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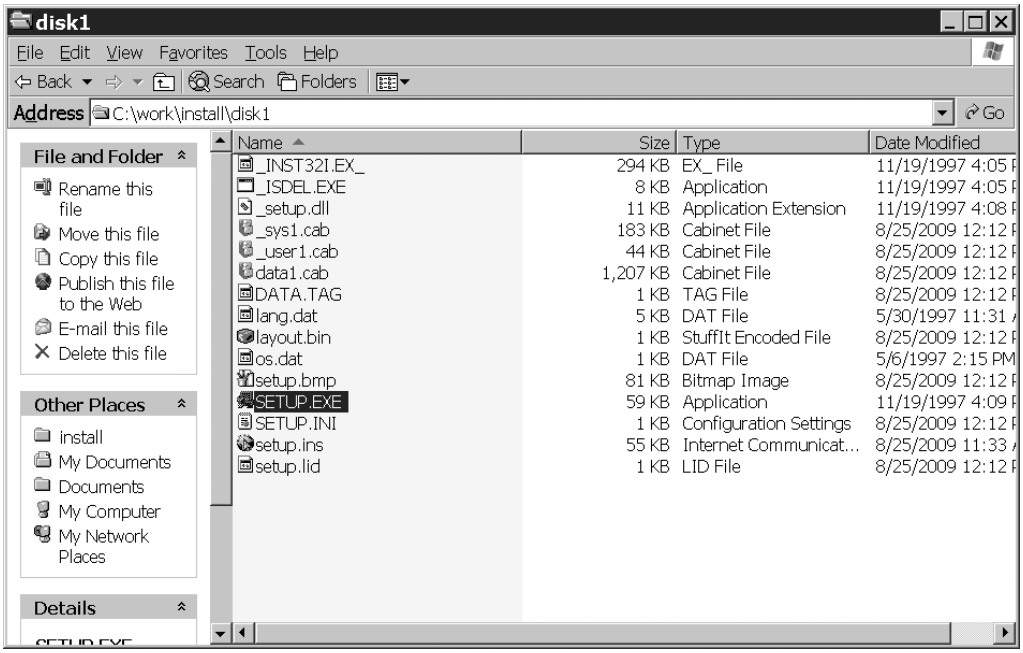
HARDWARE AND SOFTWARE INSTALLATION INSTRUCTIONS

SOFTWARE INSTALLATION

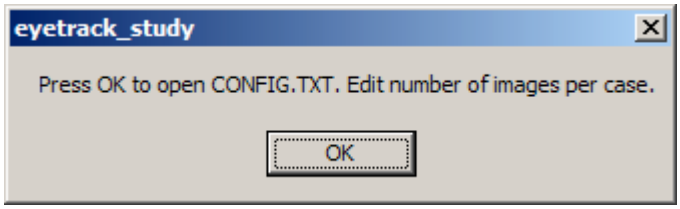


- This needs to be performed by PI and /or an IT professional or equivalent.
- Uncompress “eyetrack_study.zip” file.
- Start the “SETUP.EXE” installation program.
- The default location of the software is “C:\Program Files\DevChakraborty\Eye Tracking Study”.
- The default group name in the Start menu is “Eye Tracking Study”.

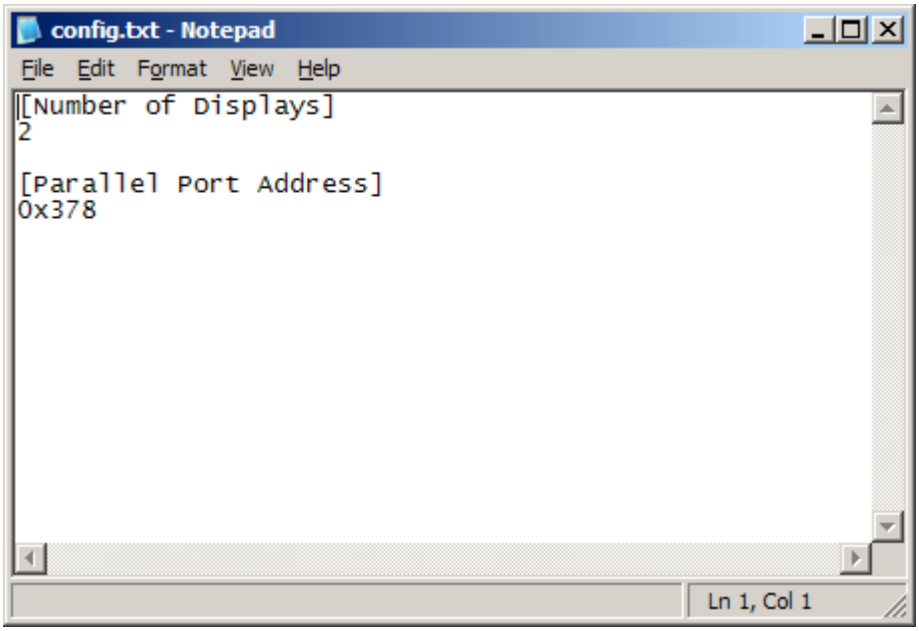
BASIC SETUP

As the first-time start the software, it is guided to setup basic configuration as well as reader and case information.

Open “Config.txt” and modify environment variables

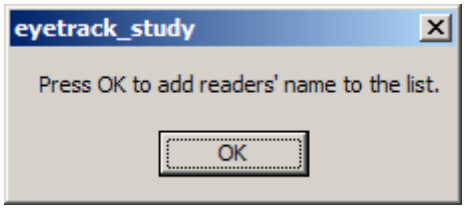


CONFIG.TXT will open on clicking the OK button.

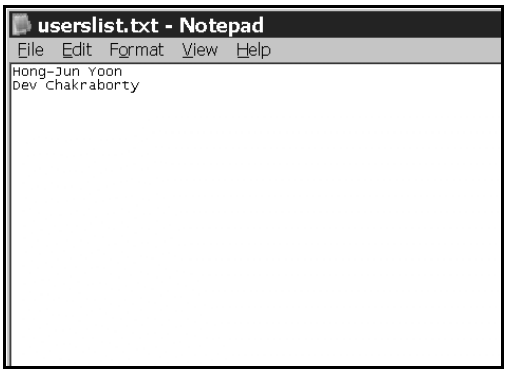


- [Number of Displays] – How many high resolution displays required for the study.
- [Parallel Port Address] – Physical address of the Parallel Port. Please refer to "**Setup Link between computer and ASL (XDAT)**" below.
- Save the file and close Notepad application. Go on to the next step.

Add names of readers



Press OK button to open empty "userslist.txt" file.

