Khresmoi Professional: Multilingual, Multimodal Professional Medical Search

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Abstract. In this demonstration we present the Khresmoi medical search and access system. The system uses a component based architecture housed in the cloud to support target users medical information needs. This includes web systems, computer applications and mobile applications to support the multilingual and multimodal information needs of three test target groups: the general public, general practitioners (GPs) and radiologists. This demonstration presents the systems for GPs and radiologists providing multilingual text and image based (including 2D and 3D radiology images) search functionality.

1 Introduction

The Khresmoi project[1] is developing multilingual multimodal search and access systems for medical and health information. It addresses the challenges of searching medical data, including information available on the internet, as well as 2D and 3D radiology images in hospital archives. The system allows text querying in several languages, in combination with image queries. Results can be translated using a machine translation tool specifically trained on medical text. This demonstration focuses on search functionality developed for general practitioners (GPs) and radiologists.

2 Innovative Medical Search System

Components of the Khresmoi system include search, a knowledge-base, machine translation, query disambiguation and spell-checking. The modular integration of multiple software technologies in the system architecture allows for easy development of required medical search applications. These applications are innovative in several ways, including:

- Multimodal search system for medical practitioners, offering multilingual support, faceted search, and several personal support components including facilities to save items and collaborate with peers.
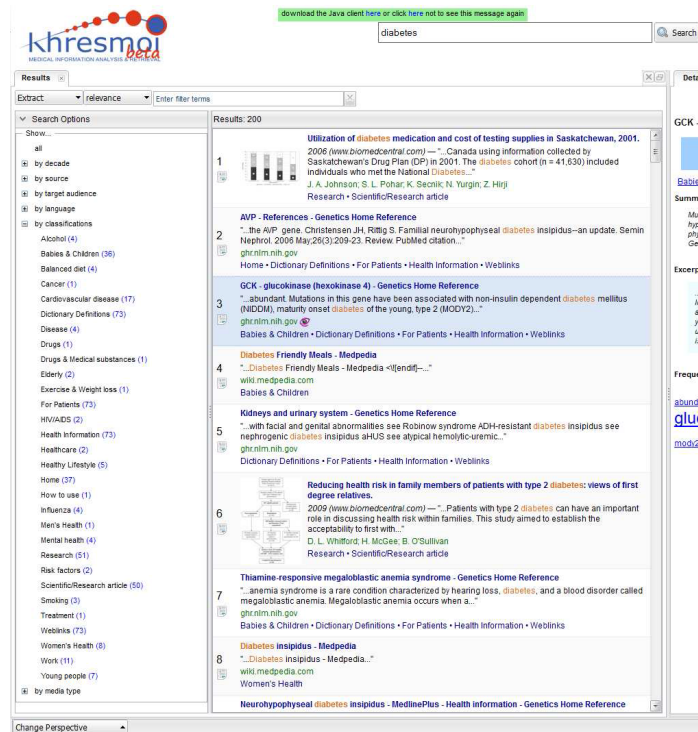
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[1] http://khresmoi.eu

Fig. 1. The Web frontend

– Large-scale image search based on visual similarity of images, supporting both 2D images (X-rays and images in publications) and 3D images (CT and MR).

These systems were developed to take into consideration users needs and requirements as determined by extensive questionnaires and analysis conducted within the Khresmoi project [1–3]. Rounds of user-centered evaluation with GPs and radiologists at both the interface component and interface system level have been used for iterative system improvement [4–6].

3 Medical Search for General Practitioners

The Khresmoi search prototype for GPs provides two user interfaces. One is a browser based web application[2] written in GWT, while the other is a Java Swing desktop application[3]. Both share a common backend service infrastructure also written in Java. A third user interface for Android devices is currently under development.

The main novelty of this search prototype is the integration in a single system of various components such as high quality machine translation, efficient infor-

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[2] http://professional.khresmoi.eu
[3] http://khresmoi.is.inf.uni-due.de/khresmoi.jnlp

mation retrieval module, medically-trained summarization, collaborative components, etc.

