Fast Content-Based Visual Retrieval of Radiology Cases in Hospital Systems

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BACKGROUND

Research has shown that efficient and quick access to comparable cases together with corresponding radiology reports increases radiological assessment quality. Typically search queries within a PACS are limited to meta data, such as those contained in DICOM images. This limits the effectiveness of searches, since they do not use the actual visual information in the images, such as patterns characteristic to specific diseases.

EVALUATION

We present a computational system for content-based retrieval of radiological images and reports based on visual or textual content of a query case. Given a query case it searches for cases that exhibit similar pathology patterns, and displays them together with the radiology reports. For the retrieval of specific pathologies it allows to specify regions or volumes of interest. It fully automatically identifies the anatomical location of an image, and retrieves cases with matching radiological features in the imaging data. In experiments on approximately 61.000 image series sampled from a hospital PACS (3TB of imaging data) it identified the position of a query case with a median error of 2.4cm to standard of reference positions on a validation set of 4000 expert annotated cases within a search time below a second. On a pilot set of lung pathology cases, pathology retrieval achieved 67% correct diseases in the top ranked 3 cases.

DISCUSSION

Providing clinical radiologists with a fast and efficient way to retrieve relevant data from hospital image data bases impacts reporting quality and speed. Performing retrieval based on both text and image data achieves high retrieval accuracy, and makes use of the visual information in the imaging data. It enables radiologists to find highly relevant cases based on regions of interest in a matter of seconds, even if no specific keywords are provided.

CONCLUSION

Retrieval plays an increasingly important role in the clinical radiology environment. It supports clinical radiology workflow, research, and teaching activities. Image content based retrieval is particularly helpful, since it allows to search for similar visual features in large data bases and enables the radiologist to efficiently access relevant cases in a hospital.