

MOBILE APPLICATION FOR ACCESSING BIOMEDICAL INFORMATION USING LINKED OPEN DATA

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Abstract

This paper aims to introduce a mobile application for accessing biomedical information extracted from public open resources like Freebase, DBPedia or PubMed. Our app exploits the interlinked feature of those sources for easing the access to heterogeneous resources. App was developed using HTML5 and Javascript and then it was compiled to different platforms like Android or iOS.

Keywords

Healthcare, medical, Linked Open Data, mobile, android, ios.

Introduction

Information technology and mobile devices let people get information not being tied to desktop computers, and this situation opens the door to new scenarios for information retrieval. Ubiquitous access to heterogeneous resources and datasets from the web using mobile devices is usually not agile, and can be frustrating for users. Using traditional ways to search information on the web (i.e. searching medical literature) with search engines like Google, Bing or Yahoo! can be slow and sometimes unproductive because of the vast amount of links and resources to explore to find the right piece of information.

In this work we present a mobile application for accessing information about diseases, symptoms, drugs and other medical topics using Linked Open Data.

We have developed a mobile application for searching medical information in an easy way using mobile devices. It can be used by a general audience; like patients who want to search info about their symptoms, but can also be used by medicine and healthcare students and professionals interested on finding general descriptions, images and biomedical literature. Ease of use is also a core objective since we want to provide easy access for people with no technical skills.

Linked Open Data

Current trends on information retrieval show that users prefer dedicated apps for accessing web information instead of traditional ways using the mobile web browser. When visiting web resources using mobile browsers, visits are usually shorter, less

interactive, and user usually explores less content per visit.

For searching from mobile devices users tend to use more direct access through applications, instead of the traditional desktop search through search engines like Google or Yahoo! [2].

For this reason we have decided to create an app for accessing biomedical information using Linked Open Data resources.

Linked Data is a publishing method for structured and interlinked data, based on protocols and standards such as HTTP, URIs and RDF, so that data can be retrieved from heterogeneous sources [3].

The WWW is becoming a Web of Linked Data. A wide amount of RDF data has been published in freely accessible interconnected datasets, building the Linked Open Data cloud.

Currently, the datasets from the Linked Open Data cloud have such a high quality that can be used as the main source of information for search [4].

There are different datasets in the Linked Open Data Cloud, but DBpedia [5] and Freebase [6] are probably the largest data sets. Both extract structured information from Wikipedia and make them available in RDF, but they also have different structure. Both are interconnected, and many DBpedia topics can be linked to Freebase topics through their Freebase IDs.

Freebase is a stable platform for collaborative creation, organization and search public data. It is designed to promote its use by any search engine [7]. The main method of accessing its information is through its public HTTP-based API. Queries and

results are represented using JSON (Javascript Object Notation) syntax. They have also created a graph-query language known as the MQL (Metaweb Query Language) for accessing the topics using that that API. While Freebase extracts data from various sources, not just Wikipedia, DBpedia is focused only on Wikipedia data and its multilingual variants. It extracts information from patterns that are available in many Wikipedia articles, called infoboxes [8]. DBpedia is update when Wikipedia is. In addition to infoboxes information extraction, the framework processes the following types of Wikipedia content [9]: labels, abstracts, interlanguage links, images, redirects, disambiguation, external links, pagelinks, homepages, categories, geo-coordinates and metainformation. It is possible to run queries against DBpedia, and link the results to other datasets of the web.

Features and functionality

We have designed a mobile app that can help students or patients to access relevant information about medical concepts. This information is enriched with related information extracted from DBpedia, Freebase and PubMed [10].

Our mobile application allows users to type a medical term on a textbox, and search related information when the “Query” button is clicked (Figure 1)

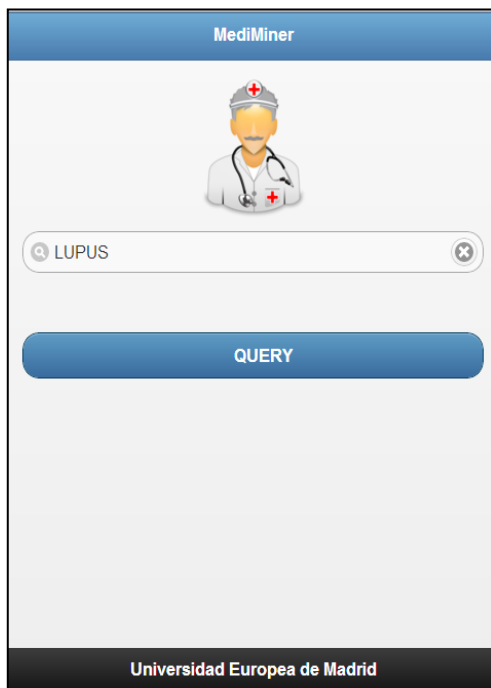


Fig. 1: Main page

The result is a list of concepts that are related to the search term, as shown in Figure 2.

