wxIFSView User Guide

Version 2.00

Contents

Chapter 1

Introduction

This document is the official user-guide to wxIFSView. wxIFSView is a cross-platform IFS(Image File System) image viewer. The program has been ported to work on Win32, Sun, Linux and the Macintosh platforms. wxIFSView can be used to analyze, visualize and process IFS images.

wxIFSView uses the wxWidgets GUI toolkit to achieve cross-platform compatibility. wxWidgets makes it easy to write code on a single platform and compile the same code on the other platforms with minimal or no changes in the code. wxWidgets uses the native Graphical User Interface(GUI) of the platform for its display.

This document is organized as follows. Chapter 2 describes how to run the program on the different platforms. Chapter 3 describes the usage of wxIFSView in depth.

Chapter 2

Running wxIFSView

This chapter contains information on how to start and run wxIFSView.

2.1 System Requirements

wxIFSView has been tested and verified to work on the following platforms.

- Microsoft Windows XP, Microsoft Windows 2000, Windows 95,98 and ME.
- Sun Solaris 8
- Redhat Enterprise Linux , Fedora and Slackware Linux 10. It should work on any recent linux distribution.
- Mac OSX 10.3+ (Tiger Compatible)

2.2 Running

wxIFSView is included with the the IFS libraries and is found in the */ifsbin* folder of the IFS package. It is called wxIFSViewPLAT where PLAT indicates the platform which can be one of the following: Motif (Sun Solaris), GTK (Linux), Win32 (Microsoft Windows) and MacX (Macintosh).

It can be run either by executing it from the console(under Linux and Solaris) or by clicking on the wxIFSView icon(under Windows or Mac). One can also specify the IFS image to be viewed on the command line but this is optional. The command line usage is shown below:

```
wxIFSViewPLAT Image-File
```

where *Image-File* can be a image stored in one of the following file formats: IFS, JPEG, LJPEG or TIFF.

One can also associate Image files to be opened by wxIFSView on the Win32 and the Mac platforms. Please refer to your operating system documentation for more information.

Chapter 3

Using wxIFSView

wxIFSView uses a Single Document Interface(SDI) where each image has its own window and tools. There is one base window which is used for file-open operations. Whenever a new file is opened, the image is loaded in a new separate window. The base window and image window are shown in the Figure 3.1 and 3.2.

The program has the same layout and functionality across all platforms.

3.1 Base Window

The base window is used to open files for display and processing. The following file formats are supported as of now:

