Last Update: February 29, 2008

Introduction

Welcome to the Temporal Bone Dissection Simulator manual (2008 Version). The following information will provide you with the requisite information to successfully use the simulator. This updated version is being deployed in a multi-institutional study to determine its efficacy for further use in the resident curriculum.

The aim of this project is to provide a robust desktop simulation environment that emulates the temporal bone dissection lab and allows you to learn both surgical technique and regional anatomy within the context of the surgical approach. Please keep in mind that although this release is Version 1.0, you may encounter some limited function and possible bugs. Please take the time to let us know if you discover any (see Bug Reports).

The simulator comprises two basic modes: the ***surgical mode*** and the ***intelligent tutor***. The ***surgical mode*** interactively emulates dissection/drilling techniques used to identify and expose the requisite structures. It allows you to position your specimen, select various tools, and drill away bone to identify and expose structures in the same way you would in the dissection lab.

The ***intelligent tutor*** takes you out of the surgical mode and allows you to seek information regarding the structures you will need to know. In general, it allows you to

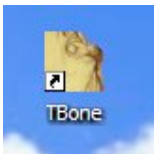
interact with the virtual specimen in new ways, to aid spatial thinking, and facilitate your conception of the regional anatomy.

Getting Started

NOTE: *This information is relevant to the appropriate individual helping set up the computing system for the study. Others who are simply participating may bo to Starting Up below. You MUST obtain a haptic (force feedback) device and load the proper libraries.* Information regarding equipment can be found on the web at:
http://www.osc.edu/research/Biomed/vtbone/hardware/index.htm

Complete information concerning software installation can be found at:
http://www.osc.edu/research/Biomed/vtbone/software/index.htm

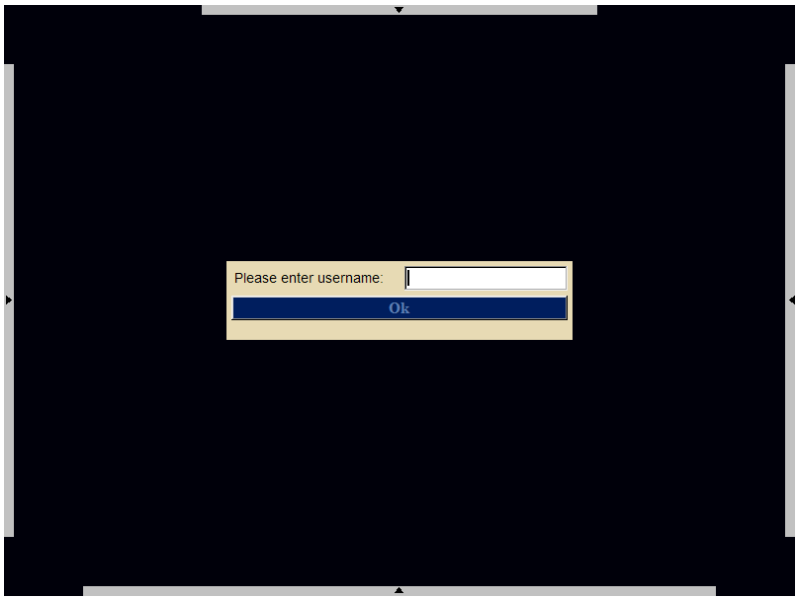
Starting Up Once you have successfully set up the hardware and installed the software, you are ready to begin.

To start the program, simply double click on the **TBone** icon on the desktop. 

