ANATOMIA Tutorial

Step 1: Get CT scan data from Hospital

Go to the hospital where you received CT scan, and request the CT scan data copied to CD-ROM media. CT scan data is personal information, and therefore, the patient has the legal right to demand disclosure. The patient should get it without difficulty.

An important point at the time is for you to clearly state that **"the necessary information is CT scan data only"**, and that the purpose of the request is **"to observe by yourself"**. The hospital tends to interpret your request as you are about to change the hospital, because slice images are only meaningful to people with expertise. If it were the change of hospital, the hospital needs to collect not only CT scan data, but to compile all treatment records. It should need time and costs including involvement of doctors. You may be kept waiting for weeks in order for the hospital to undergo an internal review process to disclose medical information outside of the hospital.

Unless your request is misunderstood, what the hospital does is just copying the scanned data, so it will not cost your time or money.

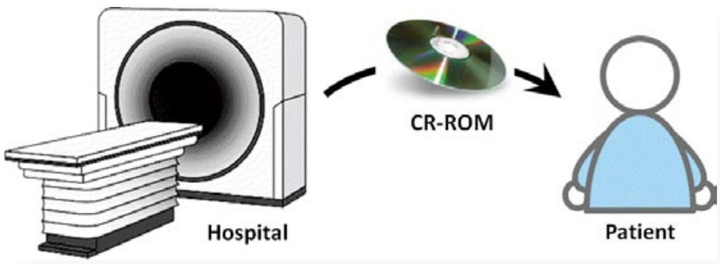

Fig. 1 Obtaining CT scan data

Step 2: Register in ANATOMIA

Launch WEB browser on your personal computer, and open the f Vocsis Corporation website, https: //www.vocsis.com/, as shown in Figure 2.

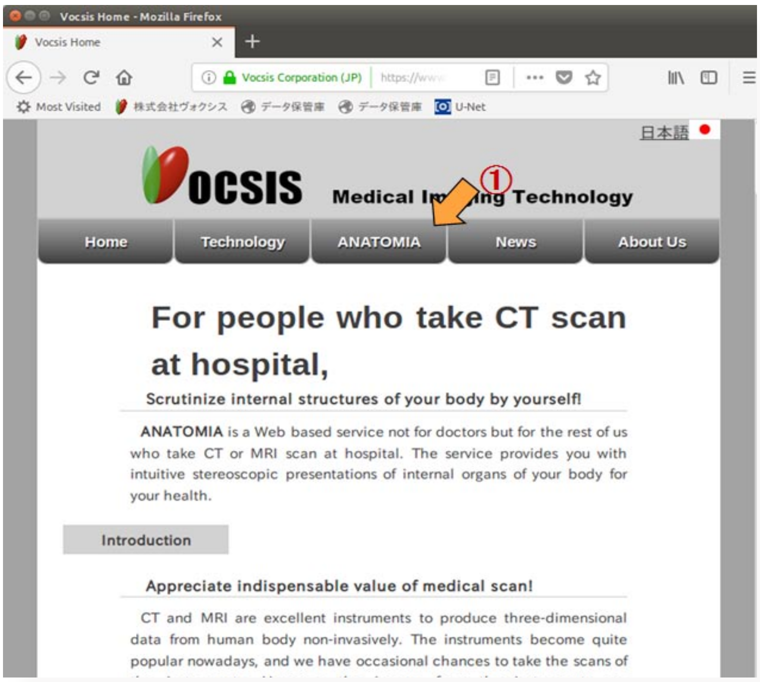

Fig. 2 Vocsis Corporation website

[Browser]
Chrome and Firefox are recommended as a browser for ANATOMIA.
This tutorial uses Firefox.

Click on the "ANATOMIA" function key as (1) in Figure 2, and ANATOMIA's "Login" screen opens as a separate window as shown in Figure 3.

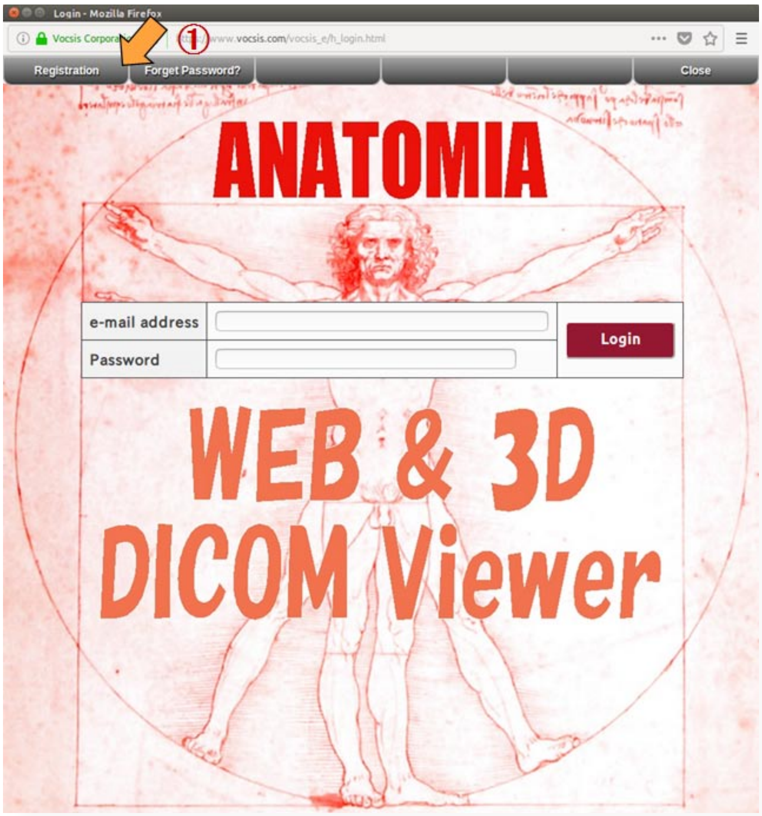

Fig. 3 Login screen

Click on the "Registration" function key as (1) in Figure 3, and the "Registration" screen is displayed as shown in Figure 4.

