

A Networked Frame Grabber

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Contents

1	Introduction	2
1.1	Hardware and software requirements	2
1.2	Typographic conventions	3
2	Installation and configuration	4
2.1	installation	4
2.2	Configuration	5
3	Operation	6
3.1	Overview	6
3.2	Menu commands	6
3.2.1	File menu	6
3.2.2	Edit menu	7
3.2.3	View menu	7
3.2.4	Frame Grabber menu	7
3.2.5	Help menu	8
3.3	Grabbing and viewing an image	8
A	Image Formats	10
B	What's Next?	11

Chapter 1

Introduction

FGView is a Windows 3.1, TCP/IP network client program that allows the user to connect to a specialized server located at the NRAO Green Bank site. This is a small Intel 286 computer with a 512 by 486 pixel video frame grabber. A CCD video camera, which currently looks out on the Green Bank Telescope construction site, is attached. FGView allows the user to connect to the server, snap an image, and download the image for viewing right on the Windows desktop.

FGView is under development primarily for the needs of the GBT Laser Ranging Project in order to inspect the status of retroreflectors and to trouble-shoot laser pointing. Parts of this system, such as the frame grabber host, may change without notice to accomodate the needs of the Laser Ranging Project. Other important aspects of the system are not yet completed. The most obvious of these to the user may be the fact that the user currently has no control over the image exposure, so *please ignore any references to CCD integration times in this manual*. This feature is documented now so that the manual need not be re-written when it is enabled. The CCD camera is currently adjusted for a bright day, so that the image will not appear washed out. This means that on a cloudy day the image may be too dark. FGView is ready to provide an exposure option to the user, but as yet the hardware to do this is not ready, so the menu options and the speed buttons are therefore inactive (grayed-out). Because the frame grabber host may need to operate in the near infra-red region of the spectrum, there is no IR cut-off filter attached to the CCD camera. This may cause some un-expected side effects to the image, such as brighter than expected trees (trees reflect green and infra-red, and absorb the red area of the visible spectrum).

Features of FGView are:

- Windows Sockets 1.1 compliant.
- Support for Windows Device Independent Bitmaps (.DIB & .BMP).
- Full clipboard cut and paste support.
- Easy to use toolbar and menu driven user interface.

1.1 Hardware and software requirements

FGView requires at least the following configuration to run:

- An IBM PC or compatible with at least an Intel 386 processor.
- 4 megabytes or more of RAM.

- A palette driven 256 color display adapter.
- A connection to a TCP/IP LAN via a network adapter or a SLIP/PPP link.
- Windows 3.1, Windows NT, or OS/2 3.0.
- TCP/IP network software that provides a Windows Socket (Winsock) version 1.1 implementation.

Virtually all current TCP/IP implementations for Windows 3.1 provide some sort of Winsock 1.1 support. Check the documentation for your network software to make sure. NT and OS/2 3.0 both provide Winsock 1.1 support without the need for third party software. OS/2 3.0 will do so only through SLIP or PPP unless IBM TCP/IP 2.0 is installed.

FGView has not been tested on a true color (16 or 24 bits per pixel) display.

Please send any comments or suggestions to *rcreager@nrao.edu*.

1.2 Typographic conventions

- **Monospace**—Monospace is used for any filenames or text that appears on the screen or that you must type in (for instance, an entry in your `AUTOEXEC.BAT` file).
- **Key**—This is used to represent any key on your keyboard, such as *Enter* or *Esc*. For instance, “press *Esc* to exit a menu or dialog box without making a selection”.
- **Key1+Key2**—This is used to denote a key combination produced by pressing and holding down *Key1* while pressing *Key2*. For example, *Alt+F* will access the **File** menu.
- **Boldface**—Boldface type indicates a menu, for instance, **Edit**, or a menu item within a menu, such as **Open**, or a dialog box name, or a dialog box selection.
- **Menu—Command**—This sequence indicates a choice from the menu bar and then a choice of a menu item in that menu. For example **Edit—Copy**—indicates that you should select the **Edit** menu and then select the **Copy** menu selection.

Chapter 2

Installation and configuration

2.1 installation

If all the requirements listed in the previous chapter are met, installation is straightforward. The files are archived in `fgview.zip`, located in the Green Bank anonymous ftp area on *sadira.gb.nrao.edu* in the directory `pc/MSWindows`. To install, place this file in the directory of your choice and unzip using `pkunzip.exe` (`pkunzip.exe` can also be found in the Green Bank anonymous ftp area, in the directory `pc/MSDOS`). FGView consists of three files: `FGVIEW.EXE` the executable file, `FGVIEW.INI`, the configuration file, and `FGVIEW.HLP`, the help file. You may choose to put the executable file, `FGVIEW.EXE`, in any directory you choose. FGView looks for the other files first in a directory specified by the `FGVIEW` environment variable, then in the Windows directory. This means that unless you put them in the Windows directory, you must specify where they are, by setting the `FGVIEW` variable in your `AUTOEXEC.BAT` file. For example,

```
set FGVIEW=c:\bin\winapps
```

would tell FGVIEW to look in the

```
c:\bin\winapps
```

directory for the `FGVIEW.INI` and `FGVIEW.HLP` files.