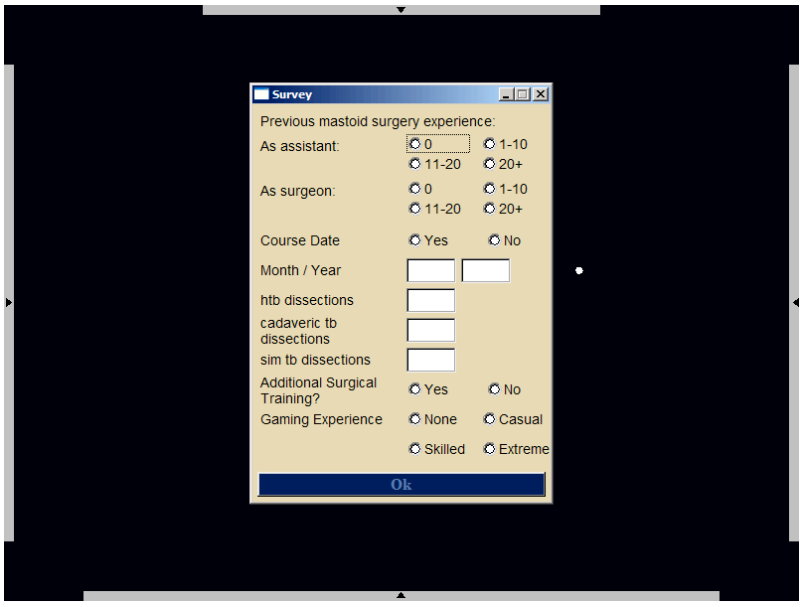
An introductory welcome will be loaded. This step is important to ensure that you have the right version running.

NOTE: In this version, ***the mouse has been completely replaced with the haptic device***. All interactions including menu selections will involve the haptic device. The program will automatically place the mouse pointer in the simulation window and the mouse will not be freed until you exit the simulation.

After the welcome, the startup menu will appear; it looks like the following:



You will need to enter the coded username provided by your local Principle Investigator (PI) who is conducting the trial at your institution. After you enter an approved username, the following menu will appear:



Upon successful completion of the various fields, click **OK** to exit.

NOTE: You will need to enter this information **ONLY** upon your *initial* entry. Subsequent entries will allow you to proceed by simply entering your username and selecting **OK**.

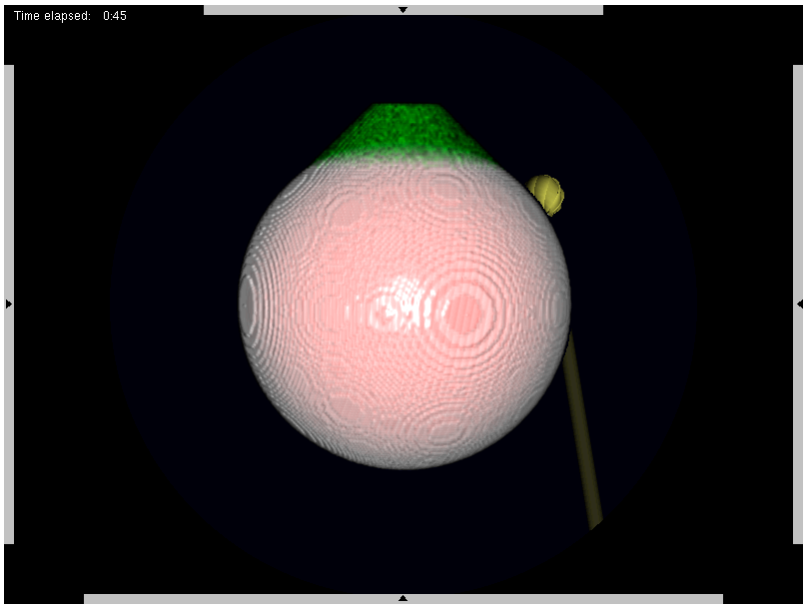
NOTE: If you are participating in the study, you will be required to do the following steps:
Objective Test (15 minutes max)
PreTest (30 minutes max)
Practice (Unlimited) (Only those in Group B will be able to access the Practice Session)
PostTest1 (30 minutes max)
PostTest2 (30 minutes max)

The Step you are in can be found in the upper right corner of the screen.

Objective Test: Upon your ***first*** time, you will be required to take an objective test that emulates the basic task of removing material. This is required ***only*** upon your first login.

The task involves using the drill to remove as much or all of the green material from the white sphere without penetrating deep enough to expose the underlying red surface. The time allotted for this test is 15 minutes. The elapsed time to complete the task will be recorded to file. Please see the following brief movie:

http://www.osc.edu/research/Biomed/vtbone/software/videos/ObjectiveTest.wmv



If you feel you have completed the test to the best of your ability prior to the 15 minutes, you can exit by moving the cursor to the right (see Exit below). At the end of 15 minutes, the program will automatically be terminated. If you wish at that time, you can restart the program to practice. During subsequent entries, you will not be required to complete the survey or the objective test. To activate subsequent menus, simply move the cursor/haptic device to any of the sides of the frame (see image below).

