

Editorial: One Year of Khresmoi

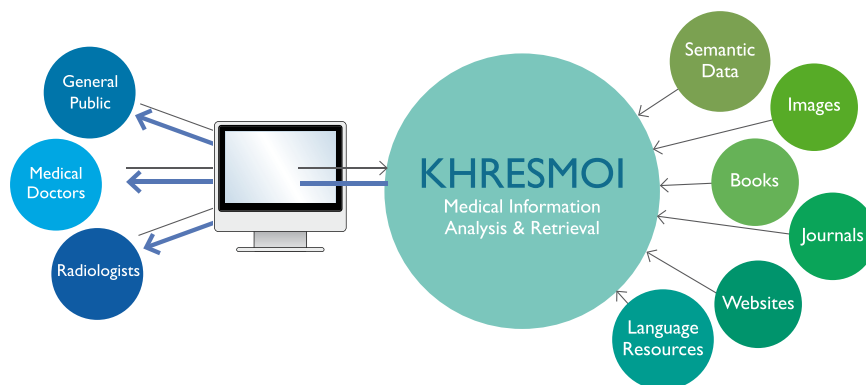
Allan Hanbury,
Vienna University of Technology, Austria
Hanbury@ifs.tuwien.ac.at

The end of the eventful first year of the Khresmoi project is approaching, and this newsletter presents some of the highlights of the work. Khresmoi aims to build a multilingual, multimodal health and medical information search engine. It will take information from many sources in many languages, and aims to improve the effectiveness of access to this information for members of the general public and medical doctors. Radiologists have specific requirements due to the specific highly visual nature of the information that they work with.

TOPICS

in this issue

- Results of the general public requirements survey
- Results of the radiologist requirements survey
- The I-Healthcare Initiative



The main aim of the first year was to elicit the current search practices of the target groups, as well as their requirements and wishes for future health and medical information search systems. To achieve this aim, three surveys were done. The first was an online survey aimed at members of the general public – a more detailed look at this survey and its results is on page 2 of this newsletter. The survey of the radiologists was done on a smaller scale, but included initial experiments on using eye tracking to determine the parts of an image that a radiologist concentrates on – more details on this survey and its results are on page 3. The final survey was aimed at medical doctors, and was also performed online. Over 550 medical doctors responded to this survey – the results are however still being analysed and will be included in the next edition of the newsletter.

In parallel to determining the requirements of the end users, the first steps towards integrating the components that will make up the Khresmoi search engine were taken. At the consortium meeting in March 2011, a focus was placed on familiarising the Khresmoi team with the components to be used. This led to the ambitious target of developing four prototypes illustrating different aspects of the Khresmoi vision by September 2011, with the development currently well underway.

A search engine is of little use if it does not access useful information. We have therefore paid attention to the information that will be indexed by the Khresmoi search engine. The information accessed by the initial prototypes includes the set of HONcode-certified websites (the HONcode is the certification of medical websites managed by the Health on the Net Foundation) and a subset of MEDLINE abstracts. The Cochrane Collaboration has also made available the complete text of their systematic reviews for use in Khresmoi. Automatic annotation of entities in the texts is being done, coupled with manual correction of the annotations to flow back into improving the automated annotation.

For the radiology application, over three Terabytes of anonymised Computed Tomography (CT) and Magnetic Resonance (MR) images were obtained. Part of this data was manually annotated by anatomical location (e.g. head, chest, hand) and anomaly (e.g. bone density in osteoporosis). This data will serve as a basis for semi-supervised learning in anatomy identification algorithms, as well as for anomaly retrieval. It is becoming increasingly evident that the transfer of biomedical research results for use in healthcare is not optimal. A recent European Science Foundation publication (Forward Look – Implementation of Medical Research in Clinical Practice) pointed out that “medical decision making is still in many cases based on poor evidence; some medical treatments can actually harm patients, and there are worthwhile treatments that are not used widely enough.” Technology developed in Khresmoi has the potential to improve this flow of information from research to practice. On page 4, the I-Healthcare initiative in which Khresmoi is involved is described. This initiative is working toward an infrastructure that is capable of delivering fully-optimised, intelligent healthcare.