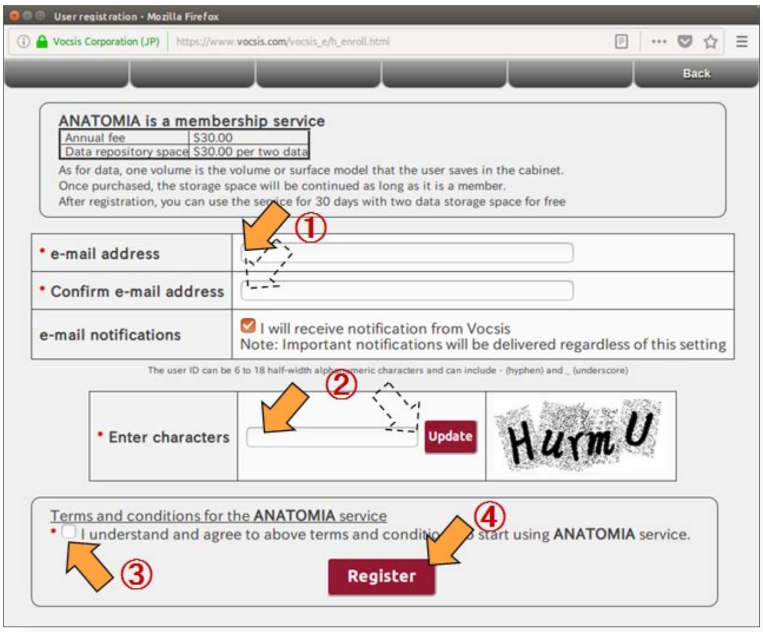

Fig. 4 Registration screen

[About ANATOMIA]
ANATOMIA is a paid subscription service. However, it can be used for free for 30 days after registration. Ther is not obliged even if a user does not switch to the paid service.

Enter your e-mail address to receive a password as (1) in Figure 4. Also, enter the same address again for confirmation.
You are required to read the characters displayed on the right of "Enter characters" area to prevent non-human registration as (2) in Figure 4. If there are difficult characters to read, do not hesitate to click the "Update" button in order to have new set of characters.

After agreeing to the "Terms and conditions for the ANATOMIA service", check the mark (3) in Figure 4. Then click the "Register" button (4) in Figure 4, and you will return to the 'Login" screen as shown in Figure 5. At this time, ANATOMIA generates a password for you, and send it to you by e-mail.

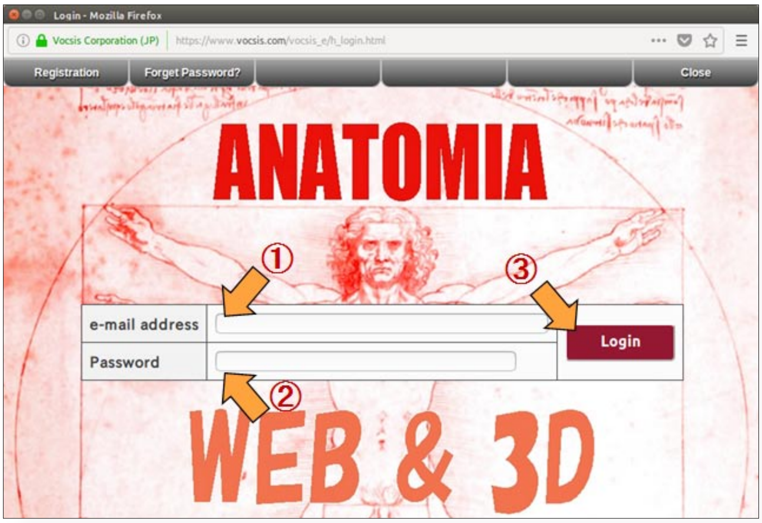

Fig. 5 Login screen

The registered e-mail address has already been set in "e-mail address" as (1) in Figure 5. If it is not, enter your e-mail address. When you receive the password by e-mail, enter it in "Password" as (2) in Figure 5. Click "Login" button as (3) in Figure 5, and "Start" screen is shown as in Figure 6.

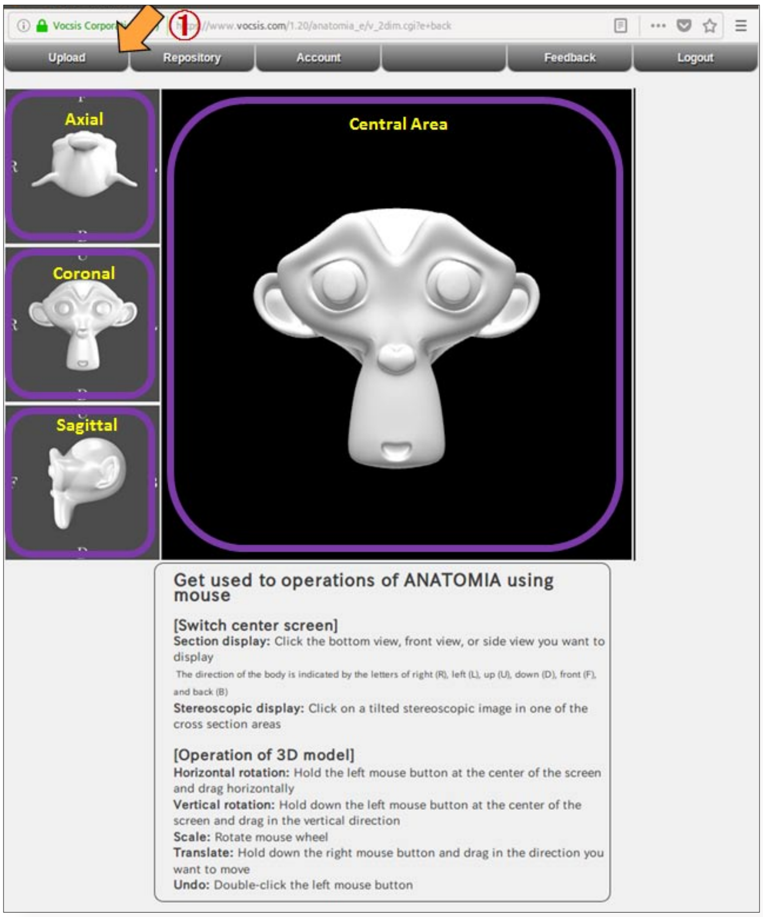

Fig. 6 Start screen

[Get used to basic operations of ANATOMIA]
ANATOMIA standardizes screen layout and basic operations. Let's try the basic operations by referencing guides at the bottom of the screen.

Step 3: Upload scanned images

CD-ROM received from the hospital usually contains many files besides the original scan data of slice images. There may be multiple sets of slice images from multiple CT scans. You need to upload a set of slice images corresponding to one scan to ANATOMIA at a time. In order to find individual sets of slice images on a CD-ROM, ANATOMIA provides ANATOMIA AA (ANATOMIA Analyzer and Anonymizer) which is a tool to analyze the content of a CD-ROM. For using ANATOMIA AA, refer to a brochure linked on the Tool screen, and on the technical explanation page of Vocsis homepage.

In this tutorial, a sample set of CT slice images is downloaded and used. This data set was created by using ANATOMIA AA.

Click "Upload" function key as (1) in Figure 6, and "Upload" screen as in Figure 7 is shown.