Crawled websites with trustworthy medical information targeted at practitioners are semantically annotated using GATE technology[4] and then indexed by Mimir[5]. In addition, images from medical publications are also indexed (using ParaDISE[6]).

Figure 1 shows the web frontend which features basic functionality including free text search, and a facet explorer which enables the result set to be filtered using metadata attributes. The system gives spelling corrections and disambiguation suggestions while a user is typing a query. Result sets may include images which can be used to trigger searches for visually similar images. Users can store retrieved documents in a tray for later inspection. The personal library is a permanent storage for documents of various formats and is available to all registered users. Queries are recorded and can easily be reissued by utilizing a separate view in the interface. All components can be (un-)hidden from the perspective, re-sized and moved in the interface.

The Swing interface includes all features of the web prototype, but in addition users can issue an image search by dropping an image from their file system or browser in a special search box. The desktop client has collaborative features which enable registered users to share documents with other users or user groups. Both interfaces are fully internationalised for all Khresmoi project languages, including English, German, French, Spanish and Czech, as well as for Chinese and Vietnamese.

4 Medical Search For Radiologists

The search system for radiologists was developed based on the Swing version of the prototype interface, and shares the same technological basis as the GP system. This system enables radiologists to search and compare 2D and 3D radiology images. A use case for this system is that a radiologist faced with an unusual or unknown structure in an image can query the hospital archives for images containing a similar structure, and use the (anonymised) radiology reports associated with these images to guide the reading of the image.A demonstration of the system can be viewed[7].

Figure 2 presents the interface instantiated for use by radiologists. Note that this is the same interface framework shown in Figure 1, but with different tools visible. Here the query is the selected area of the image slice shown in the left panel. The images in the panel on the right are returned based on their visual similarity to the region marked in the query. In the central panel, the selected image is shown, along with the associated radiology report. For this application, only the images stored in the archives of the hospital in which the system is used
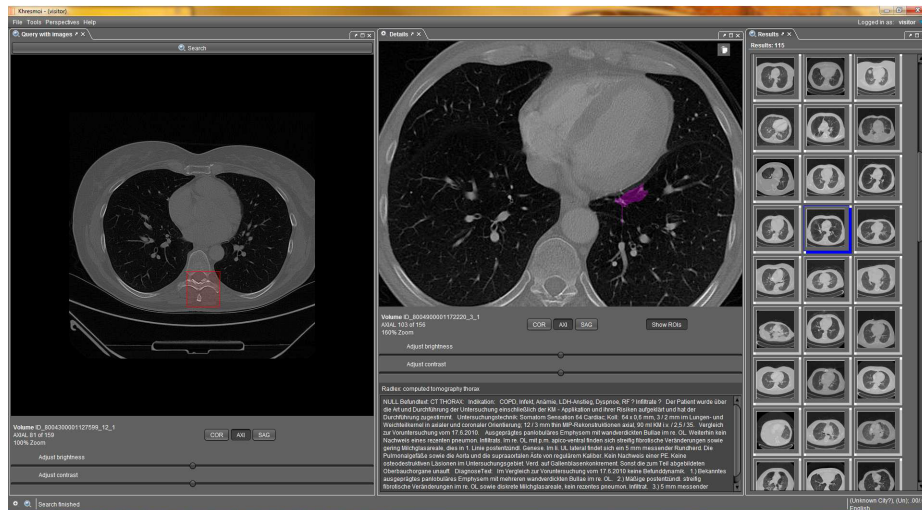
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[4] https://gate.ac.uk

[5] https://gate.ac.uk/mimir/

[6] ParaDISE is a new visual search engine developed in Khresmoi as a successor to the GNU Image Finding Tool (GIFT)

[7] http://youtu.be/UnPs7NSet1g

Fig. 2. Khresmoi interface for radiologists

are indexed. However, the possibility to do a visual search of 2D images from the medical literature is also provided.

Acknowledgments

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