PreTest – After successfully completing the objective test, when you re-enter the program you will be required to take the PreTest. You will be assigned a bone (virtual specimen) and will have 30 minutes to perform a complete mastoidectomy and facial recess approach. The program will automatically terminate at 30 minutes. Note: the intelligent tutor portion of the system is **NOT** made available during the PretTest.

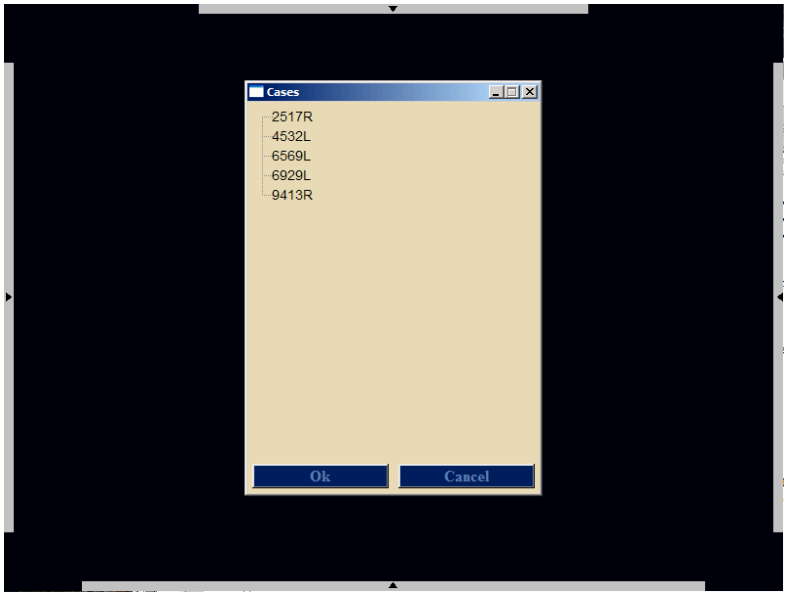
Practice - Upon entering the program a third time, those in Group B can select a bone to practice upon. There will be 8 bones provided, with a randomized selection of right and left bones. You will have unlimited time to practice, and can even save a session if you need to leave (see below). During your practice session, the intelligent tutor portion of the system will be available for your use.

PostTest 1 &2 – You will be required to perform two PostTest's as well. Each will be limited to 30 minutes, and then the session will be automatically terminated. As in the PreTest, a bone specimen will be provided for you. Note: the intelligent tutor portion of the system is **NOT** made available during the PostTests.

Cases

By moving the device to the ***top*** of the frame, you will expose the **Cases** menu:

By clicking on the **Cases** menu, you will be provided a list of data sets/specimens for loading into the system. Currently, these data sets/specimens include both right and left specimens. You will be randomly assigned bones, so you may have more right than left, or vice-versa. You can practice on these bones as long and extensively as you like.