The last step in the installation procedure is to make a program item for it in any Program Manager group. In Program Manager, do the following:

1. Open the program group you wish to place the FGView icon in.
2. Select the **File—New...** menu item.
3. In the **New Program Object** dialog box, select the **New Program Item** radio button, then press *Enter*.
4. In the **Program Item Properties** dialog box, enter a short description of the program, such as `FGView`, and the command line to start the program. If FGView were located in the directory

```
c:\bin\winapps
```

for example, the command line would be

```
c:\bin\winapps\fgview.exe
```

You may leave the remaining fields blank.

5. Press *Enter* or click on the **OK** button to complete the operation.

If all went well, you should have an FGView icon in the program group you have selected. You are now ready to configure the program.

2.2 Configuration

Configuring FGView involves giving it the host name for the frame grabber host. Currently this is *vy1*. If you are not in the *gb.nrao.edu* domain, this is then *vy1.gb.nrao.edu*. It is possible that your domain name server will fail to resolve this host name. In this case, you must enter it in your local host table. Currently *vy1.gb.nrao.edu*'s IP address is 192.33.116.174.

To configure a new host for FGView, do the following:

1. Run FGView
2. In FGView, select the **Frame Grabber—Host...** menu item. A dialog box will appear.
3. In the **Frame Grabber Host Name** dialog box, enter the name of the host, for instance *vy1.gb.nrao.edu*. Please note that a numeric address in this field *will not work!* A future release of FGView will accept a numeric address.
4. Press *Enter* or click on the **OK** button with your mouse to complete this operation.

Chapter 3

Operation

3.1 Overview

FGView can:

- Read a bitmap from a file, and display it on screen.
- Write a bitmap to a file.
- Paste from the MS-Windows clipboard.
- Copy to the clipboard.
- Grab and display an image from the remote frame grabber host.

As with most Windows programs, FGView is operated through the menu, either with a mouse or through keyboard shortcuts, for example: *Alt+G G*, which is the shortcut key sequence for the **Frame Grabber—Grab Image** menu command, will grab an image. FGView also features a tool-bar that duplicates many of the more frequently used menu commands. To find out what each tool-bar control does, press and hold down the left mouse button while the mouse pointer is over the control. A brief description of the control will appear in the message-bar at the bottom border of the window. If you do not wish to execute that command when you are done reading the description, move the mouse pointer away from the control before you release the left mouse button.

3.2 Menu commands

3.2.1 File menu

Open...

Opens a standard Windows File Open dialog box, from which a bitmap file may be selected for viewing.

Save...

Opens a standard Windows File Save dialog box, from which a filename can be selected for the bitmap to be saved.

Exit

Exits FGView.

3.2.2 Edit menu

Copy

Copies the current image into the Windows clip-board.

Paste

Copies the contents of the clip-board into FGView's display window.

3.2.3 View menu

Fit to window

When checked, stretches or compresses the image to fit the display window. Changing the size and/or aspect ration of the window when this option is selected will change the size and aspect ratio of the image (but not of the actual bitmap. This is never modified.) When this item is unchecked, the image size and aspect ratio reflect the actual bitmap. If the window is smaller than the bitmap's dimentionions scroll bars will appear in the window to allow the user to scroll around the image.

3.2.4 Frame Grabber menu

Host...

Selecting this menu item brings up the **Frame Grabber Host Name** dialog box. This dialog box is used to enter a new frame grabber host name. Changing the host name while downloading an image from the current host will have no effect.

The following menu items select the frame (memory area) used to store its image. The frame grabber's memory actually consists of 4 64K byte memory pages. The frame grabber is capable of capturing a low resolution image (256 by 243 pixels) into any of these 4 pages, or one high resolution image (512 by 486 pixels) using all 4 pages. A check mark will appear next to the selected frame. The frame selections are mutually exclusive.

Frame 1

Select a low resolution image using frame 1.

Frame 2

Select a low resolution image using frame 2.

Frame 3

Select a low resolution image using frame 3.

Frame 4

Select a low resolution image using frame 4.

Full Frame

Select a high resolution image. The frame grabber will use all of it's memory to store the image. This higher quality image will take four times longer to download than a lower resolution image, since it occupies all four frames on the frame grabber.

The next eight menu items select the integration time of the CCD camera. These times are in fractions of a second. As with a film camera, the shorter exposures are used in bright ambient light conditions. The shortest exposure possible is one ten thousandth of a second, which gives some indication of the sensitivity of the CCD chip. These menu items have corresponding speed bar buttons. The buttons for each exposure time have been labeled 1000 for an exposure of 1/10000 of a second,

500 for 1/5000 of a second, etc.

1/10000

Sets the CCD to integrate for 1/10000 second.

1/5000

Sets the CCD to integrate for 1/5000 second.

1/2500

Sets the CCD to integrate for 1/2500 second.

1/1250

Sets the CCD to integrate for 1/1250 second.