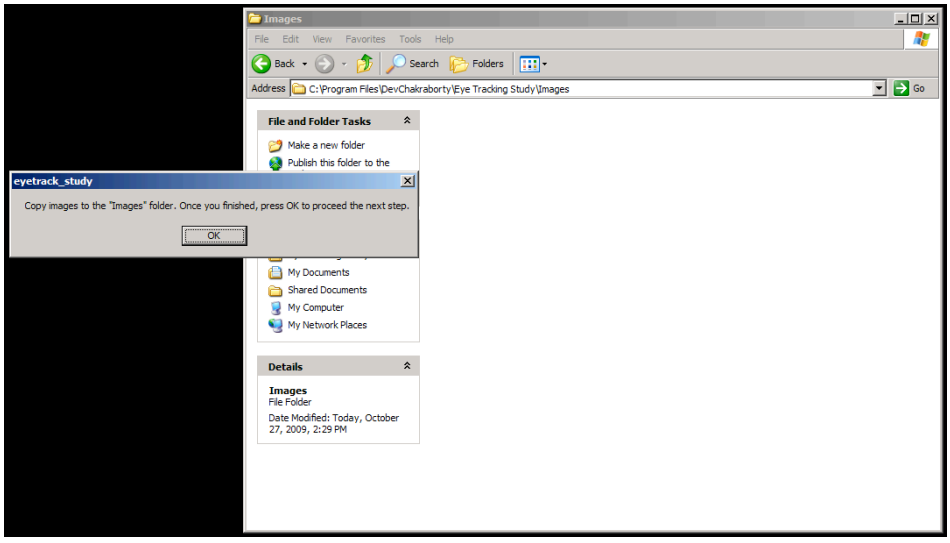


List names of the radiologists participating in the study in the file “userslist.txt”. **For confidentiality related reasons you must use a format like Radiologist_01, Radiologist_02, etc.** Keep the "key" for yourself.

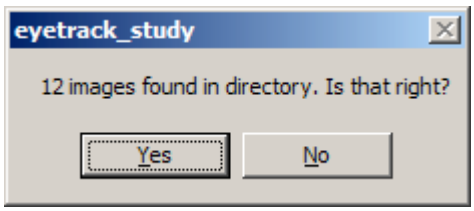
Save the file and close Notepad application once you finished, and go on to the next step.

[You may add or delete readers later by editing the list of readers in “userslist.txt”. It is located in “C:\Program Files\DevChakraborty\Eye Tracker Study” directory. Open the directory by selecting “Administrator ➔ Go to Software Directory” menu, edit the list file using Notepad, and restart the software.]

Copy case images to the “Images” directory.



Right after closing the “userslist.txt” on Notepad, the “Images” folder will be open automatically. Copy the images to the folder and press OK button. This software currently allows DICOM format (*.dcm, *.dicom) only. **Do not copy other files to the “Images” directory.**



You will be asked to verify how many images copied to “Images” directory. Press “Yes” if the number of images is right. Otherwise, press “No” and check the images in the “Images” directory.

Create reader-specific listing of cases to be read in the desired reading order

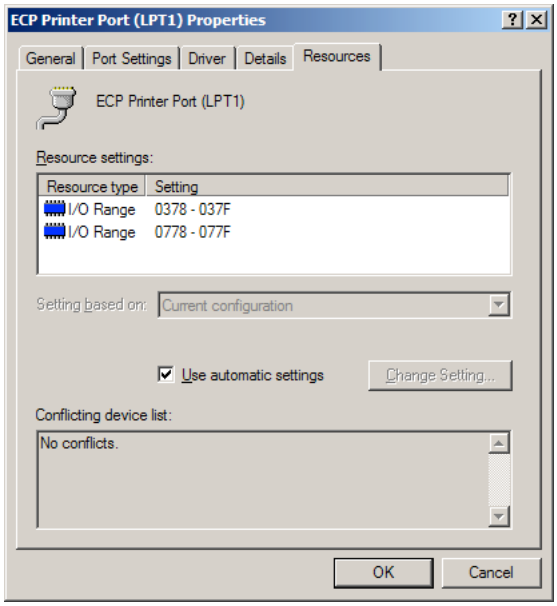
Copy "imagelist.txt"
Rename "copy of imagelist.txt" to "ReaderName_To_Do.txt"
Repeat for all readers
Should end up with as many "ReaderName_To_Do.txt" files as there are readers

SETUP LINK BETWEEN COMPUTER AND ASL (XDAT)

Display computer is connected to the ASL eye tracker controller unit via Parallel Port and XDAT port. (See XDAT section on the ASL manual)

Parallel Port

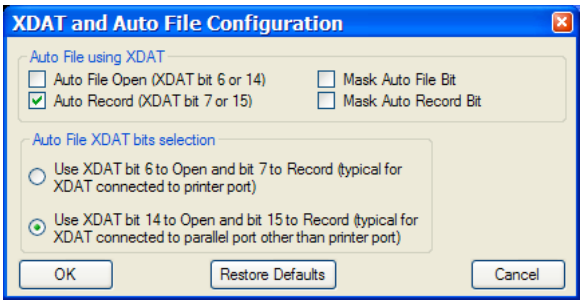
If parallel port is built-in, assign 0x378 to “[Parallel Port Address]” entry in “config.txt”. If in the rare event that the parallel port is on an add-on card, physical address is variable to the system. Obtain the physical address of the add-on card from the System menu on the Windows Control Panel. In Control Panel, double click System icon. Select the third tab “Hardware”, and press “Device Manager” button. Find “Ports (COM & LPT)” from the list, and double click “Printer Port”.



Select the tab “Resources”. I/O range indicates where the parallel port address is designated. The first entry (0x378) is the reference address.

XDAT Port

Start and stop recording of the eye tracker is controlled by the display computer via XDAT port on the ASL unit. Select "Configure -> External Data and Auto File Config" menu of the ASL eye tracker user interface software.

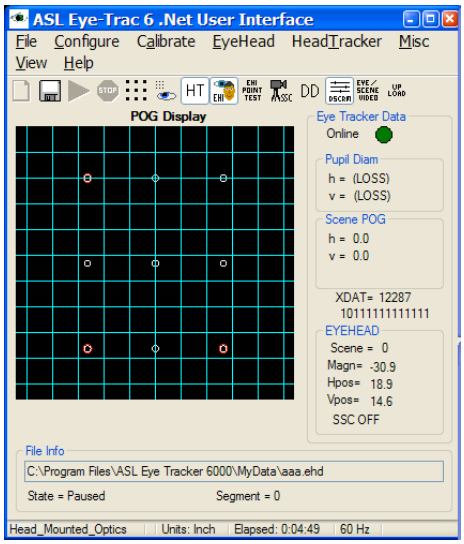


Check "Auto Record (XDAT bit 7 or 15)" to enable display computer control start/stop recording. Select "Use XDAT bit 14 to Open and bit 15 to Record". Try reading case and make sure the data record is performing properly. If it does not, try "Use XDAT bit 6 to Open and bit 7 to Record". It depends on the computer setup and parallel port cable configuration.