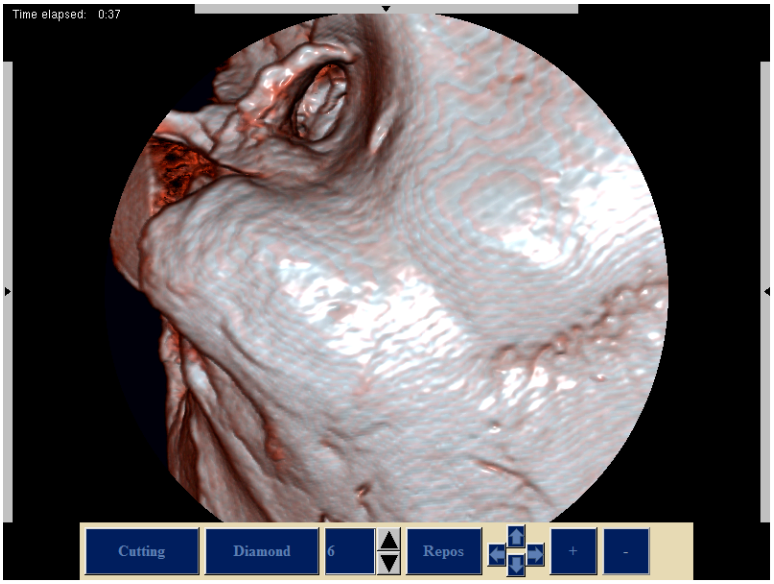


Please see the following brief movie:
http://www.osc.edu/research/Biomed/vtbone/software/videos/LoadingOrienting.wmv

NOTE: The white button allows you to interactively reorient the data at any time. See below.

Tools/Scope Functions
Moving the haptic device to the bottom of the frame will reveal the tools/scope functions menu:

http://www.osc.edu/research/Biomed/vtbone/software/videos/ToolSelection.wmv



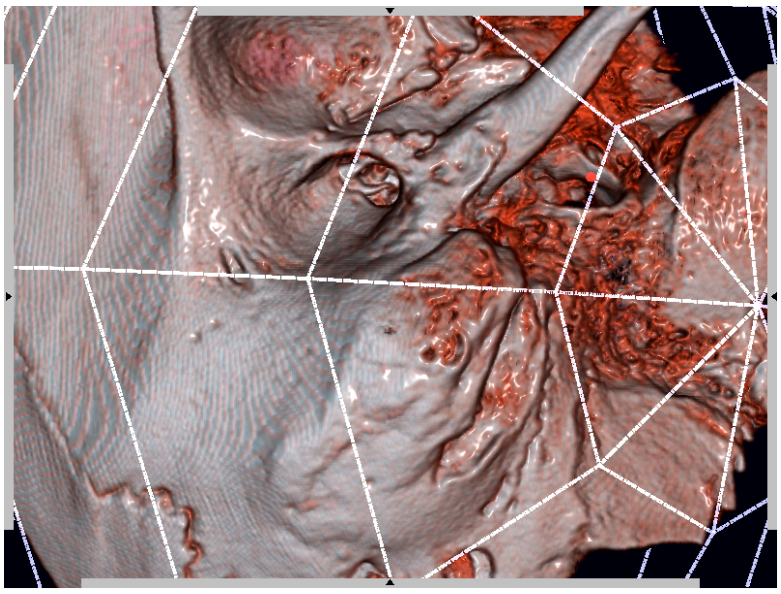
Tools

Selecting a tool places you in the surgical mode. The left side of the ***bottom*** menu includes selections for either a Cutting (tungsten carbide) or Diamond tip burr. By selecting the up or down arrows, you can increase or decrease the size of the tip by 1mm. The menu will display the size of the tool.

Reposition

NOTE: *This interaction allows you to reorient the specimen in the surgical mode. You can accelerate this action by using the white button at* ***any*** *time in the simulation.* The first image below demonstrates the location of the blue and white buttons on the haptic device. The second image shows a rendered icon that will appear when you are re-orienting the specimen. When you release the button, it will disappear.

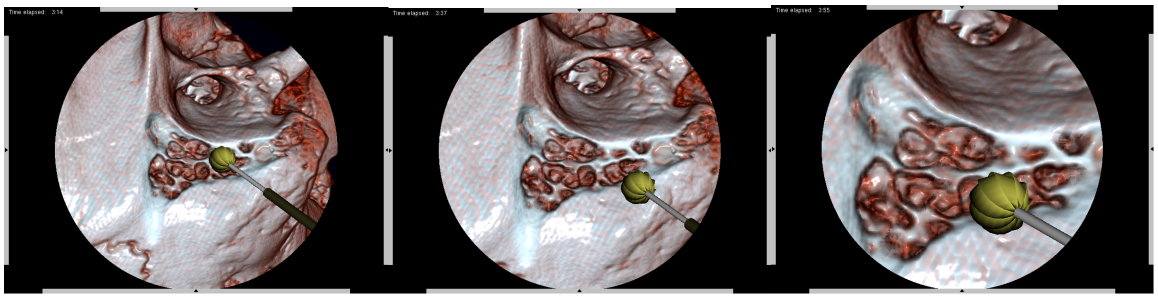
See:
http://www.osc.edu/research/Biomed/vtbone/software/videos/RepositionPanZoom.wmv



Scope Functions

Pan/Zoom functions are located on the right side of the **bottom** menu.
To ***pan*** the scope, click on the various arrows.