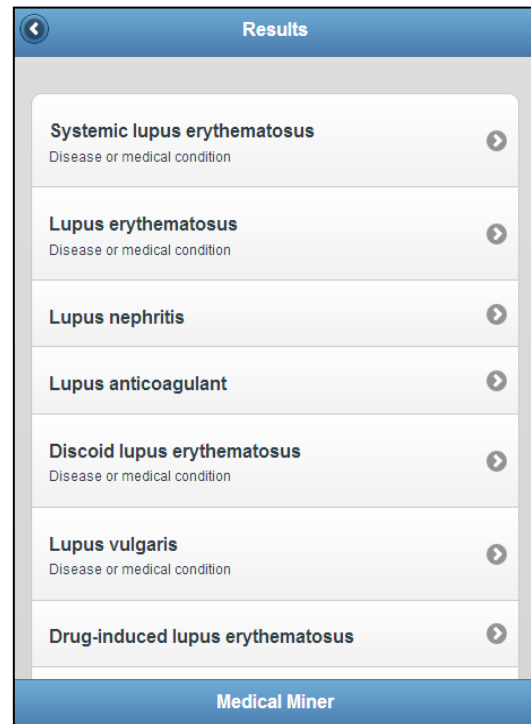


Fig. 2: Search results

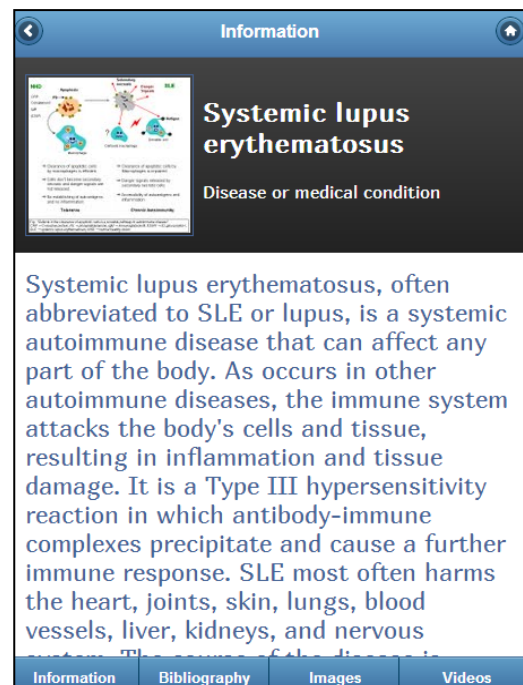


Fig. 3: Topic description.

Detailed information about each listed item can be shown by clicking on it. Once you have clicked on the item, the application displays a description of the concept, a picture of it, and a list of symptoms or treatments at the end of the description page. Additionally, the footer displays a toolbar menu with extra information of the topic: biomedical literature from PubMed, more images of the concept and even related videos from Youtube (Figure. 3).

Technical specifications

We have developed the application using the system architecture proposed in this paper for querying Open Linked Data resources.

Information is retrieved using linked data from Freebase, DBpedia, Pubmed and Google Search. The user interface was made using jQuery mobile framework and it has three pages: A landing page with a search box and a big button for making the query, a results page where we list all matching results for the given query and an information page where we show the useful information to the user.

For this application we have used Freebase as the starting point. We issue a query to the following API URL: <https://www.googleapis.com/freebase/v1/search> with the following parameters:

```
{  'query': term,
  'filter': '(any domain:/medicine)',
  'limit': 20,
  'indent': true,
  'lang': 'en'
};
```

Where “term” is the term typed by the user in the search box. The parameter “filter” restricts results to medicine domain. Our application was made for searching English terms, but can change the language using parameter “lang” (or we can make a multilingual application”).

Response result is in JSON format. We use jQuery to parse and show the results in a listview (Figure 2).

The last step is to retrieve information for the topic selected by the user from the listview. This step is made in a similar way to the previous one but this time we make a call to the “topic” service of Freebase by launching a query to topics API of Freebase:

<https://www.googleapis.com/freebase/v1/topic>

This API call gives us information about the term, such as a description, the category, symptoms, treatments, risk factors, etc. We can also get links to other medical resources extracted from other sources like DBpedia, or Pubmed. We use these datasets to show the user a collection of medical bibliography related to the topic he/she searched for.

Since the app has been developed using HTML5 and Javascript technologies, it can be run on mobile

browsers, but we have compiled the app to native platforms like Android and iOS using the Apache Cordova framework [11].

Conclusion

In this paper we have introduced a mobile application for accessing biomedical information retrieved from Open Linked Data resources. Our application makes easier to find biomedical resources than using traditional searches with the mobile web browser.

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