Results of the survey on general public requirements and difficulties in finding online health information

Célia Boyer, Health On the Net Foundation,
Geneva, Switzerland
celia.boyer@healthonnet.org

The Health on the Net (HON) Foundation conducted a survey with the aim of identifying the most important user requirements and difficulties in finding online health information. This will be further used for the use case elaboration of Khresmoi. Following a literature review, no study was found that clearly explained the search process and identified Internet users' preferences. Thus, it was necessary to design a specific questionnaire based on HON's search logs, previous HON surveys and a literature review. The questionnaire was developed from December 2010 to March 2011 in collaboration with the Society of Physicians in Vienna, Austria. Furthermore, it was translated from English into French, Spanish and German. The survey was launched on the 9th of March 2011 in French and English, and the German and Spanish versions were available at the end of March. The promotion of the survey ended on the 26th of April 2011.

In total 385 responses were collected, representing mostly the opinions of highly educated users from healthcare and IT areas of occupation. Overall, representatives from 42 countries around the world filled in the questionnaire with the top contributors being from France and Spain.

Most of the respondents reported connecting to the Internet via Wi-Fi, and many of them use mobile devices (laptops and smartphones mostly). The Internet was mentioned to be the second source of health information after physicians, due to its accessibility and ease of use. The most researched topics were general health, chronic diseases and lifestyle. Illness-related information can be prioritized

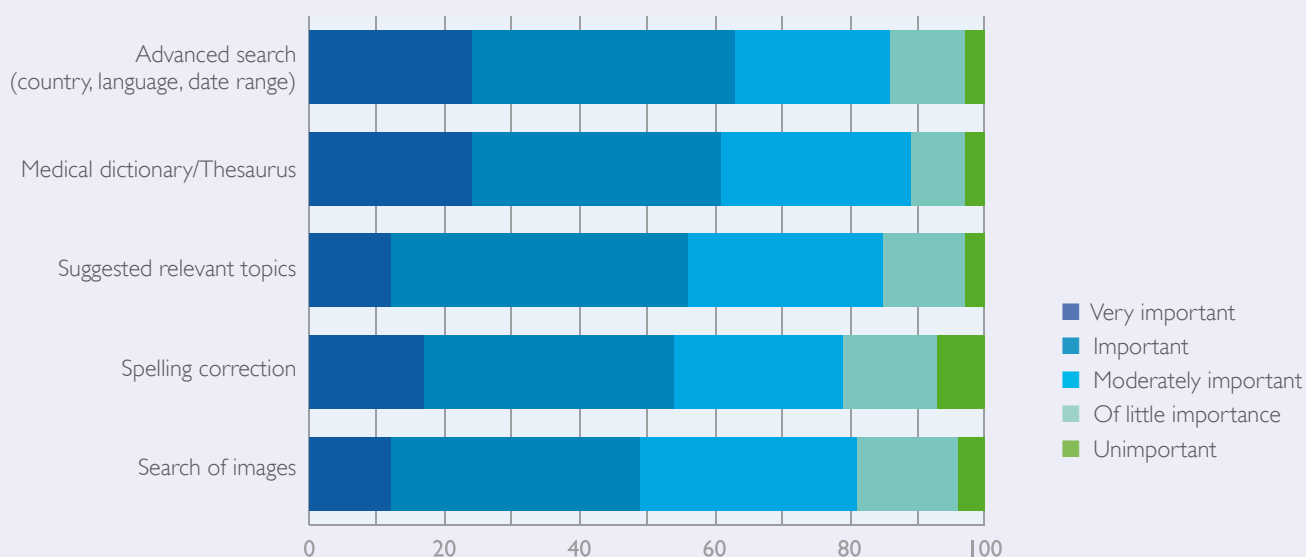
in the following way: treatment/therapy, detailed and general disease description, drugs and scientific articles. The most important characteristics of a search engine are relevance and trustworthiness of results. It seems that the main problem is that results currently retrieved using a general search engine do not satisfy these requirements. Additionally, advertisement banners, contradictory information found on different web sites, and difficulties related to very precise queries are some of the barriers encountered.

The ideal representation of the information will be a categorization of the results into different groups. Helpful tools, which are highly appreciated by respondents, are advanced search, medical dictionary/thesaurus, suggested relevant topics, spelling correction and image search. The responses of the participants for these five tools are shown in the graph below. Most users say that they would tolerate advertising in order to have a search engine free of charge, but would like to be ensured that the ads have undergone a rigorous quality control. Some respondents also mentioned that they would like to have free access to the medical literature.

