Information Retrievel with PostgreSQL

Alexander Hebel

Heidelberg University
Institute of Computer Science
Database Systems Research Group
vx228@uni-heidelberg.de

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Outline

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Task definition

- How looks and performs an IRS made of a relational database
- Similar to Apache Solr
- Finding different database models
- Python api for the database creation and communication
- Crawl Wikipages to gather some text data
- Special type in PostgreSQL named tsvector (full text search)

First goal

Support some boolean search querys like AND

Outline

Realization

Wiki crawler

- Based on package wikipedia version 1.4.0
- Takes number of pages and category as input
- Also searches in subcategories
- Variable level of subcategories

Database pipeline

- Used package psycopg2 version 2.8.5
- custom converter for tsvector

Database models

Tsvector

Possibilities

- Full text search
- GIN-Index
- Automatic tokenization and lemmatization
- Adding weights
- Predefined rating function

Limitations

- The number of lexemes must be less than 2̂64
- Max position value: 16383
- No more than 256 positions per lexeme
- Relative small set of manipulation methods
- Limited rating

Example

{'a':1,6,10 'and':8 'cat':3 'fat':2,11 'mat':7 'on':5 'rat':12 'sat':4}

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Adding your custom C-functions to PostgreSQL

Prerequisites

- Developer version of PostgreSQL
- Installation of make
- Root privilege on database

Folder structure

```
Extension
 ├─ function.c
 ├─ Makefile
 ├─ function.control
 ├─ function--1.0.sql
 └─ README.function
```

Steps

(1) make install

(2) CREATE EXTENSION "extension"

Example

```c
#include "postgres.h"
#include "fmgr.h"
#include "utils/geo_decls.h"

#ifdef PG_MODULE_MAGIC
        PG_MODULE_MAGIC;
#endif

PG_FUNCTION_INFO_V1(add_one);

Datum
add_one(PG_FUNCTION_ARGS)
{
        int32    arg = PG_GETARG_INT32(0);
        PG_RETURN_INT32(arg + 1);
}
```

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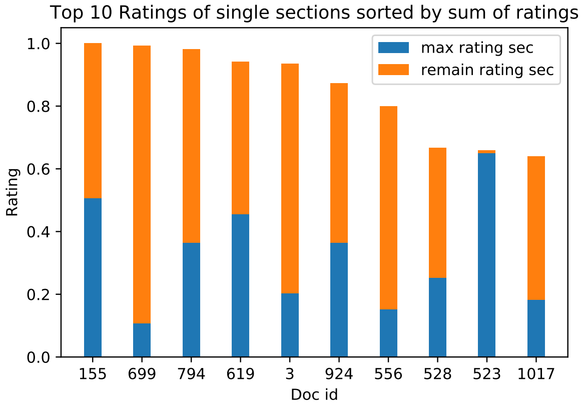
Idea

- Originates from a misunderstanding
- Thought the task is to rank whole wiki pages
- User wants the best section and not the "best" document
- So how is the relationship between page and section ranking

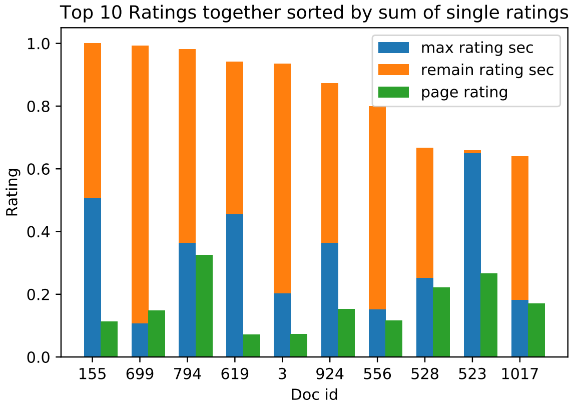
Calculation of Rating

- **section**: rating / num_words_of_section
- **page**: sum_of_ratings / num_words_of_page

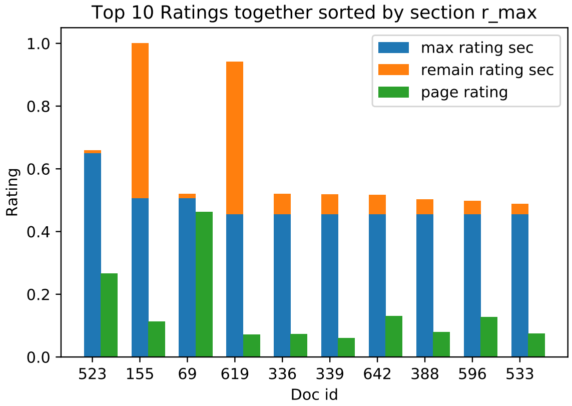
Query:"game", sorted by sum of section rankings



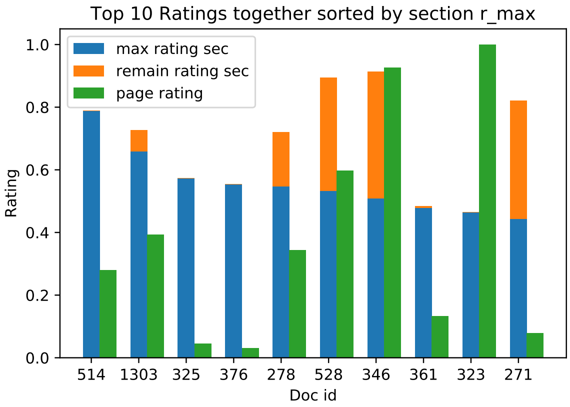
Query:"game", adding the rank for the whole page



Query:"game", ordered by max section rating



Query:"game AND team AND ball", ordered by max section rating



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Conclusion and future work

Conclusion

- Ratings for sections and page return total different results
- Tsvector has a lot of potential
- PostgreSQL is easy customizable

Future work

- Improve the rating algorithm with tf idf information (ts_stat)
- Tests on big datasets

Questions

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