To ***zoom* in**, click on +, to ***zoom* out**, click on the -. Again, the system will automatically switch the view of the data once you zoom in/out an appropriate amount. The images below show the scene after a zoom selection:



NOTE: *When you are in surgical mode the scene will change to a round mask to depict the view from the microscope. This mask will be removed when you try to reposition your orientation to the specimen (by clicking the white button), or when you enter the tutor mode.*

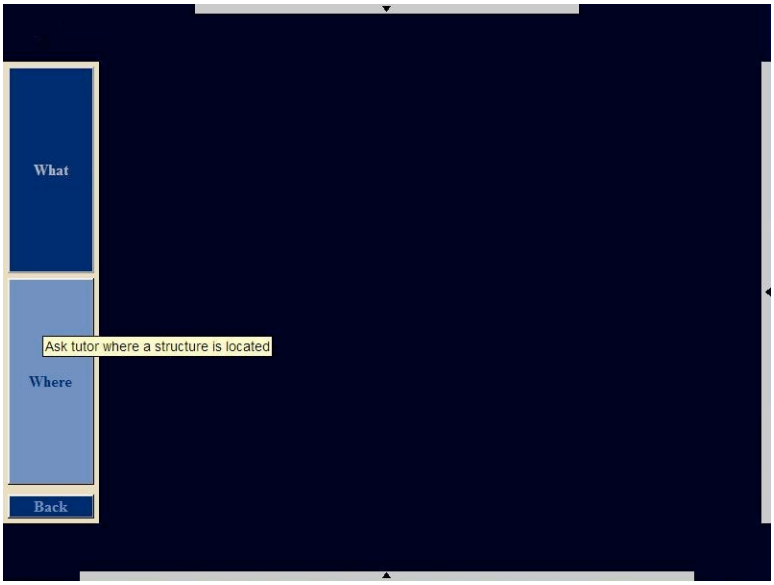
If you select **Repos**, it will return to a full view. When you have released the blue or white button on the haptic device, it will return to the surgical mode.
NOTE: *The **Time elapsed:** will be displayed **ONLY** in the surgical (drill/zoom) mode.*

Intelligent Tutor

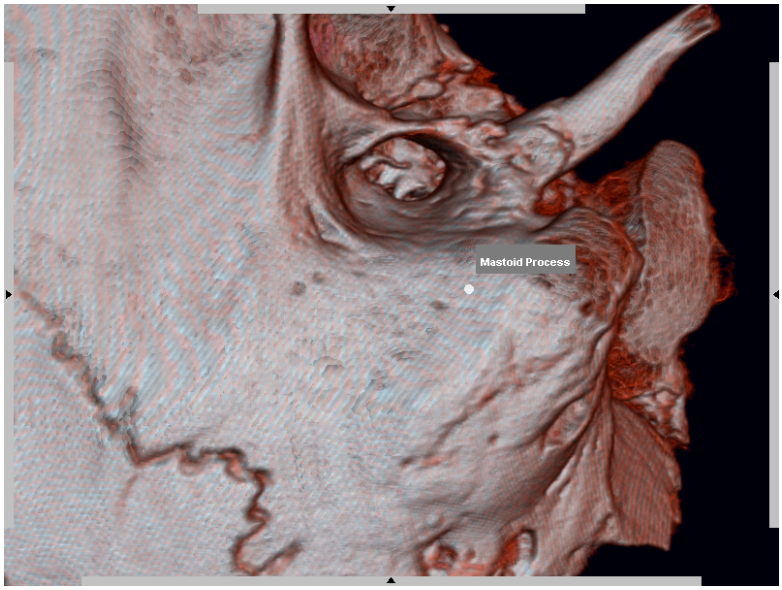
NOTE: *You cannot drill away bone in the intelligent tutor.* However, there are methods to visualize structures more rapidly and clearly, and to expose imbedded structures (see below).