1/600

Sets the CCD to integrate for 1/600 second.

1/300

Sets the CCD to integrate for 1/300 second.

1/150

Sets the CCD to integrate for 1/150 second.

1/80

Sets the CCD to integrate for 1/80 second.

Grab Image

Snap and download a picture, using the selected page and resolution options.

3.2.5 Help menu

There currently is no help file for this program. A Windows .HLP help file is a future enhancement that is currently in the works. All functions are covered in this manual, however. There is an on-line version of this manual at URL http://freya.gb.nrao.edu/fg_manual/contents.html. You may use any World Wide Web browser (Mosaic, Netscape, Lynx etc.) to view this document.

3.3 Grabbing and viewing an image

The following discussion assumes that FGView has been configured for the proper frame grabber server. The main purpose of FGView is to log onto the frame grabber server, command the server to grab an image, download that image from the server, and display it in its display window. Most of this is transparent to the user. The following sequence illustrates a typical session with FGView:

1. Start FGView by double clicking on its icon from within Program Manager.
2. Choose the desired frame and resolution, either using the speed bar buttons or the **Frame Grabber** menu.
3. Choose a starting CCD integration time.
4. Grab the image.

At this point, you will notice some activity on the message bar at the bottom of the display window as FGView prints some status messages. When it is commanded to grab an image, FGView logs onto the server, sets the options as chosen above, and commands the server to grab an image. When the server is done grabbing the image, FGView begins downloading the image. The first clue that all went well is that the progress of the download is displayed in the message bar. When the image has been received, FGView disconnects from the server, calculates the transmission time and rate and prints them on the message bar, and displays the image.

The first image has little likelihood of being “right”. It may be too light and washed out, if the integration time is too long, or too dark if the integration time is too short. Because of this it is suggested that the user use a low resolution mode to set the exposure correctly, grab an image, adjust the exposure if necessary, and try again. Once a good integration time is found, switch to high resolution and grab the final image. This will save on a lot of transmission time, especially over a slow link, as a low resolution image is only 64Kbytes, as opposed to the quarter megabyte of a high resolution image.

You may notice that the image aspect ratio is not quite right. This is because the CCD and frame grabber are set to produce a correct image on an NTSC display device, such as a TV, which your Windows display is not. To display the image with a more pleasing aspect ratio, check the **View—Fit to window** menu option, or its corresponding speed bar button. This will cause FGView to ‘stretch’ the image to fill the display window. If the window is adjusted, the image will change to completely fill it. Adjust the horizontal and vertical size until the image looks right. Note that this does not actually change the bitmap, only the displayed image. To resize the bitmap itself, import it to a image viewing program that allows resizing of the bitmap, such as LView 3.1 (see Appendix A).

Appendix A

Image Formats

The image format used by FGView is the Microsoft Windows Device Independent Bitmap (DIB) format. Such files usually are known by their file name extension of .BMP or, on rare occasions, .DIB. This format can be read by any Windows, Windows NT or OS/2 image display program, such as the Paintbrush accessory that comes bundled with MS-Windows 3.1. Conversion to other image formats can be easily performed by using a viewer that supports the DIB format as well as the desired destination format, such as the LView viewer. This very good (and free!) viewer, written by Leonardo H. Lourerio, may be obtained from any Windows freeware/shareware archive site, such as *ftp.cdrom.com*. In addition to the Windows DIB format, it supports the OS/2 DIB, JPEG, GIF 87a/89a, and Targa image formats.

The following sequence can be used to convert an FGView image into any of the LView supported formats:

1. Start FGView, and grab an image.
2. When the desired image is obtained, either save it to disk, or copy it to the clipboard.
3. Start LView. If the image was saved to disk, load the image into LView using the DIB image format using the LView **File—Open** menu command. In the **Open File** dialog box, select the **Windows(*.bmp, *.dib)** selection in the **List Files of Type:** list box. Select the file and click on **OK**. The image will be displayed in the LView display window.

If the image was copied to the clipboard, then paste it from the clipboard using either the **Shift+Insert** command or the **Edit—Paste** menu command. The image will be displayed in the LView display window.

4. Save the file in the new format. In LView, select **File—Save as....** In the **Save File as** dialog box, select the desired image format from the **Save File as Type:** list box, choose a file name for your image and click on the **OK** button.

That's it! Once the image is in one of the universal formats, such as GIF, it can be further converted to formats not supported by LView by using utilities such as the UNIX xv viewer program.

Appendix B

What's Next?

Future plans for FGView include:

1. Enabling the integration time functions.
2. Converting this document to a Windows help file.
3. Converting FGView to a multithreaded 32 bit NT program.

Ultimately, I would like to write a program that would work with the HTTP service on my Microsoft NT workstation to take over the functions of this program (something similar could be done on UNIX with HTTPD). This would provide the functionality of FGView to anyone with a graphical web browser, such as NCSA Mosaic, IBM WebExplorer, Netscape etc. The user would no longer be tied to a PC but could use a Sun, Macintosh, PC etc. to view the images that are now viewable only with FGView on a Microsoft Windows 3.1 system.