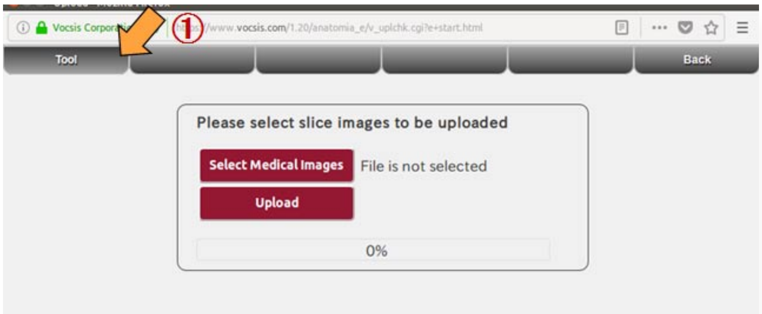

Fig. 7 Upload screen

Click the "Tool" function key as (1) in Figure 7, and "Tools" screen as in Figure 8 is shown.

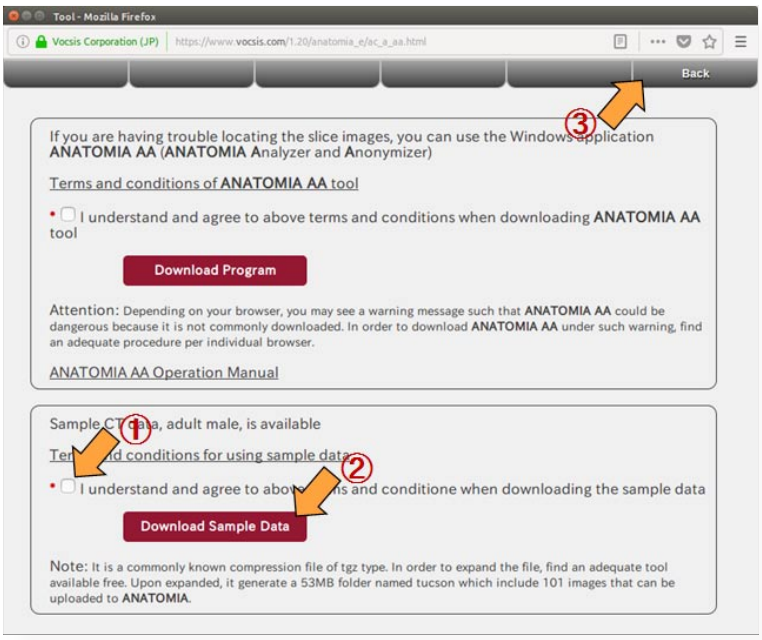

Fig. 8 Tool screen

After agreeing to "Terms and conditions for using sample data", check the mark (1) of Figure 8, and click the "Download Sample Data" button (2) in Figure 8. "Open tucson.tgz" window pops up as shown in Figure 9.

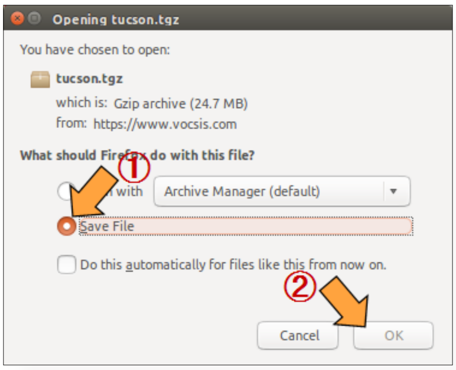

Fig. 9 Popup screen to open tucson.tgz

Select "Save File" as (1) in Figure 9, and click the "OK" button as (2) in Figure 9. A file named tucson.tgz which is a compressed file of a folder containing CT slice images starts to be downloaded, and the popup screen disappears.
The progress of the download is not displayed on the ANATOMIA page, but on the Vocsis home page as shown in Figure 10.

Fig. 10 Download of tucson.tgz

* 1 [File decompression tool]
By searching with keywords such as "Windows", "tgz", and "decompression" on the Web, you will find many free tools. WinZip and Lhaca are examples.

Upon completion of the downloading, an arrow indicating download as (1) in Figure 10 is highlighted. When you click on the symbol, you will see a message that downloading of the tucson.tgz file is completed as (2) in Figure 10. Click the folder mark on the right of the message as (3) in Figure 10, and you can find the tucson.tgz file on the download folder.
Since tucson.tgz is a general compressed file, please decompress it using an appropriate tool (*1). When this file is decompressed, a folder named "tucson" containing 101 slice images will come out.

Go back to the ANATOMIA window, and click the "Return" function key as (3) in Figure 8 on the "Tool" screen, and the "Upload" screen as in Figure 11 is shown.

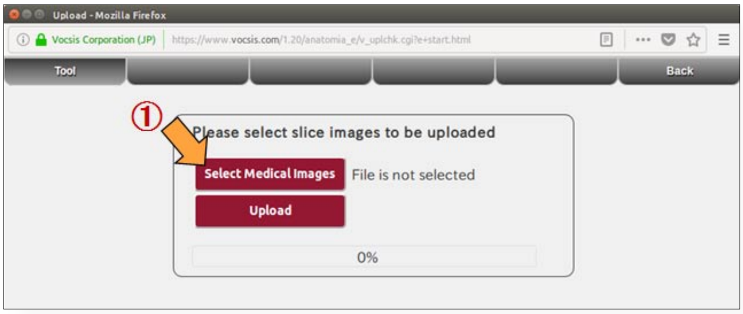

Fig. 11 Selecting Images to upload

Click the "Select Medical Images" button as (1) in Figure 11, and the "Upload File" screen pops up. Find the decompressed "tucson" folder as shown in Figure 12.

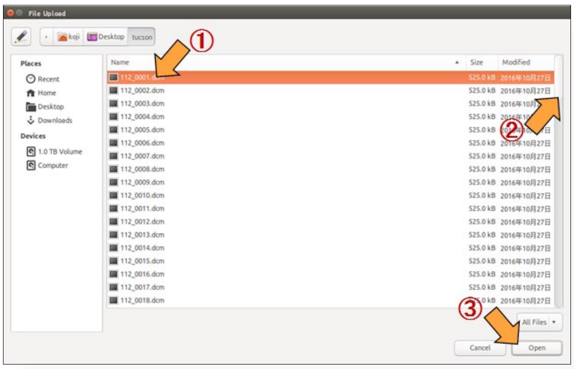

Fig. 12 File upload popup window

Select all the files in the "tucson" folder. To select all files, click the first file as (1) in Figure 12, drag the slider as (2) in Figure 12 to the bottom, and click the last file while holding down the Shift key.

Click the "Open" button as (3) in Figure 12, and the "Upload File" popup window disappears.

In the "Upload" screen where the popup disappeared as shown Figure 13, it shows "101 files are selected", which is the number of the files in the "tucson" folder as (1) in Figure 13.