- IFS

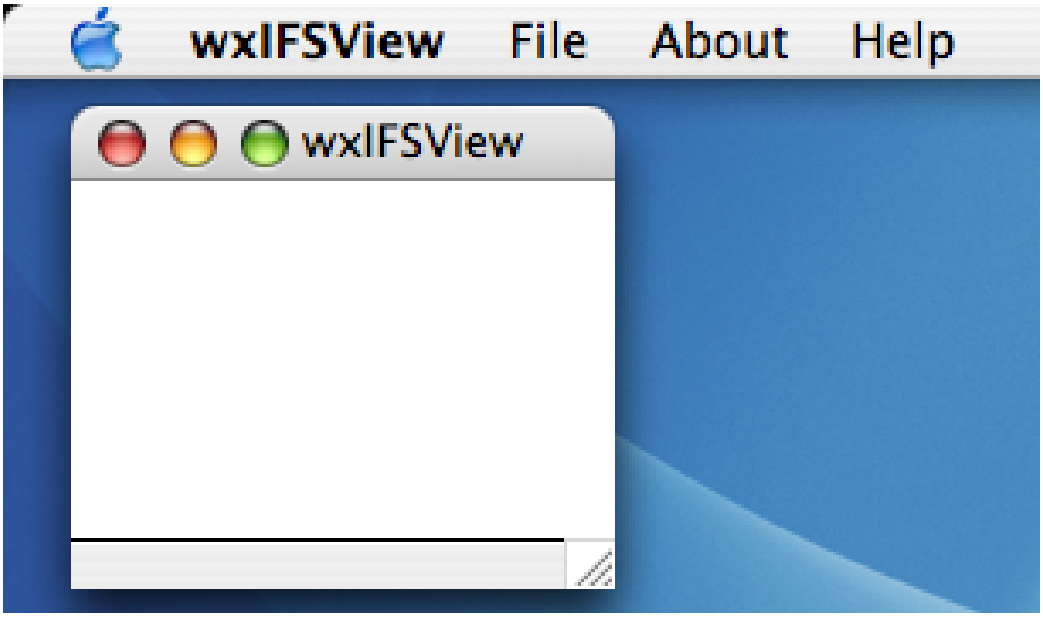


Figure 3.1: The Base Window

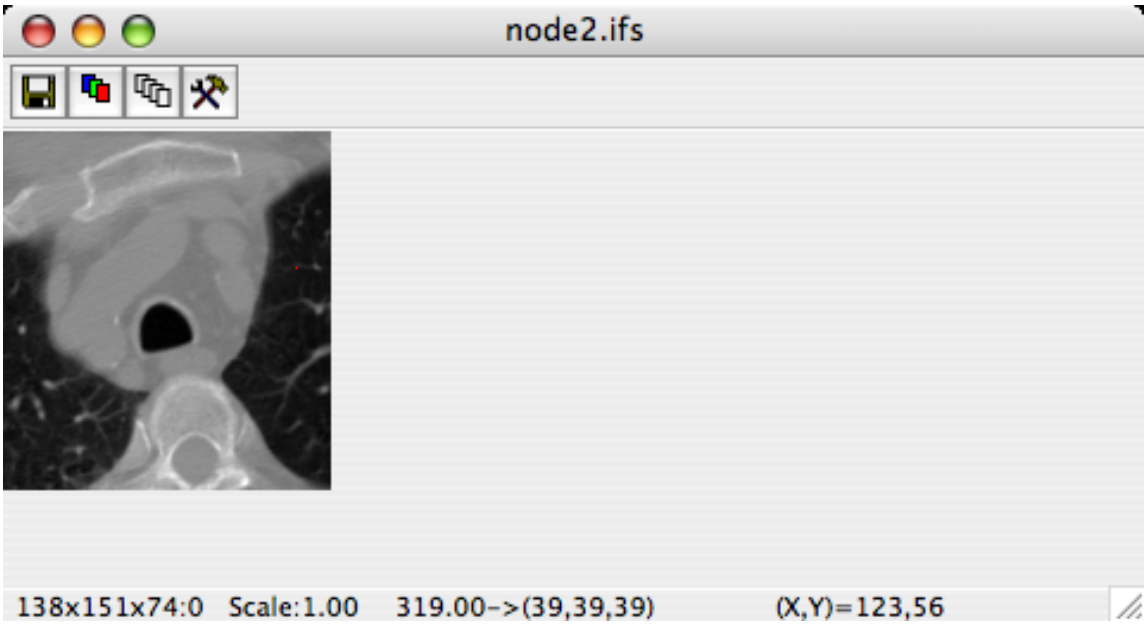


Figure 3.2: The Image Window

- JPEG
- TIFF
- Lossless JPEG(LJPEG)

The image is opened in a new image window described in the next section. Large images are automatically scaled to fit in the image window for display.

3.2 Image Window

The Image window has 3 main components.

- The toolbar on the top.
- The image display area in the middle.
- The status bar at the bottom.

The first field of the status bar in the image window shows the height,width, the number of frames in the image followed by the frame currently displayed. The current image scale factor is also displayed in this field.

The second field shows the pixel value of the pixel selected and the color it is mapped to for on-screen display. The third field shows coordinates of the pixel selected.

A pixel can be selected by clicking on the image with the mouse. For multi-frame images, one can move between frames as follows:

- To move to the next frame, the keyboard shortcut is Shift+Right Arrow.
- To move to the previous frame, the keyboard shortcut is Shift+Left Arrow.

Vector valued images like complex IFS images have to be converted to a scalar for display purposes. wxIFSView provides four such conversions. They are:

1. **Real**: The real portion of the image pixels is used for display.
2. **Imaginary**: The imaginary portion of the image pixels is used for display.
3. **Magnitude**: The magnitude of the image pixels is used for display. This is the default.
4. **Phase**: The phase of the image pixels is used for display.

3.3 The Menu

This section describes the menu items in wxIFSView.

3.3.1 File

Save as IFS Image

This allows the user to save the image as a new IFS file. One can specify the data type of the saved IFS image.