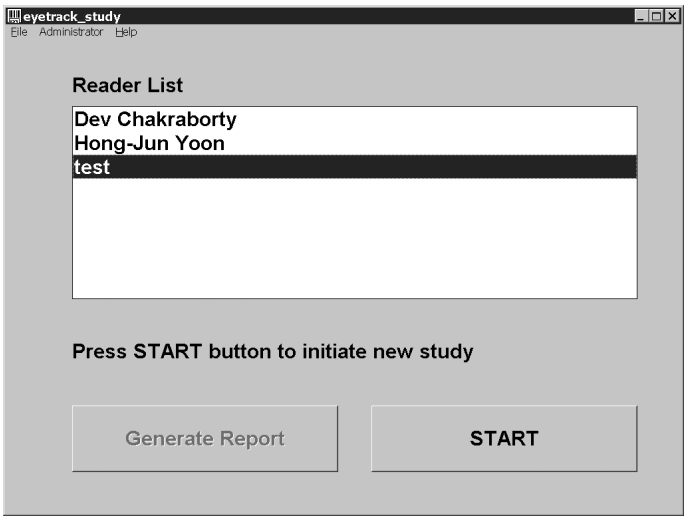
Check the XDAT Auto Record

Add a dummy reader "test" to the "userslist.txt" file. Duplicate "imagelist.txt" to "test_To_Do.txt". [Note: "imagelist.txt" is created once you start the software.] Both "userslist.txt" and "imagelist.txt" are located in "C:\Program Files\DevChakraborty\Eye Tracker Study" directory, which you can open directly by selecting "Administrator ➔ Go to Software Directory" menu.

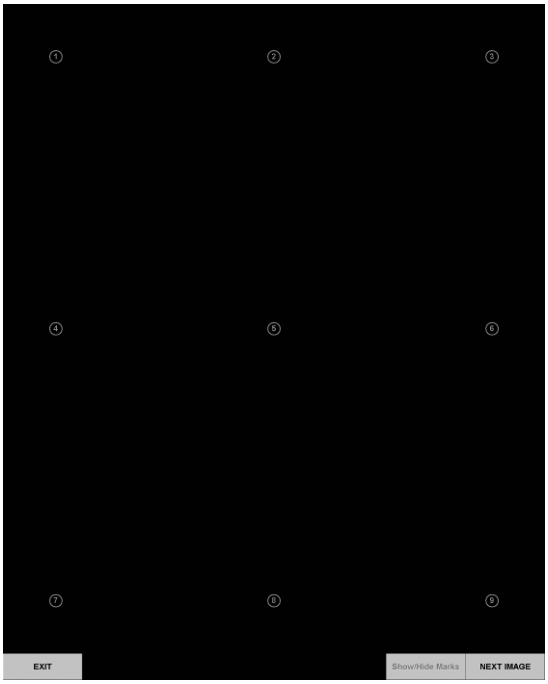
1. Connect Parallel Port and XDAT.
2. Start the Eye Tracker Study software.



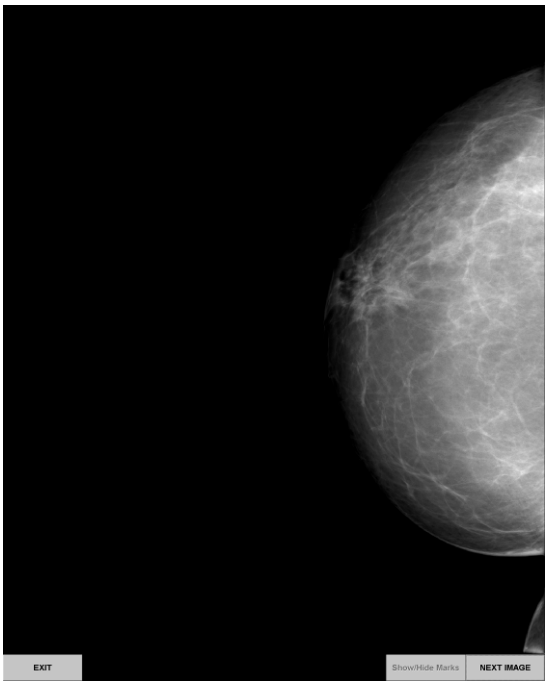
3. From ASL Eye Tracker software, select "File ➔ New Data File" to open a test eye-head integration recording file.



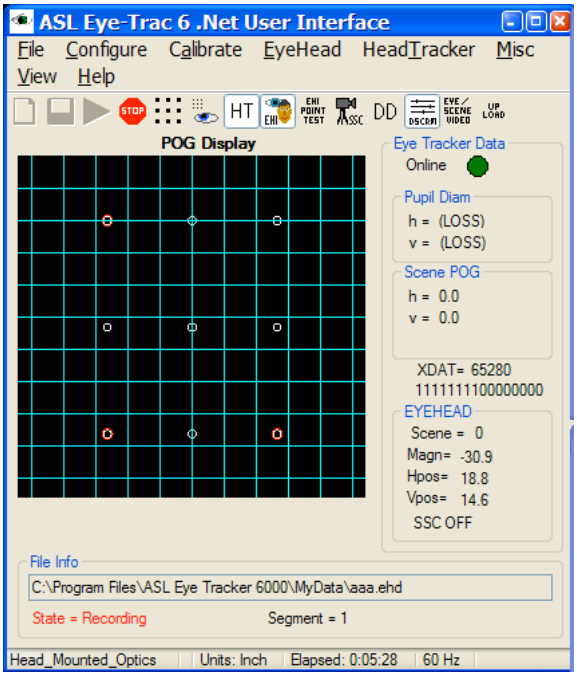
4. Select the dummy user "test" and press START button.



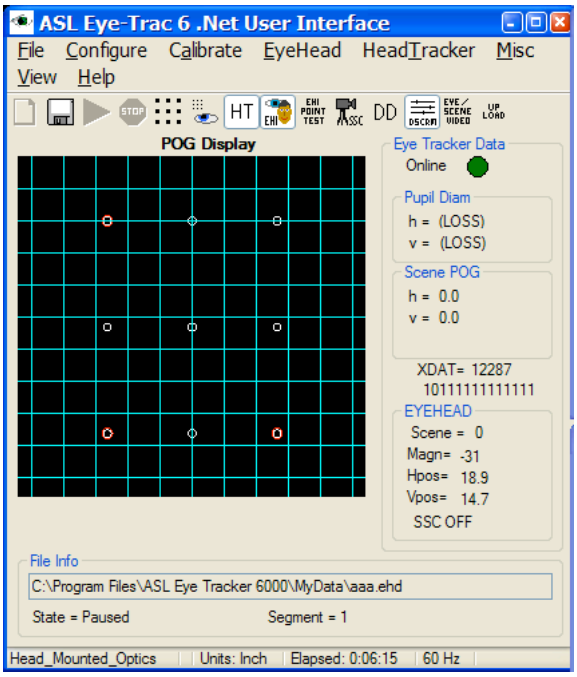
5. Skip the eye tracker calibration. Press NEXT IMAGE to proceed.