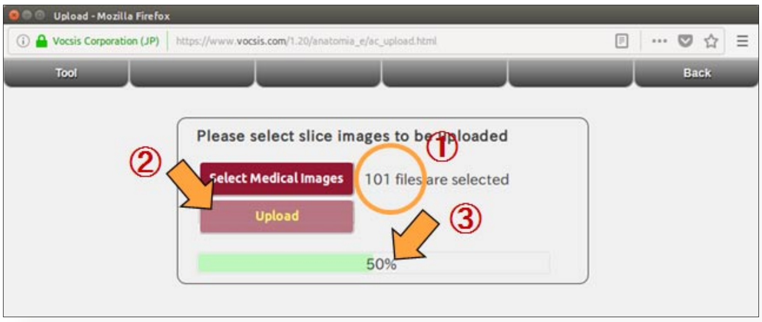

Fig. 13 Uploading slice images

Click the "Upload" button as (2) in Figure 13 to start the transfer of the selected image files to the ANATOMIA server, and the progress bar as (3) in Figure 13 shows the progress.

Because the set of the slice images is large in size, it take some time depending on your Internet environment. After the progress bar reaches 100 percent, it takes a little more time for the ANATOMIA server to convert the slice images to volume data. When the screen changes and the cross section image is displayed as shown in Figure 14, the construction of the volume data is completed.

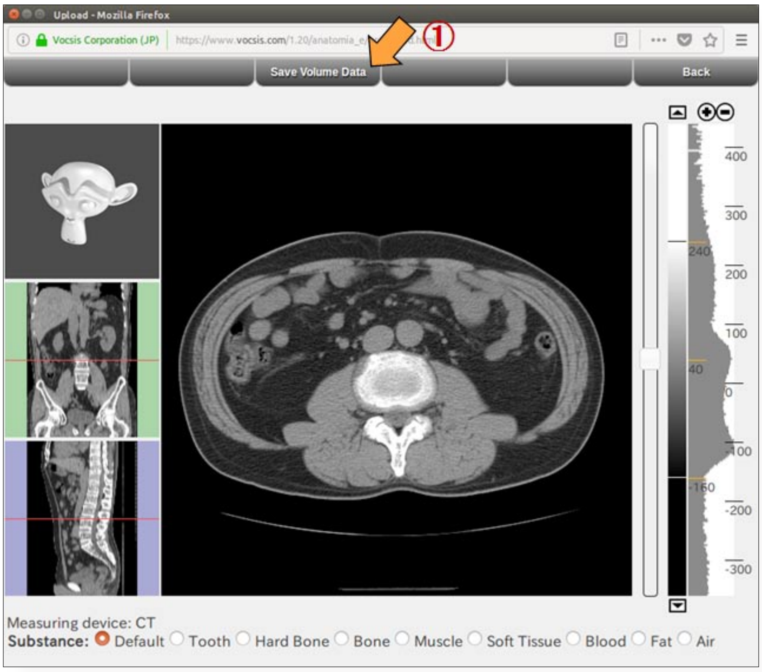

Fig. 14 Save volume data

Click the "Save Volume Data" function key, and name this volume data as "tucson". When the data is saved, the "Planar Processing" screen as Figure 15 is shown. The processes up to this point took time, but from now on, this volume data "tucson" can be recalled immediately from the repository.

Step 4: Observe distribution of substances in the body on the Planar Mode screen

In the "Planar Mode" screen as shown in Figure 15, the distribution of substances in the body is displayed in cross-section images in each of three orthogonal axes. There is a large view in the center, and three small views arranged vertically on the left side. The horizontal cross-section image is shown on the large view, the front cross-section image is on the center small view, and the side cross-section image is on the bottom small view. Because the horizontal cross-section image is displayed on the large view, the 3D symbol is displayed on the up small view instead.

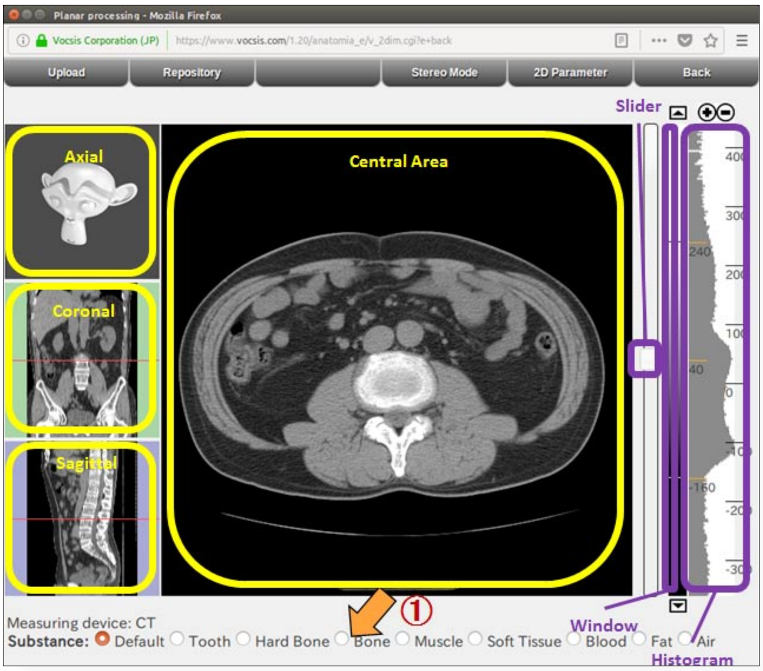

Fig. 15 Elements of Planar Mode screen

Select the "Bone" on "Substance" radio buttons as (1) in Figure 15. The areas corresponding to bone is shown in red in each cross-section image as shown in Figure 16. The range corresponding to bone is also shown in red in the histogram.

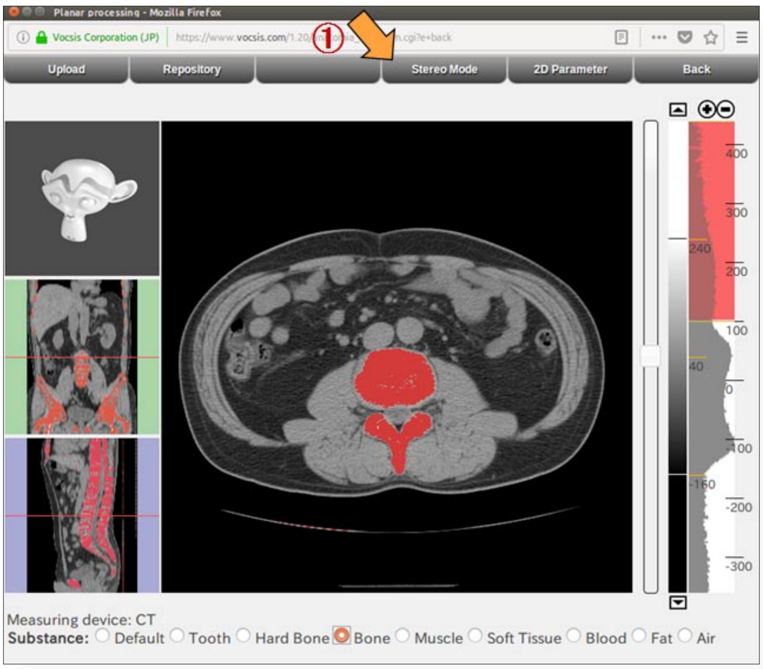

Fig. 16 Bone component

[Change the location of cross section]
Drag the slider on the right of the large view to change the location of the horizontal cross-section. The location is indicated by a red cursor on the front and the side cross-section images. By rotating the mouse wheel, you can change the location one pixel at a time.