Internally, two copies of the image are maintained. One is the master copy which is in the native data format as stored on disk and the other is the display copy which is in floating point IFS format. The display copy is used for all processing and display and the master copy is never modified.

The master copy is used here when saving as a new IFS file.

Save Select Frames as IFS Image

If the image has multiple frames, then this allows the user to save selected frames as a new IFS Image. No datatype conversion is performed and the image is saved in its original data format. The master copy is used here.

Export Displayed Image as

This allows the user to save the displayed image as JPEG,BMP,TIFF, PNG or IFS. The display image copy is used here. Other utilities exists in IFS for conversion to other formats like AVI.

Close

This closes the image window.

3.3.2 Edit

Undo

Restores the displayed image to the original image. The display image is regenerated using the master copy.

View As RGB Rendering

If the image has more than 2 frames, then its is rendered as an RGB image using the frames set in the options dialog. The default choice is to use the first 3 frames.

Animate

Animates a multi-frame image i.e. the frames are displayed in a time sequence, as a movie.

Controls

Displays the control panel where various options can be set. This is described later in section 3.4.

Show Histogram

Displays the Histogram of the current frame displayed. One can click anywhere on the histogram for the exact pixel values. The histogram uses 256 bins.

This menu item is a toggle and can be used to turn on and turn off the histogram window.

Equalize Histogram

Equalizes the histogram of the currently displayed frame.

Autoscale Image

wxIFSView maps the grey levels in the image to values between 0 and 255 for displaying it on screen, Autoscaling uses the current frame to compute the maximum and minimum pixel values to map the colors.

Globalscale Image

Similar to Autoscale expect that it uses the maximum and minimum pixel values from the entire image across all frames. It is equivalent to Autoscale for single frame images.

Record Clicks

This allows the user to save selected image intensities to a file. Once record clicks is enabled, the user can click anywhere in the image with the mouse to save the image intensity at a point to a file.

The file is a text file with each line contain information about the intensity at the point of click. The format of each line is shown below:

```
Frame x y pixel-intensity
```

The file name of the saved intensities is the same name as the IFS file but with an appended extension of .clicks.log.

3.4 Control Panel

Figure 3.3 shows the control panel dialog.

3.4.1 Colormap

This allows the user to pick the colormap to apply on the displayed image. The following colormaps are currently available:

1. Greyscale
2. Inverted greyscale
3. Log
4. Heated Spectrum
5. Hot Metal
6. Bronson
7. Random

Figure 3.4 shows the colormaps as applied to an image. The default colormap is greyscale.