On the ASL computer screen you will see



6. While the image is on screen, the eye tracker is recording. On the ASL computer the **red** "stop sign" will come on and the display will show "**State = Recording**".

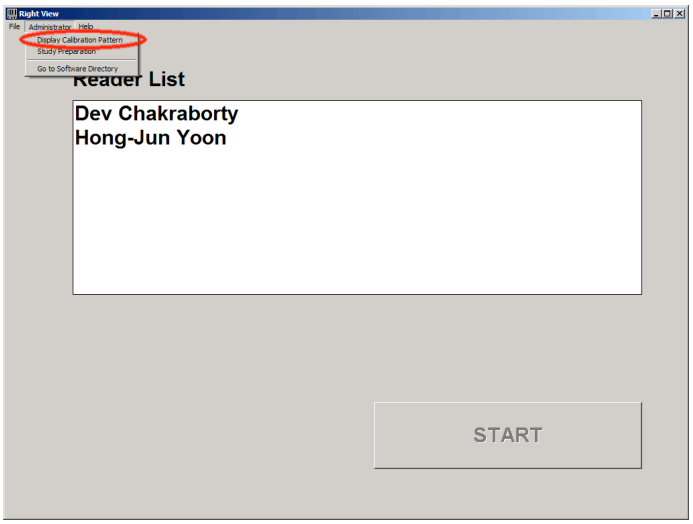


7. Stop the eye tracker recording after pressing the EXIT button.

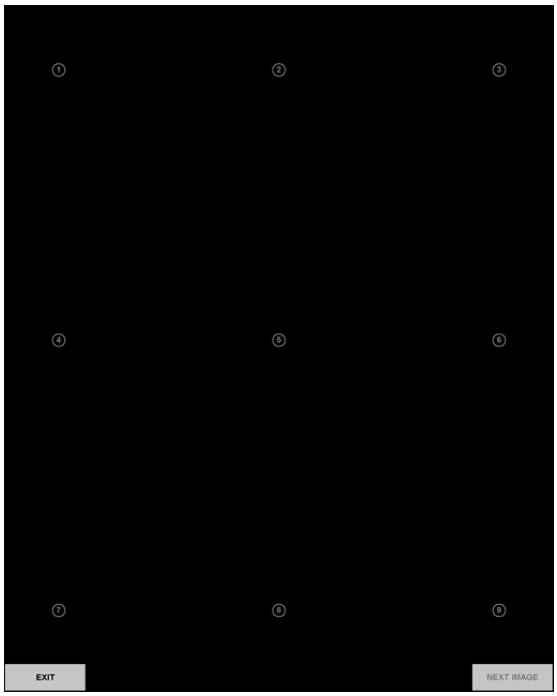
DISPLAY SETUP (APPLICABLE TO MULTIPLE MONITORS)

For multiple high resolution display setup, be sure to locate the first monitor on the left and the second one on the right. Assign the left monitor as the primary monitor by checking the box.

EYE HEAD INTEGRATION SETUP



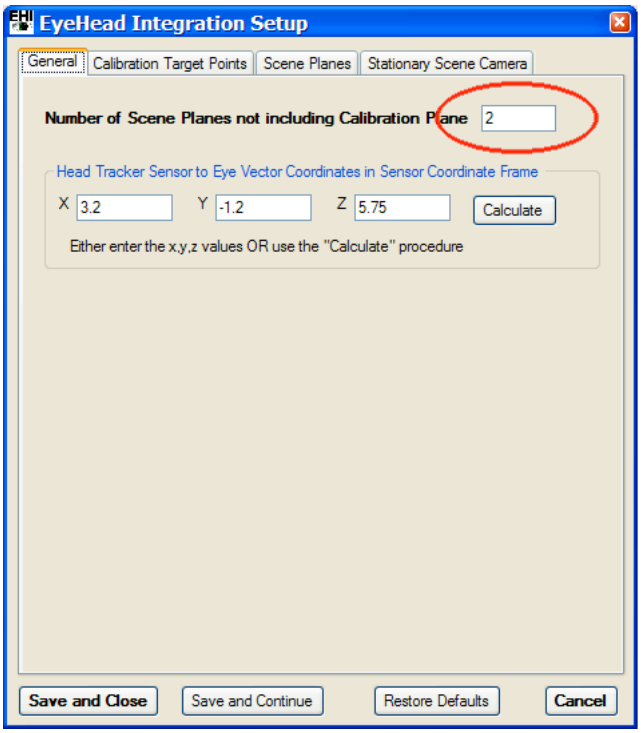
Select “Administrator ➔ Display Calibration Pattern” menu.



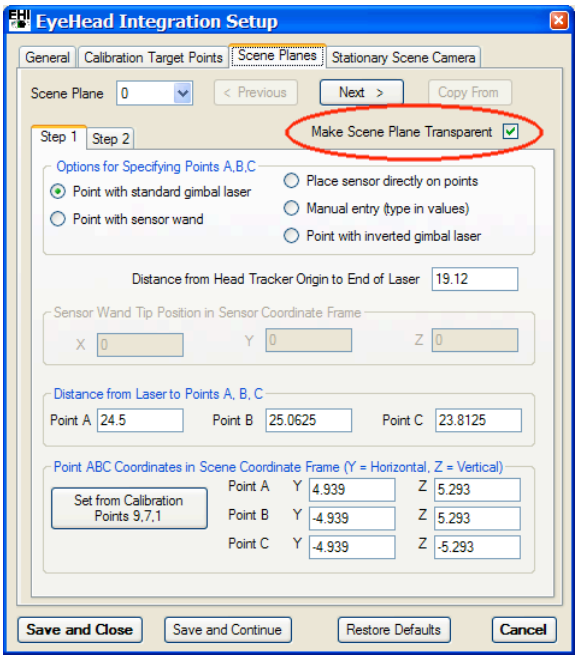
Eye tracker calibration pattern is shown. Use this pattern for the "Eye Head Integration" setup for ASL eye tracker using the ASL software.

