

Using eye tracking on a clinical viewing station to help investigate image search requirements of radiologists

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Introduction

Searching for visual information is a common task for radiologists during clinical or scientific work. However, the performance of current visual information retrieval systems is often unsatisfactory as it is difficult to represent clinical anomalies visually and detect regions of interest (ROI). One of the objectives of the Khresmoi project is to build a multi-modal search and access system for biomedical information, and more precisely an image search engine corresponding to the radiologists' needs. This study aims at analyzing the radiologists' image use behavior with the help of an eye tracking system. Goal is to provide input for designing a search system based on real requirements. A larger scale survey among radiologists is currently underway and will complement the eye-tracking information.

Methods

A stand-alone radiology viewing station was set up for an eye tracking system. Three radiologists were asked to perform routine radiology tasks, including the following steps: choosing a patient, loading and analyzing the image data. The results of the experiments were visualized among others as heat map images. The study included several sessions and cases for each of the three radiologists. The radiologists were explaining their tasks while they were performing the actions.

Results

A qualitative analysis was performed on the results, demonstrating a clear trend to focus on small ROIs. This shows that the radiologists' interest in an image is highly localized highlighting the need for marking local regions for focused retrieval and using local visual features. Some types of images have single ROIs whereas others have a set of 4-8 ROIs with high activity, meaning that several ROIs often need to be combined. Based on the image types a pre-selection of interest zones seems possible based on first results.

Conclusions

Image search of radiologists can be improved by analyzing state-of-the-art approaches for visual and textual retrieval based on clearly defined requirements. Observing the image use behavior can help finding patterns for improving existing tools and adapt them to the needs of the end users.

This study is part of a larger study on the radiologists' image search needs. It adds interesting aspects of their image use and provides information for defining realistic specifications of a system that can implement the required search techniques.