[Switch axis of the large view image]
Click on the center small view, and the large view changes to the front cross-section image. The location of the cross-section is indicated by a green cursor on the horizontal and the side images.
Clicking on the bottom small view, and the large view changes to the side cross-section image. The location of the cross-section is indicated by a blue cursor on the horizontal and the frontal images.

[Window]
Window is a range of pixel value to be converted to gray on cross-section image, and shown as an image in the right of the slider. When you click the upward triangle mark at the top of the image, the window shifts to the direction that the value becomes larger. The downward triangle at the bottom shifts to the direction that the value becomes smaller. The amount of change increases as you click the triangle while holding down the Shift key, and further increases while holding down the Control key.
Click + (plus) mark at the top of the histogram to reduce the window's range. Click - (minus) mark to enlarge the window's range. If you hold down the Shift key or Control key while clicking, the amount of change increases like the triangle.
The range of the window can also be set numerically on the "2D Parameter Setting" sub-screen.

[Histogram]
A histogram of pixel values of the image on the large view is shown on the right side of the screen. Since the histogram has large variations, it is on a logarithmic scale so that the relative distribution is easy to see.

[Substance]
Substance is a range of pixel values shown in red with yellow cursors at its limits in histogram when selected. In CT, the range is from 100 to 1000 for bone and -200 to -5 for fat, as examples.
The cursor is high-lighted when clicked, and you can change the range by dragging the cursors or by rotating mouse wheel.
Holding the mouse on the cursor for a while, and the pixel value of the cursor is displayed.

[Distribution of body fat]
The distribution of body fat and visceral fat is shown by clicking "fat" with "Substance" radio button.

Step 5: Let's make a surface model

Click the "Stereo Mode" function key as (1) in Figure 16, and "Stereo Mode" screen is shown as in Figure 17.

In the "Stereo Mode" screen, perspective images of ROI (Region Of Interest) are displayed instead of cross-section images on the "Planar Mode" screen. The ROI is a rectangular parallelepiped region from which a three dimensional model is generated specified by the upper and lower limits on each of three orthogonal axes. A perspective image is an averaged of images in the rectangular parallelepiped region in the axis superimposed by the reverse silhouette of the surface model. It gives an image of what shape it will generate before calculation. The shadow of the object is black in a normal silhouette, whereas white in a reverse silhouette.

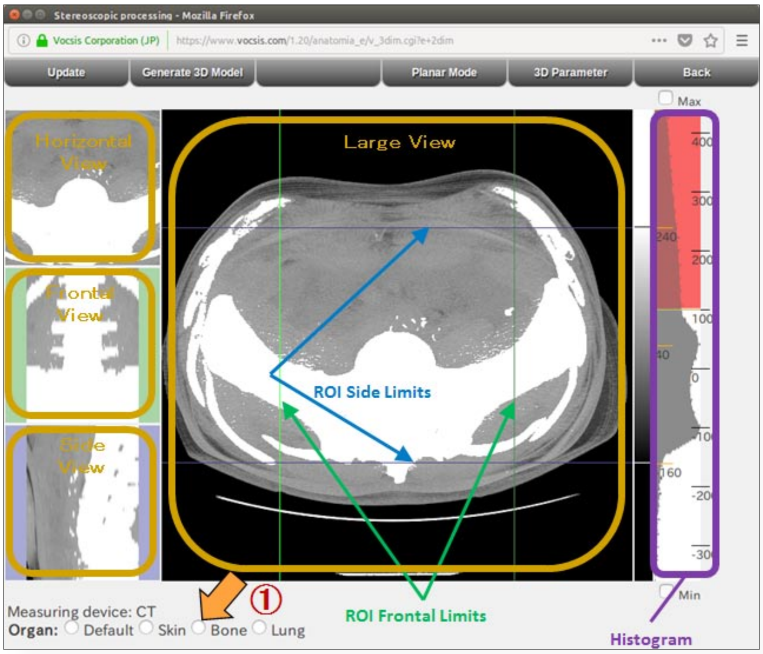

Fig. 17 Stereo mode screen

[ROI]
The ROI is indicated by three pairs of limit cursors on the perspective images, red cursors for the horizontal axis, green cursors for the frontal axis, and blue cursors for the side axis.
When a horizontal view is displayed on the large view, the upper and lower limits on the frontal axis are indicated by green vertical cursors, and those on the side axis are indicated by blue horizontal cursors. In order to see the cursors in the horizontal axis, change the large view either to the frontal view or to the side view, and they are indicated by a pair of red horizontal cursors.
Initial ROI is set at the center of each axis as half of the valus in the axis.
When a cursor is highlighted by a click, ROI can be changed by dragging the cursor. It can also be changed by rotating the mouse wheel.
If you hold the mouse on the cursor for a while, the pixel coordinates of the cursor will be displayed.

[Histogram]
The histogram is calculated from the pixel values of all images between the upper and lower limits of the ROI.

[Organ]
The organ radio button specifies a set of parameters for extracting the organ as a three-dimensional model. This parameter includes the window, substance, extraction algorithm, and others. Adjust the parameters by watching the generated 3D model.

Let's make a surface model for bones. The model is generated by an algorithm named surface rendering.

Select "Bone" on the "Organ" radio button as (1) in Figure 17, and the perspective images corresponding to the bone substance is displayed as shown in Figure 18. The white areas in these figures are the inverse silhouettes of the bones which will be generated as the surface model.