EYE HEAD INTEGRATION SETUP FOR MULTIPLE MONITORS

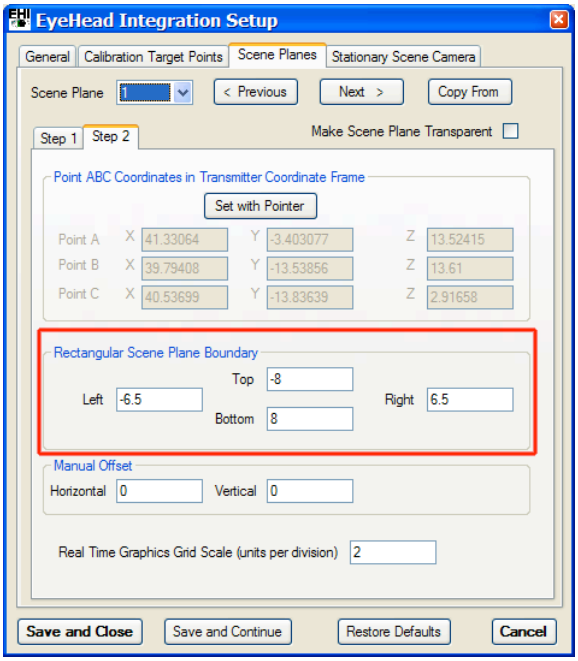
For multiple display configurations, define multiple scene planes using the ASL software, see example below.



Select “EyeHead -> Setup” menu of the ASL eye tracker user interface. From the first tab “General”, assign number of scene planes. For two display setup, the number of scene planes is 2.



Input the calibration target points on the second tab. On the third tab “Scene Planes” make the scene plane 0 transparent.



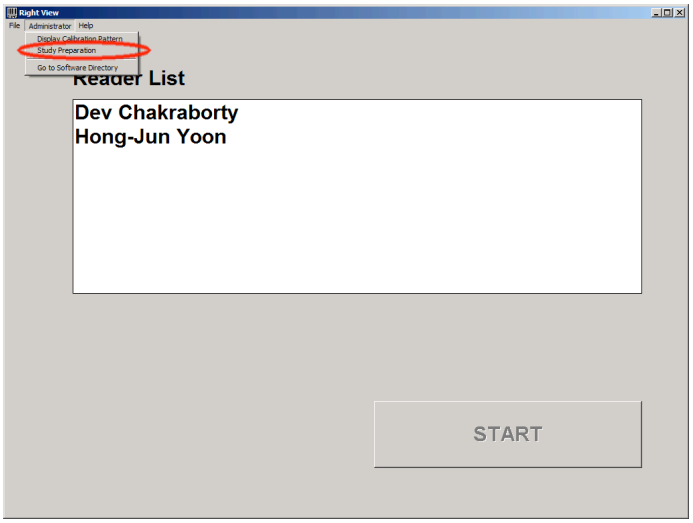
Press button “Copy From” to define the scene plane 1 and 2. Assign scene plane boundary on the “Step 2” tab.

INITIAL STUDY PREPARATION INSTRUCTIONS

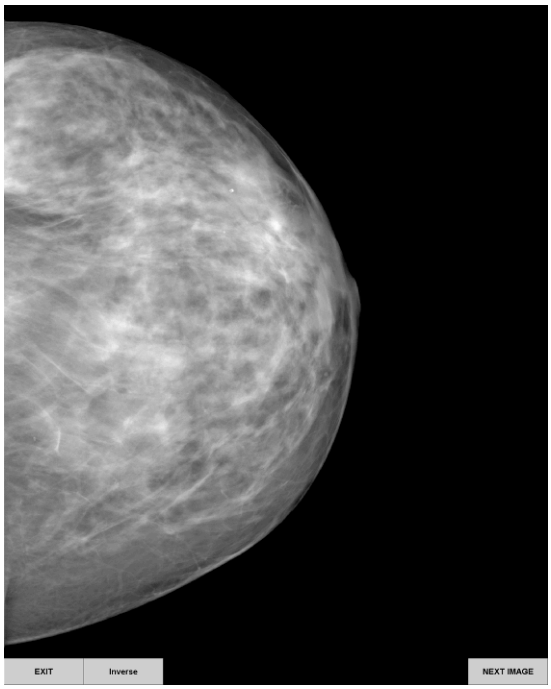
This procedure is performed **ONCE** for the study.

TRUTH INFORMATION

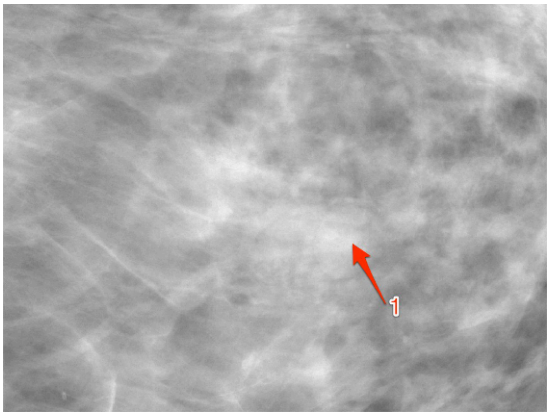
Select "Administrator ➔ Study Preparation" menu.

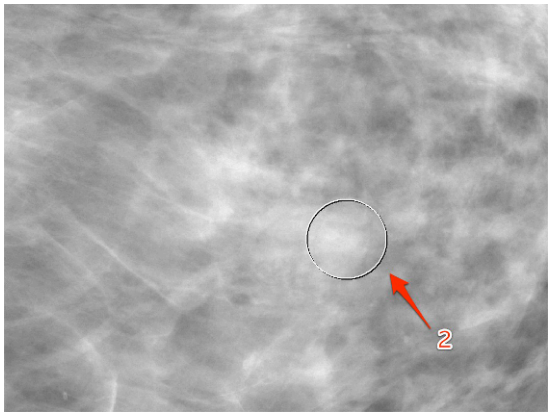


An image from the "Images" directory will be shown.



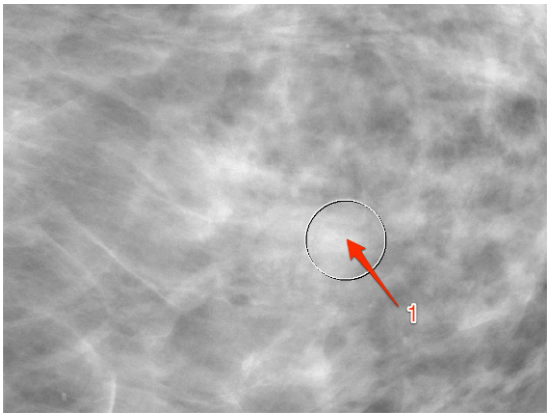
Add Truth

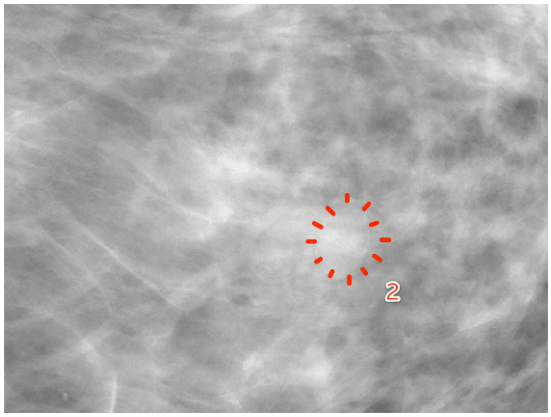




Locate mouse cursor to CENTER of the True Lesion (1).
Press [LEFT] mouse button and drag until the circle occupies the lesion boundary (2).
Release [LEFT] mouse button.