Finally, information of poor quality will always be on the internet, thus efforts should be made to create an approach where understandable, good-quality information is available, leading to potentially better health choices.

More detailed information on the survey results can be found at:
http://www.hon.ch/Survey/khresmoi_general_public_survey_results.html

Top 5 helpful tools



In the next newsletter: Results of the survey on the information search requirements of physicians

Analysis of Image Search Requirements among Radiologists

Henning Müller, University of Applied Sciences
Western Switzerland, Sierre, Switzerland
Henning.mueller@hevs.ch

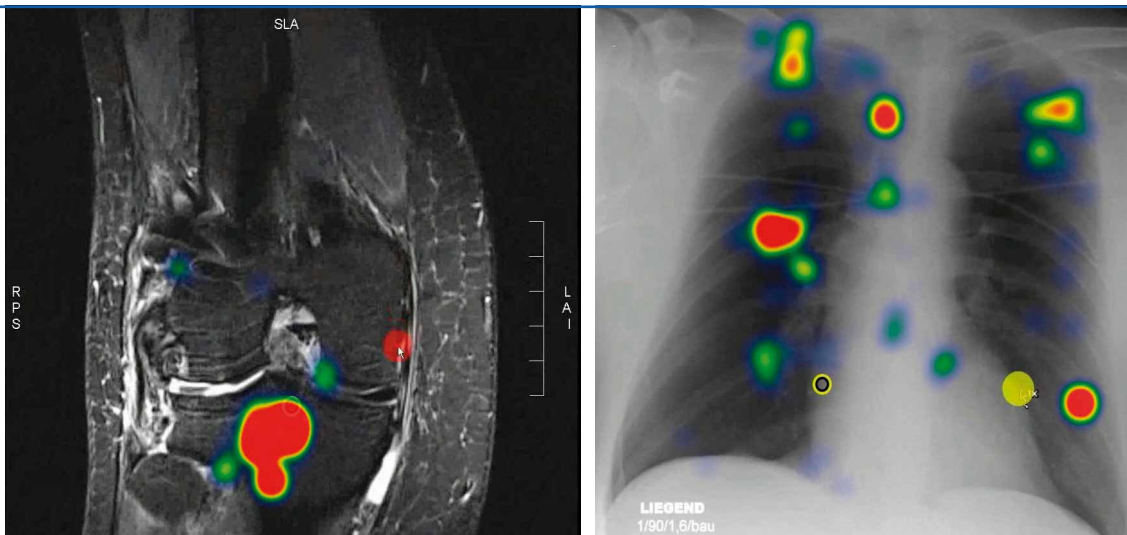
One goal of the Khresmoi project is to learn more about image use and search requirements of radiologists. As part of this analysis a qualitative survey was performed among radiologists. In addition, a test using an eye tracker to analyze the image use behavior on practical cases was done.

The eye tracking was performed on a clinical workstation where radiologists had to perform diagnosis on a few example cases of different anatomic regions. Eye tracking allowed the identification of clear and well defined regions of attenuation or interest (see image below). Sometimes only one major region is seen but for other images several well defined areas are viewed. The regions important

personal experience, so similar to general web search.

Search for images was regarded as successful in around 65% of the cases. When it is not, most often the target is assumed to be rare or new, and only rarely do radiologists think that the images might not exist. Successful image search took in general 10 minutes or less whereas unsuccessful searches are stopped after more than 15 minutes. For clinical work the time available to search for images is around 5 minutes, whereas for teaching and research more time is available.

Important additions for search were mentioned to be filtering by pathology and modality, and also search for similar images, similar



Heat map images for knee MRI (left) and a chest x-ray (right), where red areas attracted the most attention of radiologists. This shows that often a particular region attracts the main attention as in the knee MRI or several distinct regions as with the chest x-ray.

for a diagnosis are often very small and linked to a specific organ, highlighting the need to identify anatomy and also a need for local retrieval and detection of anomalies.

The survey was web-based (in addition to a paper version) but by invitation only to ensure that only radiologists responded. In total, 30 radiologists answered the survey, mainly from Switzerland and Austria. The persons answering the survey were in a large part around 30 years of age and hence with less experience, but several people with over 15 years of experience in radiology participated as well.

Questions were asked separately for the three main activities, notably clinical work, teaching and research. The respondents sometimes did not answer all three in the same detail and mentioned that activities in the three domains were similar; but some differences could also be found in the responses.