Moving the device to the left frame will reveal the following menu:

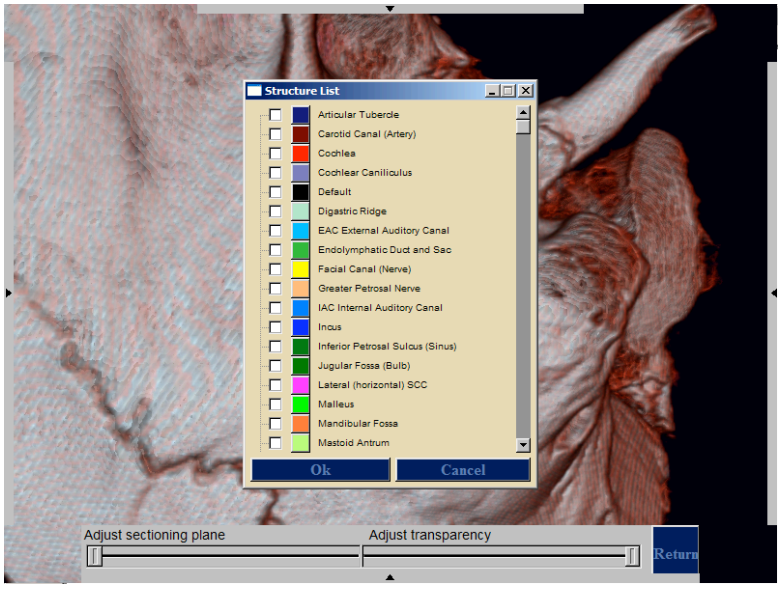
Identify: Select this button to enter the identification section of the ***tutor***. A second level will appear:



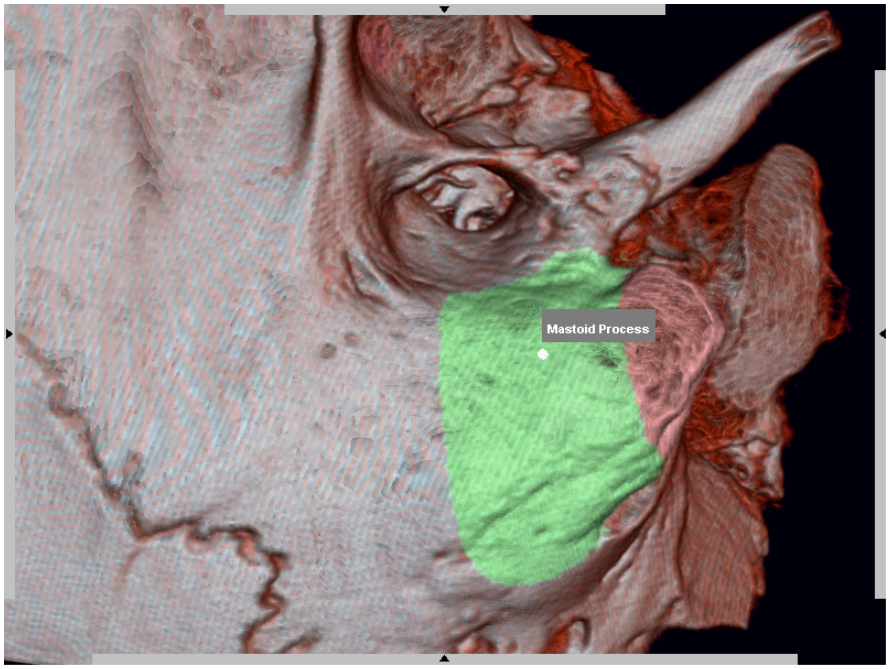
The "**What"** button allows you to move the 3D cursor over the representation of the bone. If a structure has been identified, by clicking the blue button a tool tip will pop up identifying the structure (See below). This utility provides an easy way to quiz yourself. If you need, use the sectioning tool or the transparency tool to identify deep structures that have not been exposed (see below).