Remove Truth





The Truth is not correctly assigned. Locate mouse cursor to inside of the circle (1).
Click [LEFT] mouse button (2). The falsely assigned Truth is removed.

Press NEXT IMAGE button to save the Truth data and go on to the next image.

Adjust Default W/L Settings

- Press and hold **RIGHT** mouse button, and drag to adjust brightness and contrast for optimal visualization:
- DRAG UP: Brighter
- DRAG DOWN: Darker
- DRAG LEFT: More Contrast
- DRAG RIGHT: Less Contrast
- Press INVERSE button to invert / revert the image intensity.

STARTING A DATA ACQUISITION SESSION

The data file for storing the eye-tracker data must be manually opened by you before beginning each session. Follow these steps before starting each session.

The following steps are **critical** to ensure proper data collection.

- Display computer and ASL controller are connected. (Parallel Port ←→ XDAT Port)
- ASL Auto Record is ON. ("Configure ➔ External Data and Auto File Config" menu), as per section on XDAT PORT
- Open a new file for the streaming ASL data. Use the following file name convention: [Reader name]_[session number].ehd
- ex) Radiologist1_01.ehd, Radiologist1_02.ehd,…

At the end of each session, the eye tracker recording file must be manually closed by you. Otherwise, eye tracking data for that session will be lost.

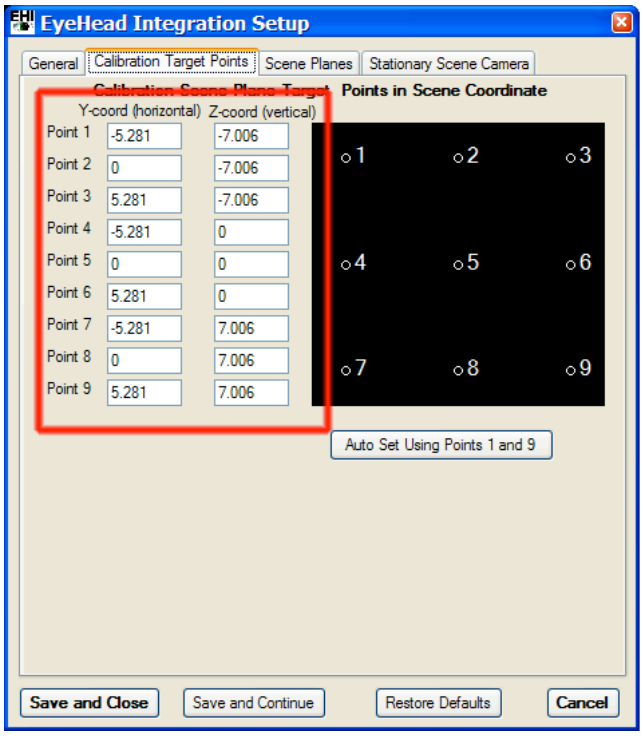
If these steps are not followed data will be invalid.

AFTER FINISHING THE READER STUDY

Please send

(1) All text files in the "Eye Tracking Study" directory
(2) All text files in "Eye Tracking Study\Logs" directory
(3) All (*.ehd) files

On ASL computer navigate using EyeHead ➔ Setup ➔ EyeHead Integration Setup to the following screen.
Copy this screen to a word file [simultaneously click ALT PRINT SCREEN, open a WORD document and past this image into the document].
Send this document.


EyeHead Integration Setup
General
Calibration Target Points
Scene Planes
Stationary Scene Camera
Calibration Scene Plane Target
Points in Scene Coordinate
Y-coord (horizontal)
Z-coord (vertical)
Point 1 -5.281 -7.006
Point 2 0 -7.006
Point 3 5.281 -7.006
Point 4 -5.281 0
Point 5 0 0
Point 6 5.281 0
Point 7 -5.281 7.006
Point 8 0 7.006
Point 9 5.281 7.006
1
2
3
4
5
6
7
8
9
Auto Set Using Points 1 and 9
Save and Close
Save and Continue
Restore Defaults
Cancel

STUDY PARTICIPANT INSTRUCTIONS

OVERVIEW

The aim of this study ("New Methods for Analysis of Eye-tracking Data for Medical Image Perception Research") is to determine whether simultaneously conducted eye-tracking and free-response studies can lead to better understanding of the diagnostic process, which may result in methods for improving diagnostic performance. The study will be conducted at two institutions.

The University of Arizona study will be conducted by Dr. Krupinski and your (i.e., the chest radiologists) task will be to find nodules on a series of chest images. Each case may contain no nodules, or it may contain one or more malignant nodules.

The University of Pittsburgh study will be conducted by Dr. Mello-Thoms and your (i.e., the mammographers) task will be to find malignant masses on a series of two-view (CC and MLO) digital mammograms of a single breast. Each case may contain no masses, or it may contain one or more malignant masses. Please do not report any other type of finding, such as micro-calcification clusters, cysts, etc. Henceforth the generic term "lesion" will be used to denote a malignant nodule or a mass, as appropriate.

STUDY INSTRUCTIONS

Interpret the image as you normally do in the clinic, with the obvious exception that this is a laboratory study with no clinical consequences, and we are asking you to stretch the reporting range on the liberal side to get you to generate false positives as otherwise we cannot analyze your data. During the interpretation a head mounted camera will be used to record your eye position. If you decide that there are no lesions to report then click the “NEXT IMAGE” button. If you have detected one or more lesion candidates, use the mouse to position the cursor on their centers and click the mouse button (try to be reasonably accurate) upon which a pop-up menu will appear that will ask you to select a confidence rating. You may mark more than one lesion candidate per image. Click the “NEXT IMAGE” button when there are no more lesion candidates to report.