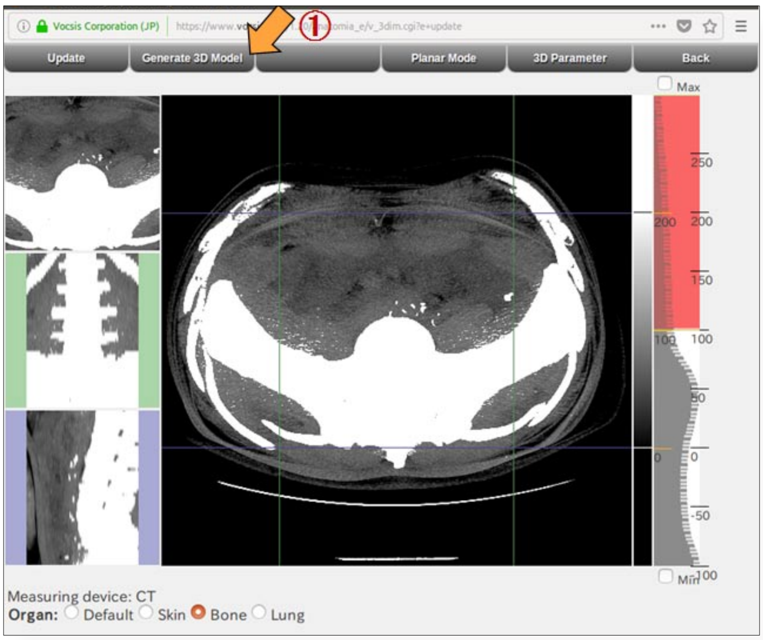

Fig. 18 Make a surface model of bones

Click the "Generate 3D Model" function key as (1) in Figure 18, and the surface model which shows the junction of the spine and femur is shown in the large view as shown in Figure 19.

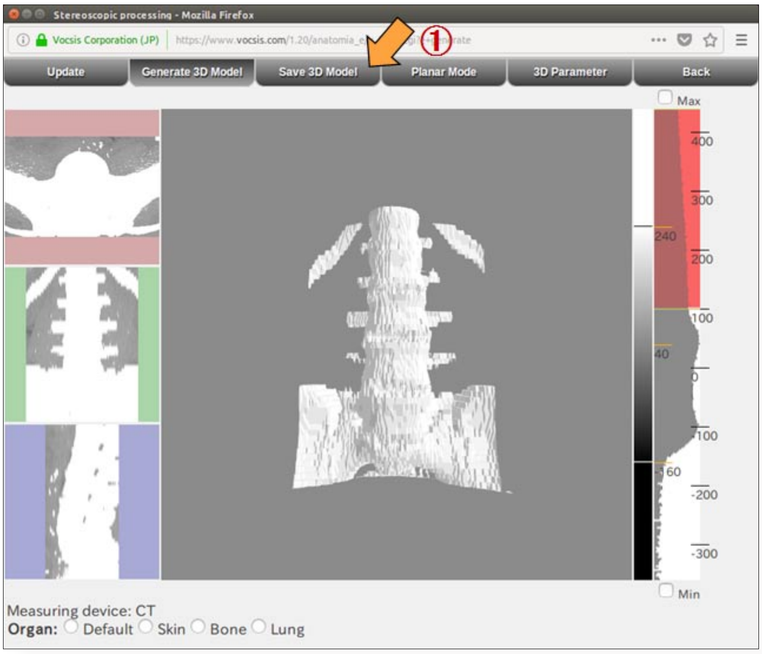

Fig. 19 Bone Surface Model

When you drag the model on the large view, the model rotates to the direction you drag, so you can observe it from various directions. If you drag with the right mouse button, it moves in parallel in that direction. Rotating the mouse wheel will change the size of the model. Double click the model to return it to the initial position.

Click the "Save 3D Model" function key as (1) in Figure 19, and save the model with the name of "bones". When saved, the "Observation" screen is displayed as shown in Figure 20.

On the observation screen, you can conveniently observe the three-dimensional model together with the cross-section images from the corresponding rectangular parallelepiped region of the model.

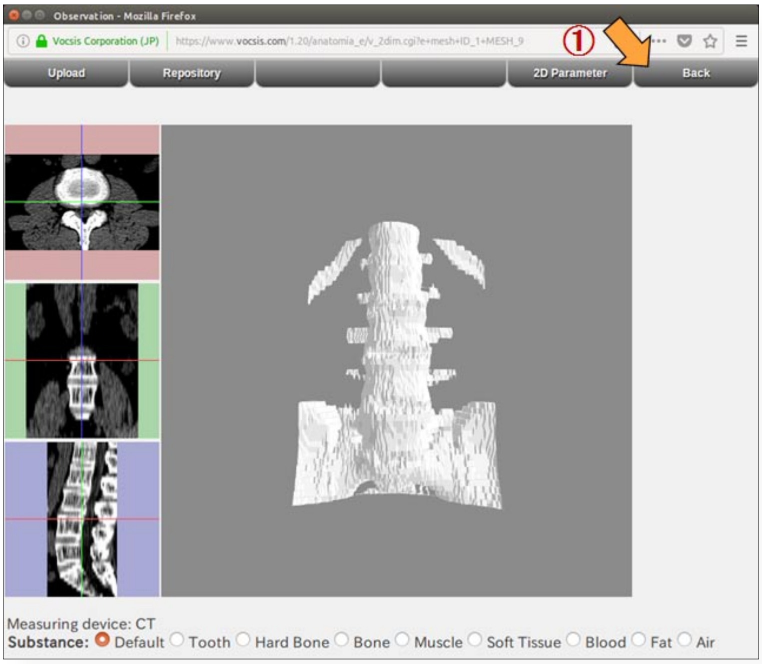

Fig. 20 Observation screen

Step 6: Let's make a volume model

Let's make a volume model from the initial region of interest. The model is generated by an algorithm named volume rendering.

First, read the volume data from the "Repository".

Click the "Return" key as (1) in Figure 20, and return to the start screen as shown in Figure 21.

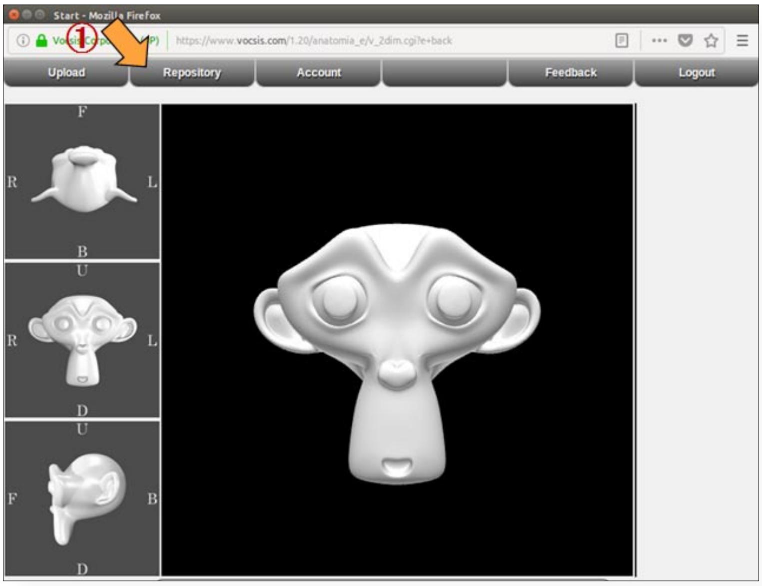

Fig. 21 Go to the Repository screen via the Start screen

Click the "Repository" function key as (1) in Figure 21, and the "Repository" screen is shown as in Figure22.

