly better than the original RATF-formula.
User Generated vs. Automatically Generated Queries

- The overlap between the user-generated and the automatically generated queries was usually four words.
- The user generated queries performed worse than the automatically generated ones (based on MAPs):
  - 0.3333 vs. < 0.01 for the topic EP1186311 and
  - 0.0004 vs. 0 for the topic EP1353525.
Summary

- The modified version of the RATF-formula and the $tf \cdot idf$ weighting could be good candidates for initial query extraction in patent retrieval.
- The combination of abstract and description fields was the best source for query words in our runs.
- Our approach to using GT for translating the missing patent fields did not noticeably improve the results.
- More user data would enable interesting evaluations of the system.
Thank You

Questions?
Comments?
Suggestions?

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