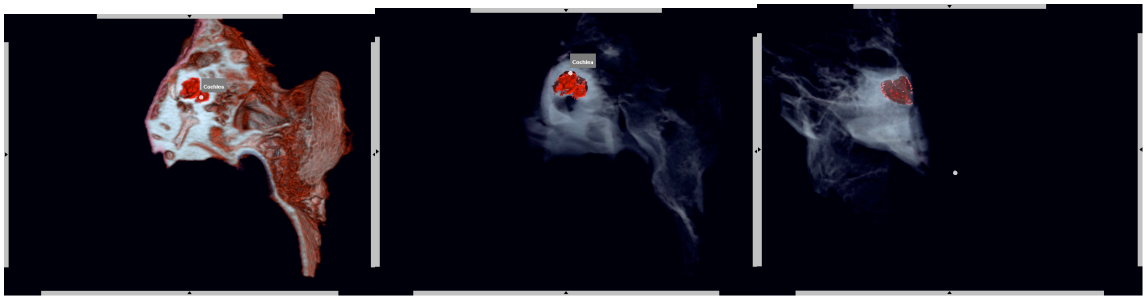
Clicking the "**Where"** button will bring up the following menu that provides a structure list:



Click on the white box to select (check) any structure(s) you would like to see identified on the specimen that is loaded. In this example below, the cochlea, mastoid, and mastoid tip are selected. Also note that the tool tip is activated and will pop up ONLY over the structures you have requested to be shown. **NOTE:** The structures will be tinted the color of the color box. In the example below, the cochlea has not been exposed, and subsequently is not readily visible.



Us the appropriate toolbar to interactively change the sectioning (clipping) plane or the transparency (opacity) of the data set. **NOTE:** *The transparency of the selected structure(s) will* ***not*** *be affected. The images below demonstrates the use of the sectioning (left) and transparency tools (right) to visualize the cochlea (red).*



You may return to the structure list simply by moving to the left frame and going back through the menu. **NOTE:** *In addition, in the tutor mode, the haptic tool is automatically bound to allow for interactive reorientation*. Again, ***There is no drilling in the tutor mode.***

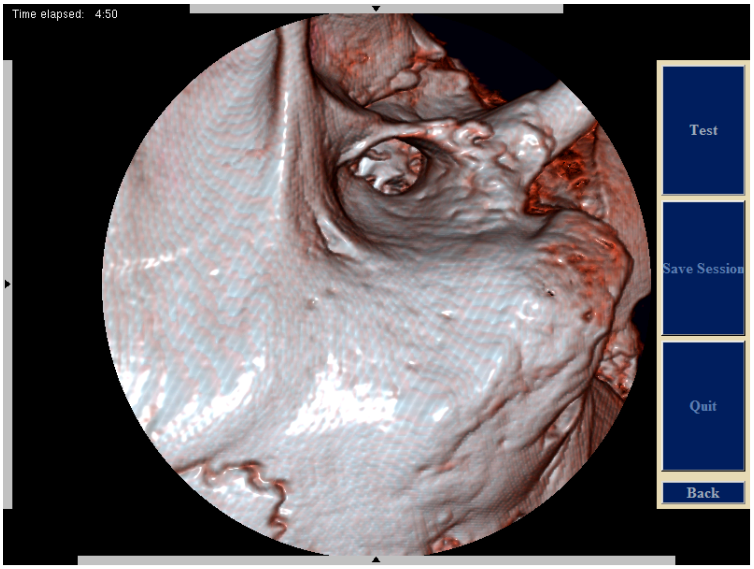
See:
http://www.osc.edu/research/Biomed/vtbone/software/videos/IdentifyWhere.wmv

Expert Demo: **NOTE:** *This function is not implemented at this time.* Selecting this button will provide a list of recorded sessions performed by expert surgeons.

Back:
Select **Back** to return to the previous level.

Test/Save Session/Quit

Move the device to the right frame and you will reveal the following menu:



Test

Select **Test** to determine if you wish to be tested. **NOTE:** This option will only be available on or after the data provided to you by your PI.