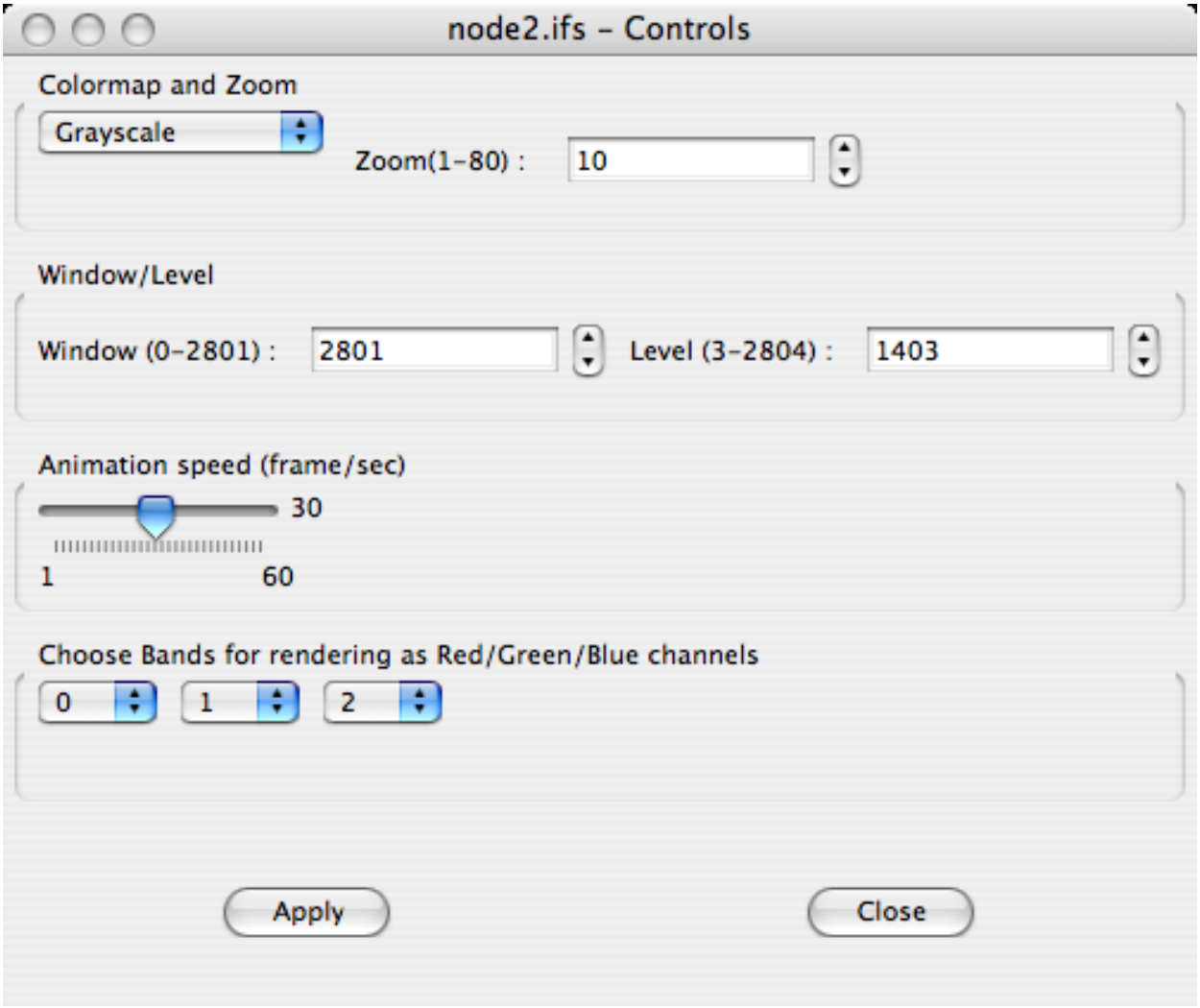
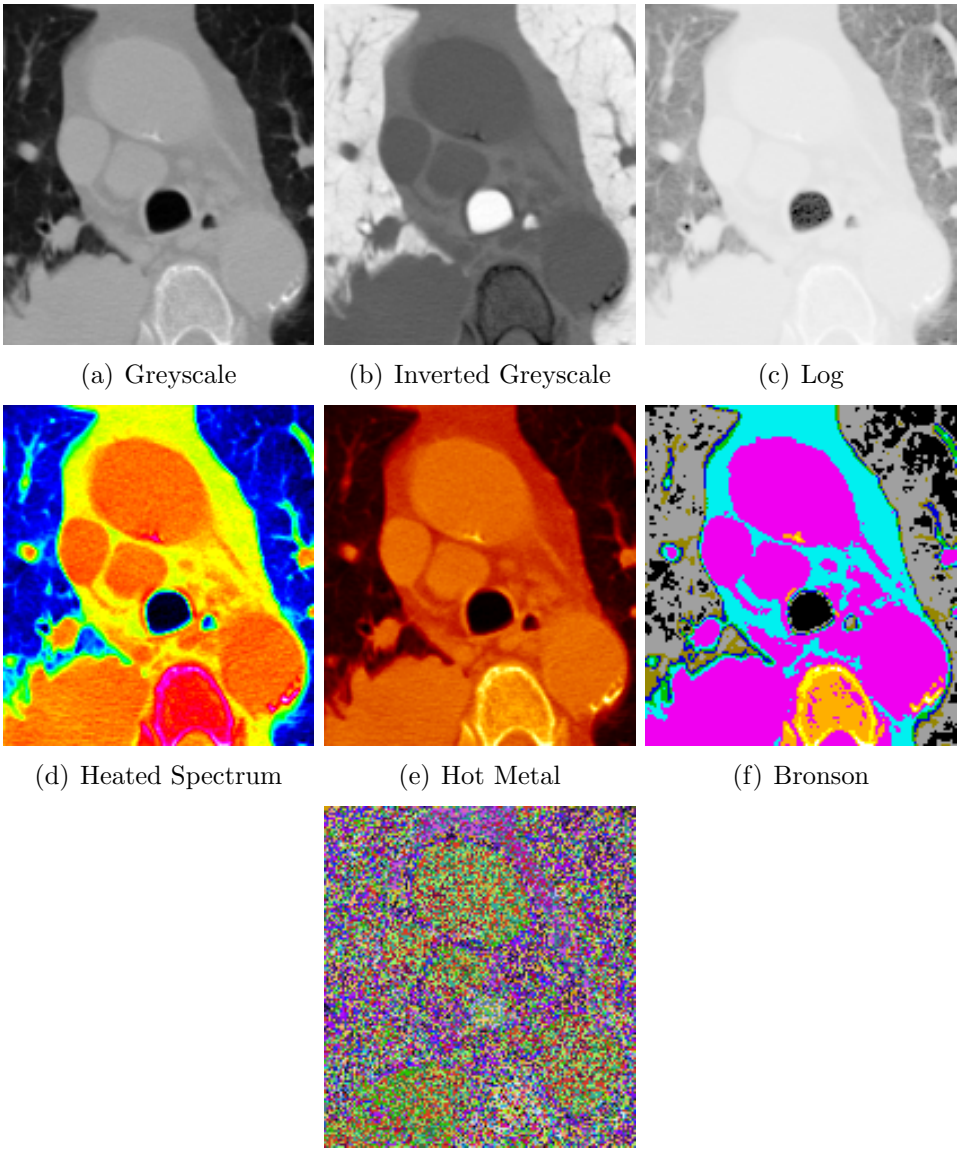