It became clear that image search is a common activity, often for finding interesting cases or articles for a differential diagnosis. Sources are most often Google but also specialized search engines such as Goldminer and Yottalook were mentioned. Relevance is based on

cases or for articles of the scientific literature were mentioned.

Very few of the radiologists are familiar with visual search but many would like to have the possibility to upload images to search for similar ones. Terminologies to describe images are only very rarely used but many persons regard the exact formulation of a query as difficult and would like to search for specific pathologies and modalities.

Image search is a common task in radiology but currently only few radiologists are fully aware of research in visual medical information retrieval. Taking into account many unsuccessful searches and the time necessary for this a good image search engine could well improve the situation. Particularly filtering of results by modality, pathology, anatomic region but also based on patient demographics are other aspects that a radiology image search engine would need to include to have real impact.

Full results of the survey are available here:

<http://khresmoi.eu/assets/Deliverables/WP9/KhresmoiD9I.pdf>

A video is available here:

<http://bit.ly/pibhl5>

The I-Healthcare Initiative

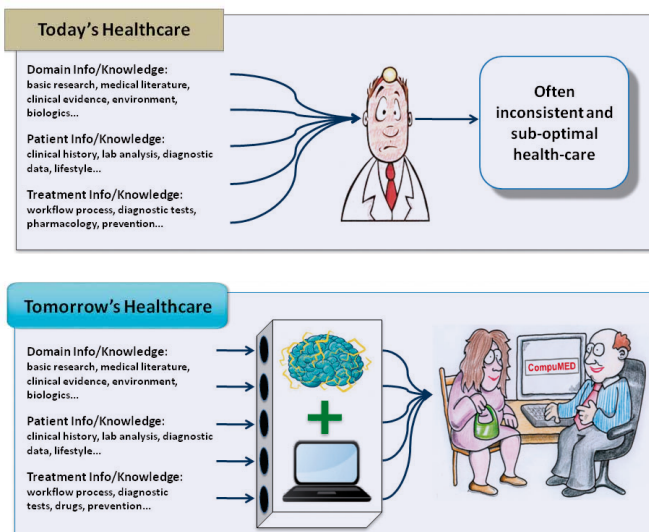
The I-Healthcare Initiative aims to improve the take-up of research results in healthcare, so that future healthcare will be able to fully and effectively exploit the exponential growth of new knowledge emerging from biomedical research, especially those advances that are centred directly or indirectly upon individualised and molecular based understanding of disease. The ideal system should intelligently locate, distil, and repurpose all the key biomedical knowledge, framed in the specific context of a 'health avatar' (a personalised health model) for each patient, and then place this at the fingertips of doctors, patients and other stakeholders, in a real-time and multi-lingual format and mode that they can use. This is clearly a challenge involving many disciplines, and could even require the launching of a new discipline. Initial discussions on this topic took place at the I-Healthcare Workshop in May 2011, and presentations can be downloaded here:

<http://www.ideal-healthcare.org/workshop2011>

The I-Health Workshop, taking place in Brussels from the 3rd to the 4th of October 2011, will allow these considerations and discussions to continue among a larger group of people.

More information can be found here:

<http://www.gen2phen.org/i-health2011/>



The Khresmoi team at the Consortium Meeting hosted by ATOS Origin in Madrid in March 2011



To order the newsletter and receive regular updates:
<http://www.khresmoi.eu/contact-us/keep-me-updated/>

At a glance

Project Coordinator

Henning Müller
University of Applied Sciences
Western Switzerland
Tel: +41 27 606 90 36
Fax: +41 27 606 90 00
henning.mueller[at]hevs.ch

Scientific Coordinator

Allan Hanbury
Vienna University of Technology
Tel: +43 1 58801 188310
allan.hanbury[at]tuwien.ac.at

Partners

University of Applied Sciences
Western Switzerland (CH),
Vienna University of Technology (AT),
Atos Origin (ES),
ELDA (FR),
Ontotext (BG),
Dublin City University (IE),
University of Duisburg-Essen (DE),
Charles University in Prague (CZ),
The University of Sheffield (UK),
Health on the Net (CH),
Medical University of Vienna (AT),
Society of Physicians in Vienna (AT)

Duration:

09/2010 - 08/2014

Funding scheme: IP

Total Cost:

€ 10.534 m

EC Contribution:

€ 8.036 m

GA number: 257528