CONFIDENCE RATING SCALE

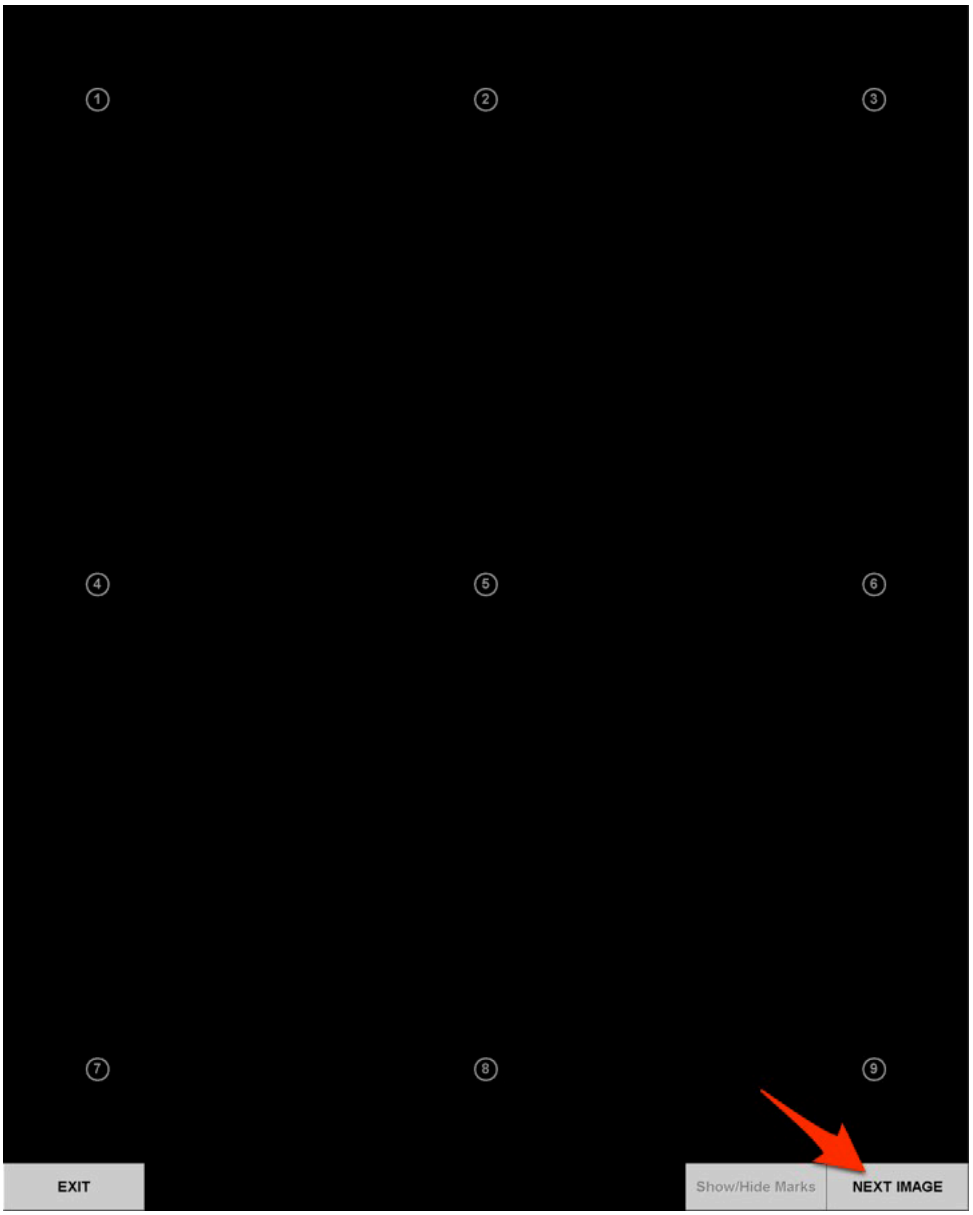
The confidence rating is on a 5-point scale:

- 1 ≡ Very low confidence lesion; e.g., less than 5% chance
- 2 ≡ Low confidence lesion; e.g., more than 6% but less than 30% chance
- 3 ≡ Moderate confidence lesion; e.g., more than 30% but less than 80% chance
- 4 ≡ High confidence lesion; e.g., more than 80% but less than 95% chance
- 5 ≡ Very high confidence lesion; e.g., more than 95% chance

The percentages are for illustration only; it is only important that a "5" be more confident than a "4", a "4" be more confident than a "3", etc. It is very important that you use the scale as best you can ("spread your ratings"). The liberal ("1"s and "2"s) false positives you generate will not depress your performance level as they will be compensated by lesions that would otherwise not be detected. Information linking you to your performance will not be shared with anyone outside the key-investigator at your institution.

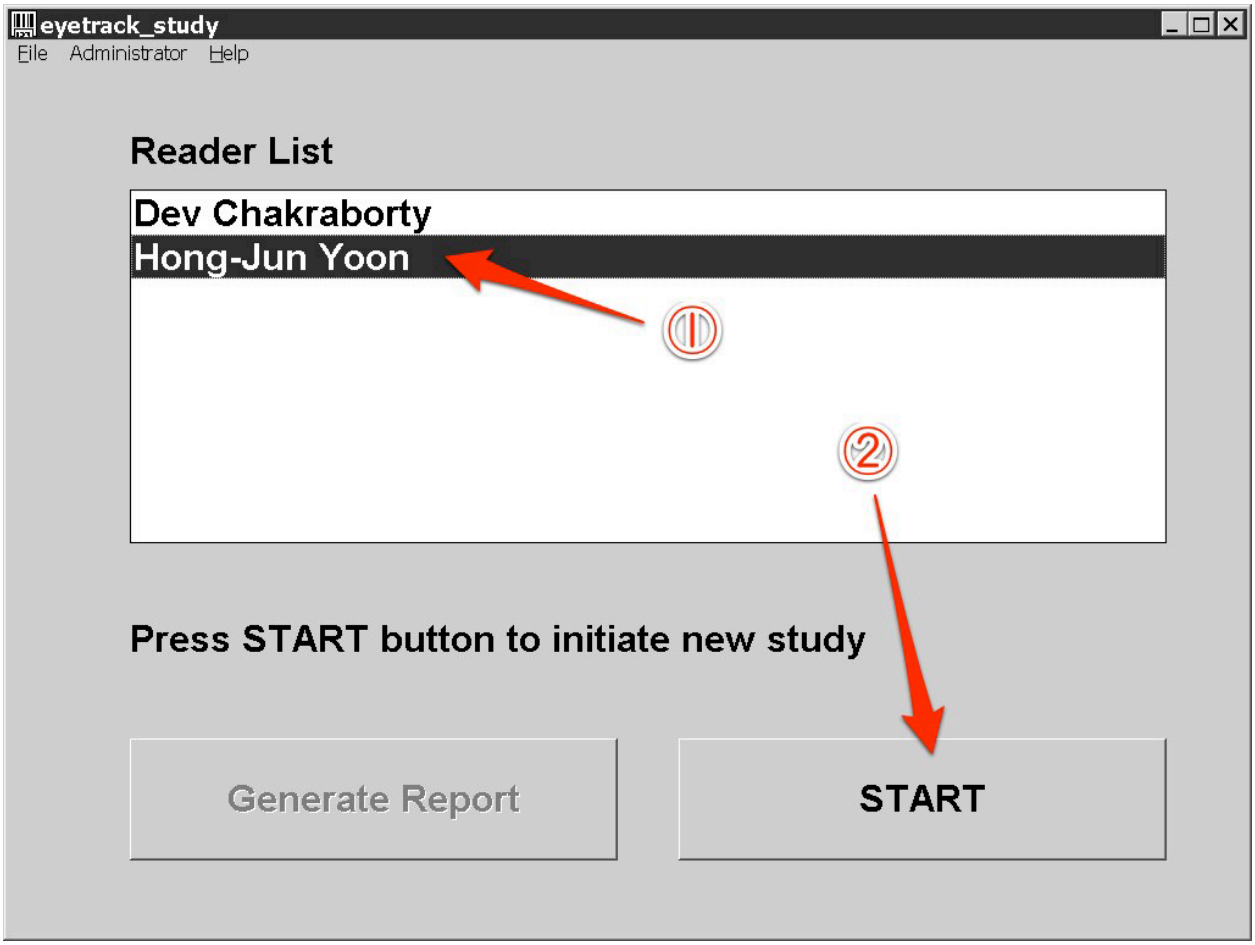
EYE TRACKER CALIBRATION

The following eye tracker calibration pattern will at the beginning of each session and every five cases thereafter. Please follow the investigators directions. Then click on "NEXT IMAGE".