Figure 3.3: The Control Panel



(a) Greyscale (b) Inverted Greyscale (c) Log

(d) Heated Spectrum (e) Hot Metal (f) Bronson

(g) Random

Figure 3.4: The 7 Colormaps

3.4.2 Zooming

The zooming control allows the user to zoom-in and zoom-out of the image. A zoom factor of 10 indicates a 1:1 scale. Any value less then 10 will downscale

the image and any value greater then 10 will upscale the image. For example, a zoom factor of 20 will upscale the image by a factor of 2 and zoom factor of 5 will downscale the image by a factor of 2.

3.4.3 Window/Level

These parameters controls the visible pixel range of the image displayed on the screen. *Window* is defined as the range of pixel values around a fixed *Level* which are scaled to 0-255 for display on screen. Figure 3.5 illustrates the concept of window and level.

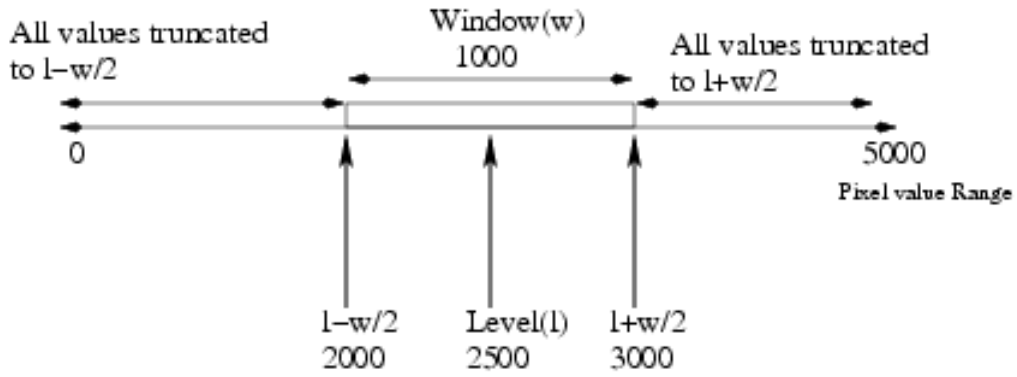


Figure 3.5: Window/Level Example

The default window/level are calculated as follows:

$$window = maximum\ pixel\ value\ -\ minimum\ pixel\ value \tag{3.1}$$

$$level = minimum\ pixel\ value\ +\ window/2; \tag{3.2}$$

3.4.4 Animation Speed

This option appears for multi-frame images and sets the speed at which they are animated. The default value is 30 frames/sec.

3.4.5 Color Bands

This allows the user to select the frames to be used for RGB rendering in multi-frame images. The default value is the first 3 frames for red, green and blue respectively.

3.5 Built-in Algorithms

This section describes the algorithms and their parameters which can be run on the displayed image. All algorithms are under the *Tools* menu.