Save Session

During practice (only), you may save your session to revisit at a more convenient time. To do so, simply click on the Save Session. When you re-enter the program, the case list will identify a "saved session" in parentheses with the specified bone. After selecting a bone with a saved session, you will be asked to load the saved session or to start fresh. Please note if a bone is selected with a saved session, the session will be removed unless another session is saved.

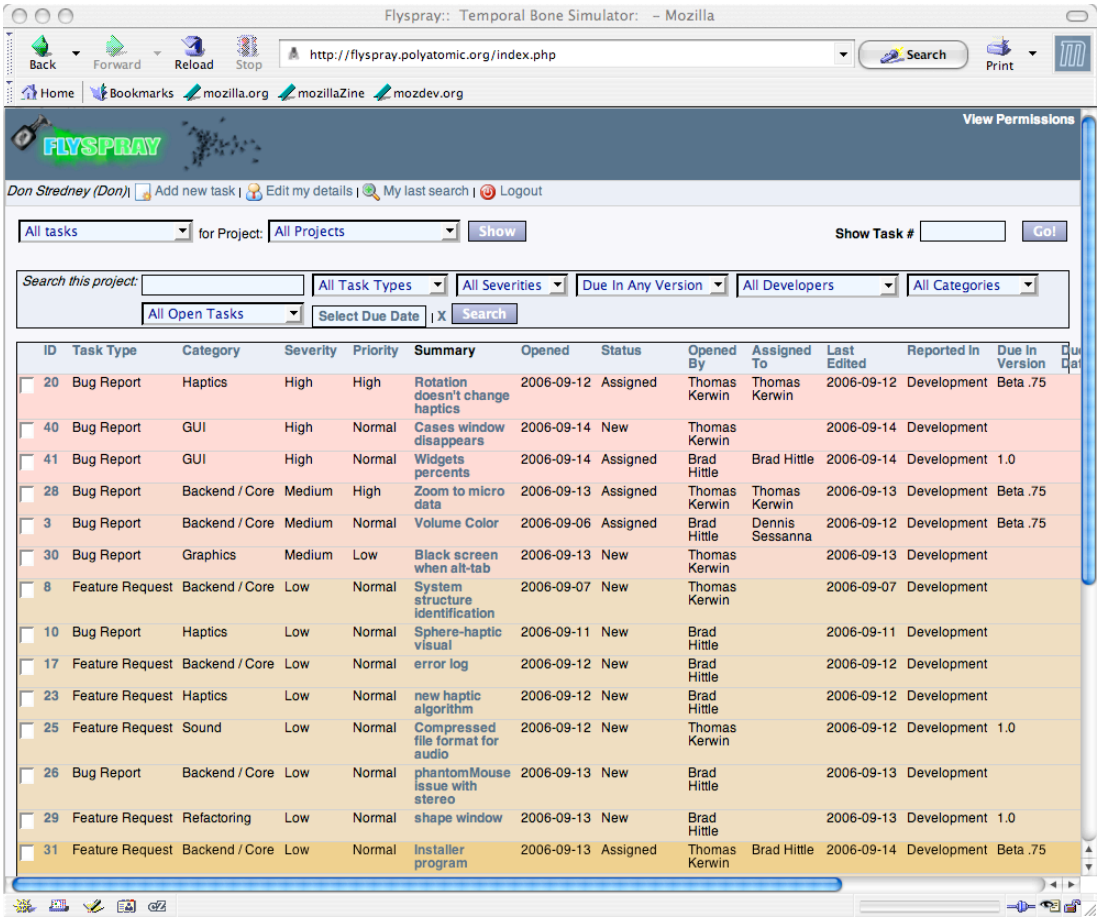
Quit

Selecting this will terminate the session. See:

http://www.osc.edu/research/Biomed/vtbone/software/videos/TestSaveQuit.wmv

Bug Reports

To facilitate adding your comments, suggestions, and request for features, we have installed a bug-tracking tool called FLYSPRAY ™. Go to **flyspray.polyatomic.org** on your favorite Internet browser. In the upper right will be a link to register as a user. Please follow these instructions.



This manual is available in pdf format at: http://www.osc.edu/research/Biomed/vtbone/software/index.htm