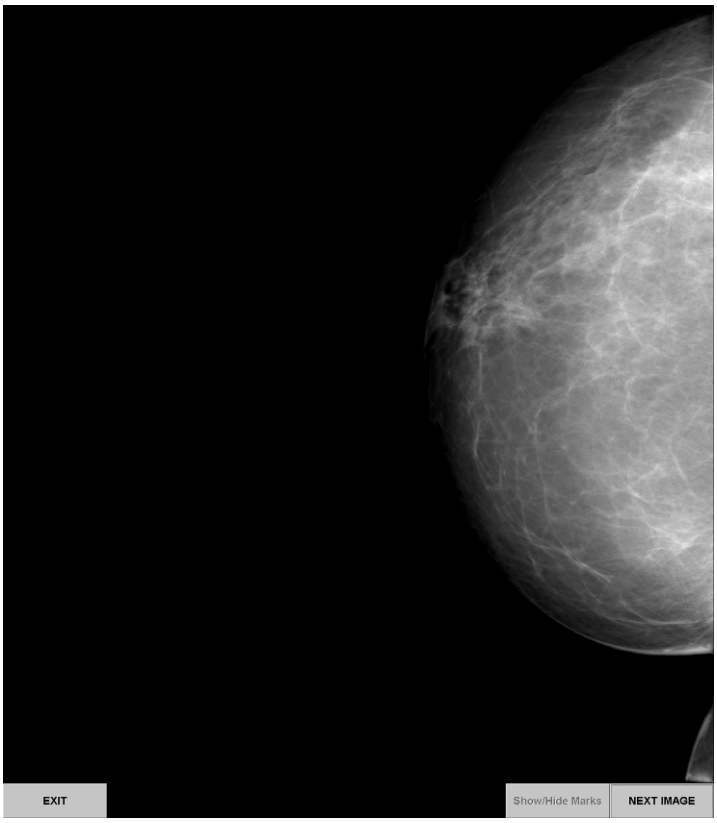


DETAILS OF THE STUDY (YOU WILL BE HELPED BY THE PI)

Starting or resuming the study

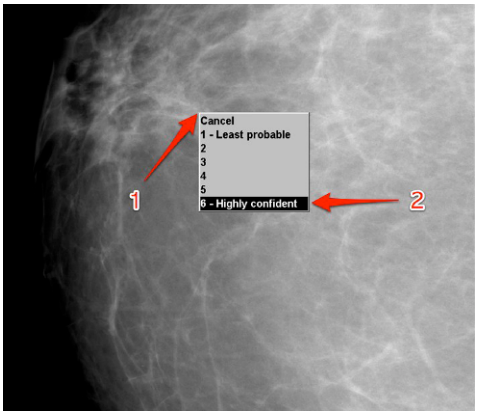


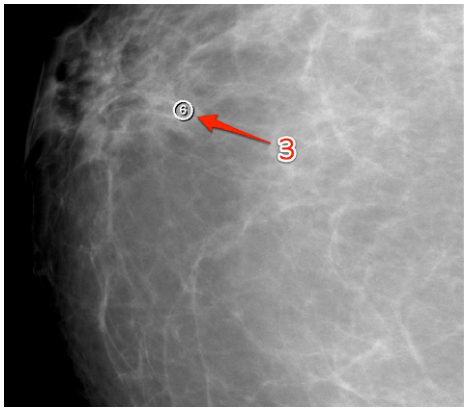
Select your name from the list of readers. Click the "START" button to begin the study, whereupon an image will appear.



If you find no suspicious region, even at the "1" level, click on the "NEXT IMAGE" button. You may click on "EXIT" in case you have to leave due to an emergency; the study will resume from the point at which you left.

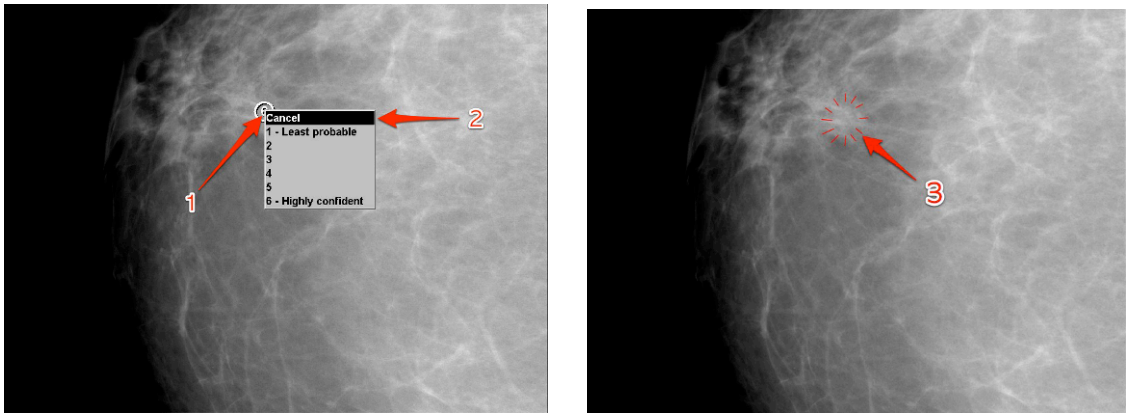
Adding a new mark and selecting a rating





If suspicious lesion found, click left mouse button on the lesion. Pop-up window with ratings is shown adjacent to the mouse cursor. Select appropriate rating based on your confidence level. You may cancel the current marking by selecting “Cancel”. A circled mark along with the numerical value of rating is overlaid on the mark. Click "Show/Hide marks" button to toggle on/off the overlaid information.

Editing a rating or deleting a mark



Click left mouse button on the circled mark. Pop-up window with ratings is shown adjacent to the mouse cursor; select new rating. If you want to cancel the mark, select “Cancel”. Revised circled mark along with the rating is overlaid. If “Cancel” is selected, the mark is removed from the data record and the display. Click "NEXT IMAGE" button to proceed to the next image, or click the "EXIT" button to stop the study and come back later to resume.

Finishing the study

This message will appear once you finished reading all cases.