3.5.1 Connected Component Labeling

Connected component labeling is used to group pixels into components based on pixel connectivity. The output is a label image where each component has a different label.

Parameters

Figure 3.6 shows the parameters which can be set for connected component labeling.

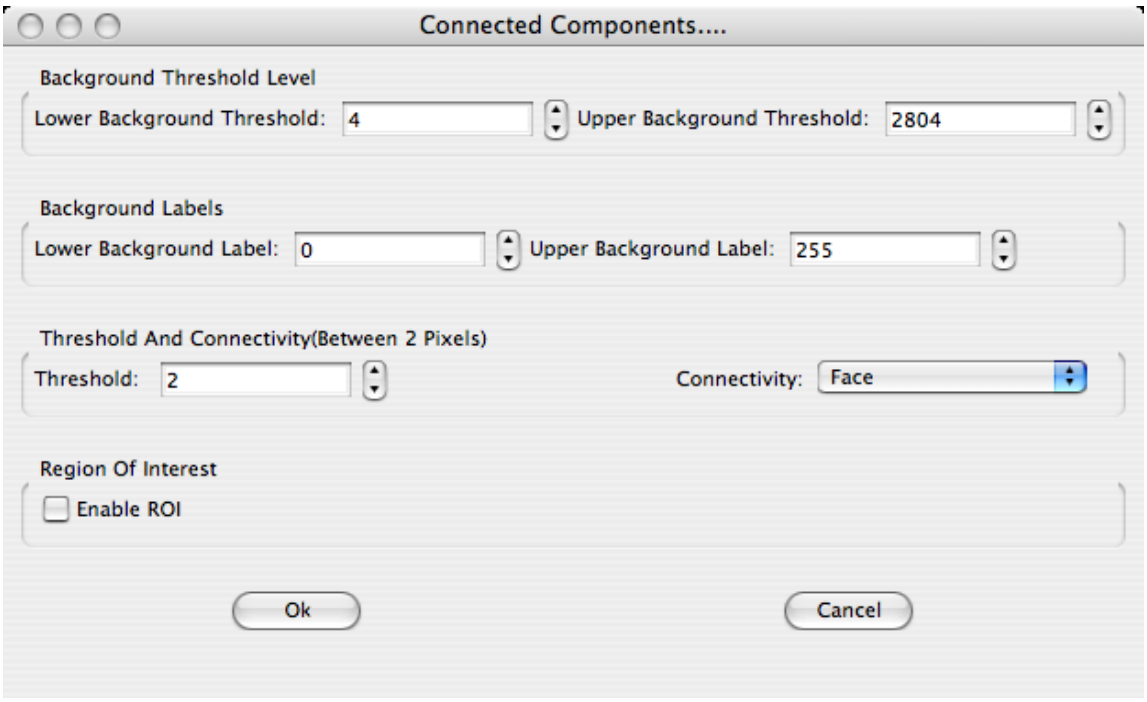


Figure 3.6: Connected Components Options Dialog

1. **Lower Background Threshold:** All pixel values below this value are considered to be part of the background and are ignored while labeling.

2. **Upper Background Threshold:** All pixel values above this value are considered to be part of the background and are ignored while labeling.

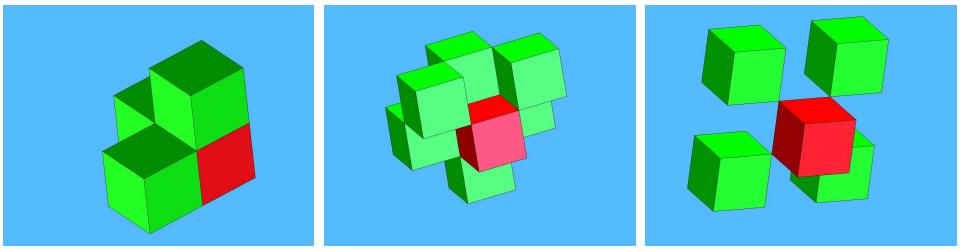
3. **Lower Background Label:** The label to be assigned for pixels below the lower background threshold.

4. **Upper Background Label:** The label to be assigned for pixels above the upper background threshold.

5. **Threshold:** The difference between the values of two adjacent(described below) pixels. If the difference is below the threshold, then they are considered to be connected.

