

MIR - ‘ZoekMuis’

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1 Overview

‘ZoekMuis’ is the name of my search-engine-lite project. I tried to do my best to ensure compatibility with the LIACS computers, but if something does not work, please let me know. It is also possible to download the entire project from GitHub:

<https://github.com/mickymuis/zoekmuis>

1.1 Components by others

Some of the components used in this project were made by others. First of all, I have used the entire ‘imageretrieval’ program and its libraries almost as-is. It can be found in the folder `imgcompare` and it is build to a separate executable. For the duplicate detection I have used an implementation of avl-trees taken from ‘zentut.com’. This implementation is far from perfect, but it makes the duplicate detection work at a decent speed. Moreover, I have picked Murmur2 as my main hashing function and DOCID. Its implementation was written by Austin Appleby. Last but not least I have also included ‘htmlstreamparser’ by Michael Kowalczyk.

1.2 Features

- Basic crawler and duplicate detection using avl-trees and hashing
- Circular queue limits memory usage
- Websearch using reverse indices for ‘link’, ‘page’, ‘web’ and ‘title’
- Image search using ‘alt’ and page title
- Weighted ranking
- Color based image-matching

1.3 Discussion

Here I will discuss some of the limitations of the implementation and certain decisions I made that may be worthwhile mentioning. First of all, I have chosen to replace all URLs by DOCIDs instead. The Murmur2 hash used for DOCID is fast to generate and its 64 bit length prevents significant collisions, at least in this

context. With this approach, the indices can be binary with fixed 8 byte fields, resulting in a significant reduction of memory footprint and lookup time. The downside is that reverse lookup (DOCID to URL) can be very expensive or needs a separate hashmap. Because of time constraints, I favoured an approach where I use the repository as reverse lookup. Instead of storing the complete HTML-page, every DOCID has an equally named file in `repository/` containing:

```
abs_url \n
page title \n
dump of HTML inner text elements
```

For images, the two last fields are empty. One of the advantages is that the reverse lookup is now completely handled by the filesystem. The extraction of the HTML inner text proved to be hard using `htmlstreamparser` and is, in many cases, not very accurate or complete. This is definitely a point for improvement.

I have also decided to include image similarity queries based on color histograms. To this end I have modified the ‘`imageretrieval`’ demo to output a list of DOCIDs instead of an HTML page. Because I did not want to mix my C and C++ code, I have kept the result as a separate executable (`imgcompare`) that is invoked by `webquery` if such a query is given. With more time, `imgcompare` could be made into a shared library to achieve some speedup and robustness.

Another limitation is the way the ranklist is generated. Currently, an associative array is employed and C’s `qsort()` is used to sort it. However, the datastructure relies on exhaustive search to update its entries which will be extremely slow for larger indices. This could be alleviated by augmenting it with the already existing avl-tree or by turning it in a proper hashmap.

The last limitation worth to mention is the fact that currently only single-word queries are supported. Logical OR could be easily implemented, but the more usefull AND would obviously need to have at least some degree of pre-processing done on the indices. Luckily, the DOCID based indices make this already easy.

1.4 Results and screenshots

Results in terms of speed were generally very positive until I implemented the retrieval of *all* images. Some pages, with many images, can take up to minutes to process (mind you, this is from my internet connection at home). The following statistics were obtained by lifting the domain restriction and crawling from `www.leiden.edu`:

- Total pages retrieved: 1240
- Queue: in queue 30316, total size 2.45 Mb
- Database: 637 Mb, from which 625 Mb for images
- Total time: 71 minutes

Example of a webquery

ZoekMuis

Search Web Search Images

Results for `leiden`

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<https://nl-nl.facebook.com/UniversiteitLeiden>

Fenna IJtsma (22), studying History. [www /span> Professors are ofcourse not only professors... but you just can't wait... :\) Any questions about natural sciences, mathematics and computer science in Leiden? Put them in the comments! Maak gebruik van ons mentornetwerk Nuno Rijken \(24\), studeert Film- en Literatuurwetenschappen. \[https De Masterdag is begonnen! Studiekeizers uit heel Nederland en daarbuiten zoeken in Leiden naar de perfecte Masterstudie. mastersopenday Het Mentornetwerk is een online por...\]\(#\)](#)

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Weet je zeker dat je deze Tweets wilt bekijken? @UniLeiden wordt niet gedeblokkeerd door Tweets te bekijken. pic websites zijn weer bereikbaar. Hans Schouffoer heeft geretweet Universiteit Leiden ... Hans Schouffoer heeft toegevoegd, ... pic pic ... pic pic Bij de volgende verkiezingen ga ik door het land touren met een programma over grafieken van politici. pic is wel beschikbaar. ... pic UniLeiden FGGA heeft geretweet Universiteit Leiden ... UniLeiden FGGA heeft toegevoegd, ... pic pic ...

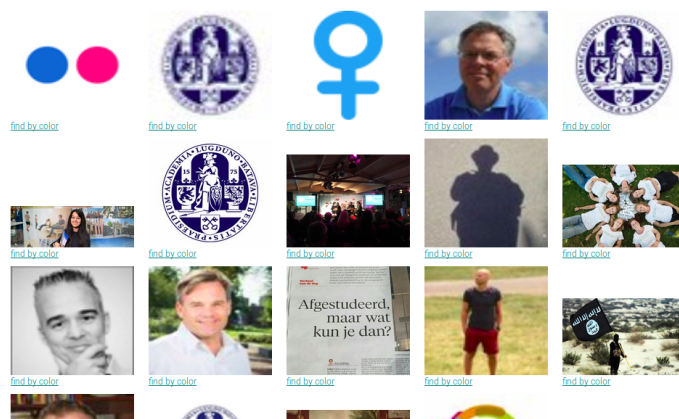
[Introduction - LIACS - Leiden Institute of Advanced Computer Science](#)

Example of an image query

ZoekMuis

Search Web Search Images

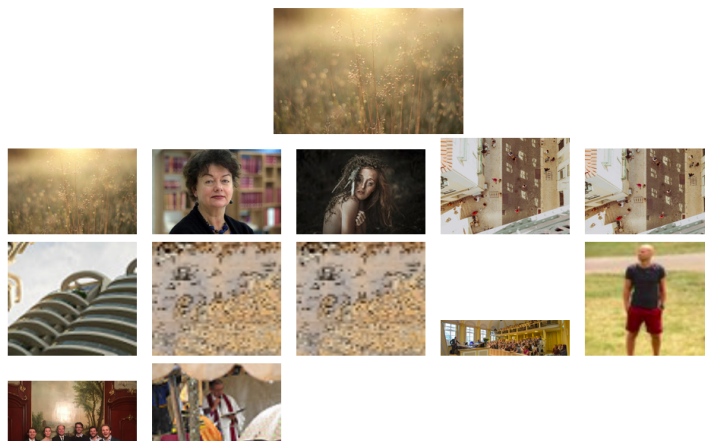
Results for `twitter`



Example of a color query

ZoekMuis

Images similar to:



Another image query

ZoekMuis

Results for 'universiteit'