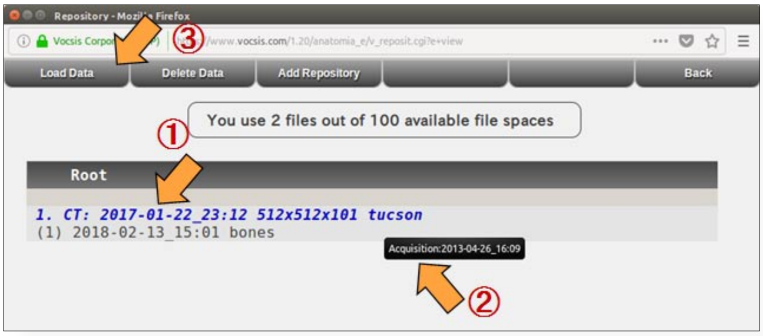

Fig. 22 Repository screen

[Read 3D mode data]
Three-dimensional data can also be read from the Repository. Clicking on three-dimensional data changes it to bold red.

When you click the volume data of "tucson" as (1) in Figure 22, the color of the data changes to bold blue. When you hold the mouse a while on the volume data, the date and time of the CT scan is displayed as (2) in Figure 22, so you can see from which examination this volume data is taken.

Click the "Read Data" function key as (3) in Figure 22, and the "Planar Mode" screen is shown with the "tucson" volume data as shown in Figure 23.

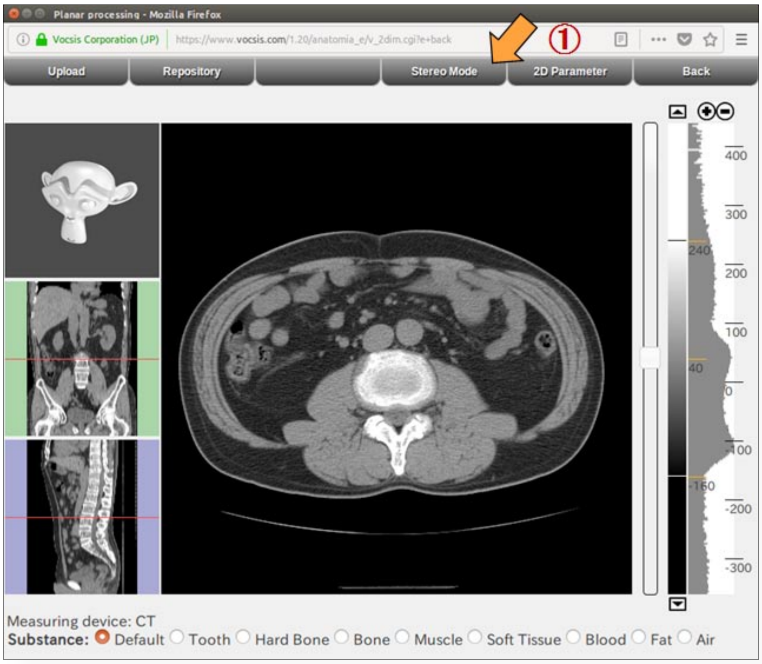

Fig. 23 Transition to Stereo Mode screen

Click the "Stereo Mode" function key as (1) in Figure 23, and the "Stereo Mode" screen is shown as in Figure 24.

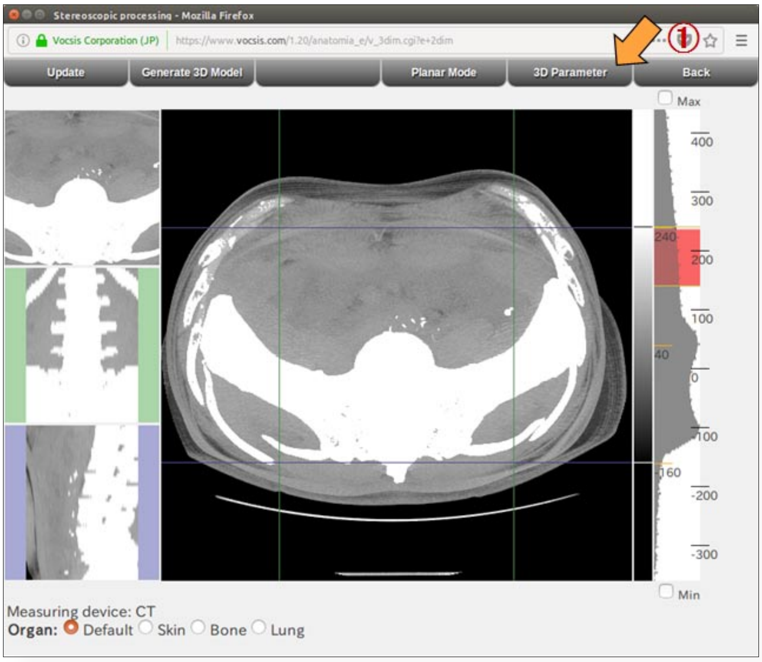

Fig. 24 Go to 3D parameter setting sub-screen

Click the "Parameter Setting" function key as (1) in Figure 24 to open the "3D Parameter Setting" sub-screen as shown in Figure 25.

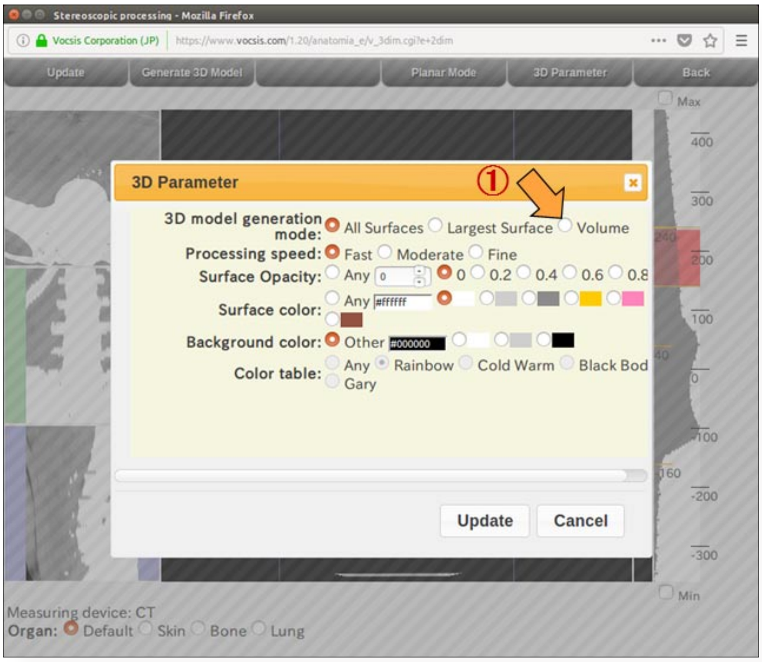

Fig. 25 3D parameter setting sub-screen

When "Volume" as (1) of Figure 25 is selected in the "3D model generation mode", a Transfer Function Editor is displayed under "Color Table" as in Figure 26.