6. **Connectivity:** The type of pixel adjacency to be used while labeling. Figure 3.7 shows the different types of adjacencies supported.

7. **Enable ROI:** This enables Region of Interest(ROI) support where the region corresponding to the current pixel selected(the last pixel clicked on) is extracted.



(a) Face Adjacency (b) Edge Adjacency (c) Vertex Adjacency

Figure 3.7: Adjacency

3.5.2 Maximum Intensity Projection

Maximum Intensity Projection is a volume visualization technique which traces parallel rays from a projection plane through the volume object and projects the maximum intensity along the ray on a the projection plane. The loss in spatial information is made up by casting rays from different angles through the volume object to produce multiple images which are animated

while viewing. The human brain integrates all the frames and makes the image appear three dimensional.

Parameters

1. **No. of Frames:** The number of images to produce.
2. **Viewing Plane location:** There are two possible starting locations for the projection screen:
   - **XY Plane**: The projection plane initially located in the XY-Plane and is then rotated about the Y-axis.
   - **YZ Plane**: The projection plane is initially located in the YZ-Plane and is then rotated about the Z-axis.

The output is a multi-frame floating point IFS image which contains the maximum intensity projection of the volume image from different angles.

3.5.3 Profile Plot

Profile plots are used to look at the variation of pixel intensity along a line. The line can be traced with the mouse on the image. The pixel values along the user defined line is plotted from the start point to the end point. Figure 3.8 shows an example of a profile plot.

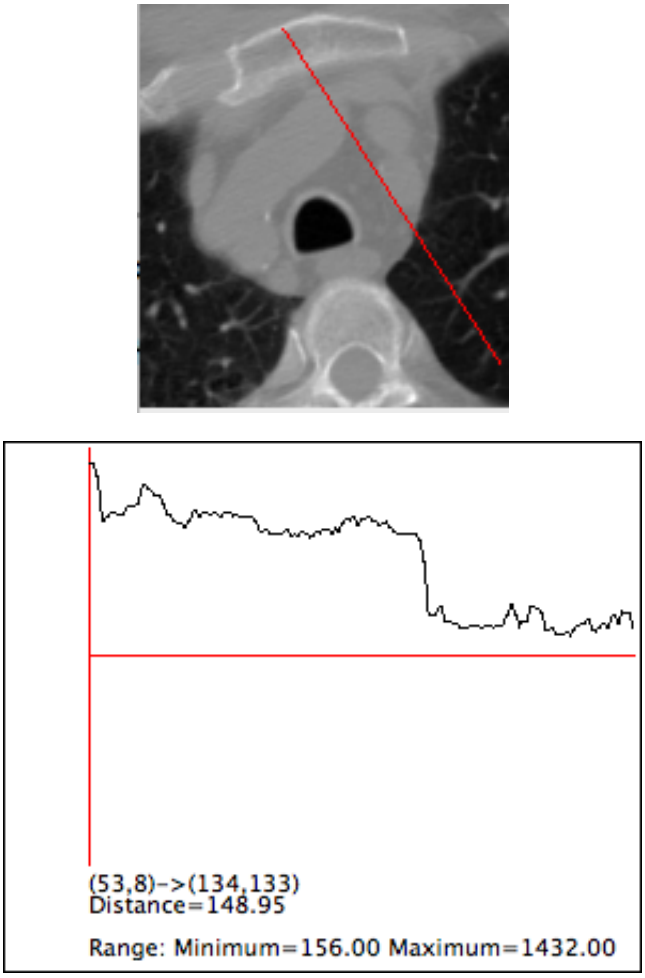


Figure 3.8: Profile plot of the image along the red line

3.5.4 Segmentation

Simple segmentation using thresholding can be done in wxIFSView. The user can pick the threshold by clicking on the histogram of the image and then use the *Segment* option to do simple thresholding. Thresholding can also be done on multi-frame images by using the same threshold across all

the frames. This is done using the *Segment 3d* option under the *Tools* menu.

3.5.5 Fast Fourier Transform and Inverse Fast Fourier Transform

The Fast Fourier Transform(FFT) and the Inverse FFT of the image can be obtained in wxIFSView. The image is automatically resized to the closest power of two by zero padding.

The output is a complex IFS image and thus, the magnitude and phase images can be viewed separately. The log colormap is best suited for visualizing the magnitude of the FFT.