An Interactive Computer-aided Detection Workstation for Reading Mammograms

Maurice Samulski, Nico Karssmeijer, Carla Boetes, Gerard den Heeten
Department of Radiology, Radboud University Nijmegen Medical Centre, The Netherlands

PURPOSE/AIM
To experience the use of an interactive computer-aided decision support system for the detection of mammographic masses.

BACKGROUND
Current computer-aided detection systems for mammographic mass detection are aimed to avoid missed cancers due to perceptual oversights. In these systems all suspicious mammographic findings are displayed as prompts after the reader has inspected the case.

It was found in previous research that when CAD analysis was restricted to mammographic regions identified by radiologists, the performance of the CAD system was comparable to the radiologists in discriminating these regions in cancer and non-cancer. Independently combining CAD results with radiologists’ findings showed a significant improvement of the single reading results, demonstrating that current CAD systems can be used to help radiologists with interpretation of regions they find suspect (see Figure 1).

We have developed a dedicated mammographic workstation that is aimed to help radiologists with interpretation of mammographic masses. Instead of displaying all CAD findings as prompts, the reader can probe image regions for the presence of CAD information.

RELEVANT PRESENTATIONS RSNA 2008
   Tue Dec 02 2008 3:50PM - 4:00PM ROOM S402AB.
   Wed Dec 03 2008, 3:30PM - 3:40PM, ROOM E253CD.

INDEPENDENT READING WITH CAD
Fig 1. Mass detection performance of CAD and 10 experienced screening radiologists. Radiologists are represented by different marks, each point represents an operating point of the radiologist. The solid line shows standalone CAD performance, while the dashed line shows FROC results of CAD on regions identified by radiologists.


TRADITIONAL VS. INTERACTIVE
Fig 2. (Top) Current practice where CAD findings are presented as prompts (Bottom) Interactive CAD system where a region is probed.

ACKNOWLEDGMENTS
This work has been funded by grant KUN 2006-3655 of the Dutch Cancer Society and by NWO under BRICKS/FOCUS grant number 642.066.605
When selecting the demonstration mode, the reader can go through a small series of cases, get familiar with the presented mammographic workstation, and experience the use of CAD in an interactive way.

**WORKSTATION USER INTERFACE**

- **FULL SCREEN**: Enter zoom mode. Holding the button will pan during zooming mode.
- **CASE LIST**: Exit zoom mode. Probe for CAD results.
- **EXIT EXPERIMENT**: Scrolling will adjust gamma (contrast).

**DEMONSTRATION / TRAINING SESSION ~ 5 MINUTES**

**OBSERVER EXPERIMENT ~ 20 MINUTES**

1. Case set A: 6 cases with CAD
2. Case set B: 6 cases without CAD
3. 6 cases without CAD
4. 6 cases with CAD

**4 sessions**

- **Query suspect regions for CAD (if enabled in session)**
- **Annotate location of the finding**
- **Proceed to next case in session**
- **Assign a suspiciousness rating**

**Evaluation detection performance & Reviewing the findings with and without CAD**