The color table defines a transfer function that converts a pixel value into a combination of color and opacity for the volume rendering. Here, the default color table of "Rainbow" is used for this tutorial.

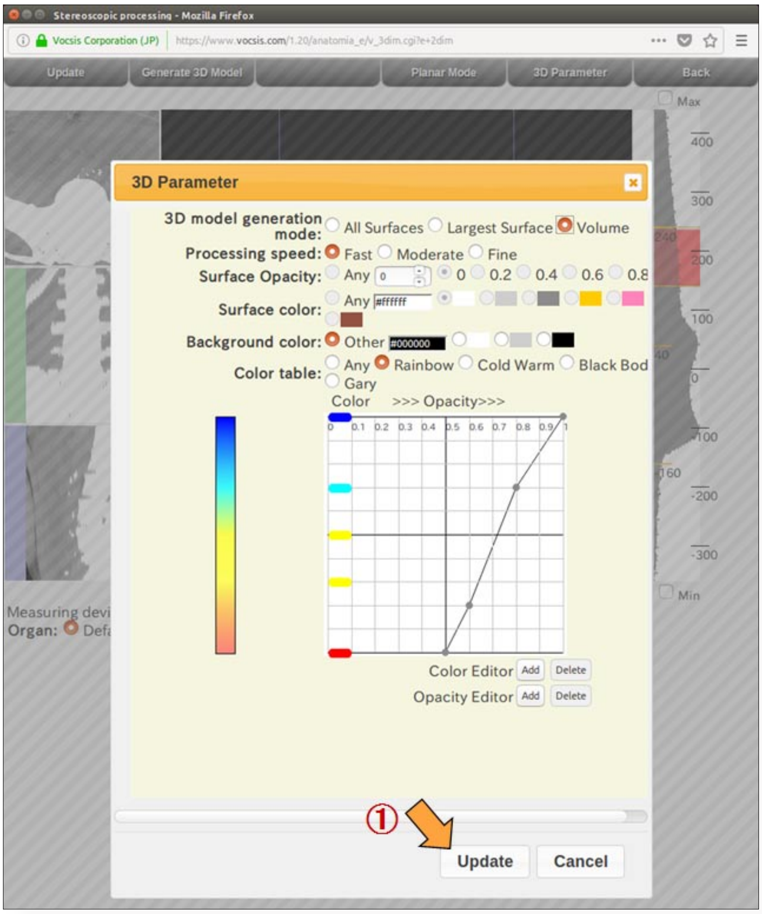

Fig. 26 Transfer Function Editor

Click the "Update" button as (1) in Figure 26, and the "3D Parameter Setting" sub-screen is shown as in Figure 27. The window image as (1) in Figure 27 shows the transfer function of Rainbow.

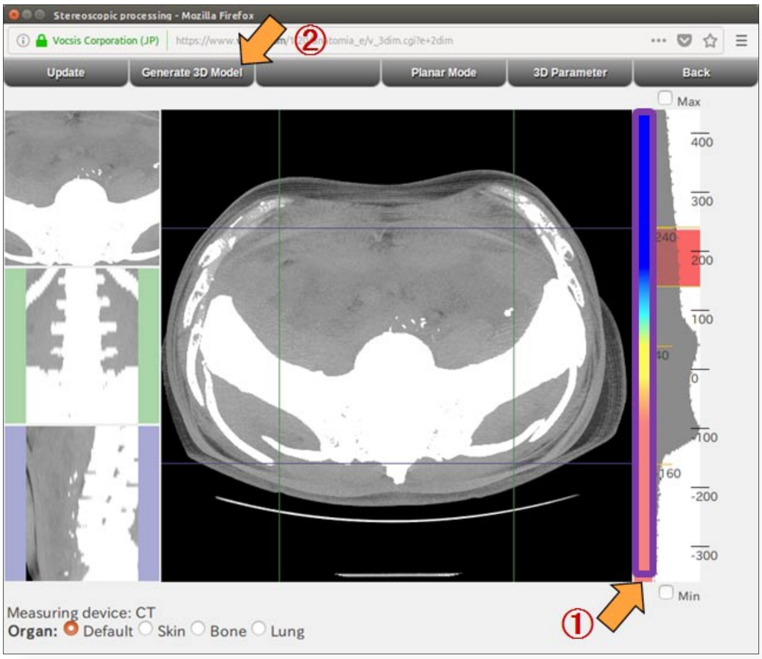

Fig. 27 Creating Volume

Click the "Generate 3D Model" function key as (2) in Figure 27, and a volume model is generated as in Figure 28.

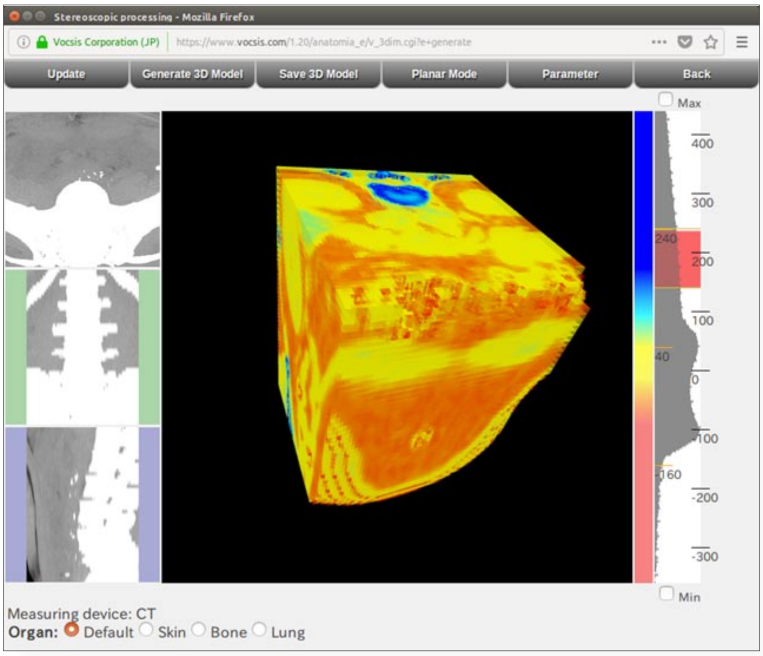

Fig. 28 Displaying the volume model

[High CPU load]
Since the volume model places a heavy burden on the CPU of the personal computer, the response of the personal computer may be slow while this model is displayed.

In Figure 28, the volume model is dragged and rotated so that the boundary surfaces can be seen.

Vocsis Corporation

1392-2 Hase, Atsugi, Kanagawa 243-0036 JAPAN
+81-46-248-5171
WEB：https://www.vocsis.com/