

Vistapro 1 Manual

Windows version

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Chapter 1 Introduction To Vistapro

WHAT IS VISTAPRO?

Vistapro is a three dimensional landscape simulation program. Using U.S. Geological Survey (USGS) Digital Elevation Model (DEM) data, Vistapro can accurately recreate real world landscapes in vivid detail. As a fractal landscape generator, Vistapro can create landscapes from a random seed number. Vistapro supports over four billion different fractal landscapes. Simply by changing a number, you can create whole new worlds. In addition, by simply clicking on several buttons, rivers and lakes can be created in a landscape where none existed previously.

HOW VISTAPRO WORKS

Vistapro uses a combination of artificial intelligence, chaotic math, and a user definable set of values to simulate landscapes in their natural state. At present, the USGS has converted about 40% of the United States to DEM files which may be potentially used with Vistapro. Vistapro is a single frame generator, meaning that it acts like a camera; point and click the camera and Vistapro will render a new view of the landscape.

Landscapes can be viewed from a practically infinite combination of heights, angles, and distances. Using the combination of user controllable values and Vistapro's built-in routines, landscapes can be made as realistic or as surreal as desired. It is easy to alter tree and snow lines, haze, exposure, rivers, lakes, and light sources to customize the appearance of the landscape.

Vistapro uses data derived from United States Geologic Survey Digital Elevation Mapping files for generating its images. These files contain coordinate and elevation data at 30 meter (roughly 100 ft.) increments. Each file used in Vistapro contains about 65,000 elevation points and 130,000 polygons.

Vistapro doesn't know anything about what covers the terrain. It doesn't know where the trees, roads or buildings are. It does its best to color each polygon (based upon a few numbers that you

input) in a realistic way. It still can't draw each rock and tree where they are in reality.

SOME USES FOR VISTAPRO

Vistapro is not only of interest to scientists and engineers. Artists, writers, teachers, game designers, travelers, and people just looking for hours of entertainment will appreciate Vistapro.

Artists can design realistic scenery as backgrounds for their artwork. Writers can create worlds and see them through their characters' eyes. Geography, geology, and meteorology teachers can use Vistapro to breathe life into their subjects. Game designers can make realistic or surrealistic scenery for backgrounds in their games. Travelers, hikers, and backpackers can preview their journeys.

Vistapro can be pure entertainment. Explore fascinating terrains that you might never have a chance to see, or visit distant planets that man has not yet trod. Build new worlds that exist nowhere except in the imagination, and then visit them as if they were really there. On the other hand, there are many scientific and business applications for Vistapro. Environmentalists, surveyors, geologists, architects and engineers will all find Vistapro a useful adjunct to their work.

SPEEDING UP VISTAPRO

There are two ways to speed up Vistapro - strategy or brute strength. After having used the program for a while, it becomes easy to read the lower resolution settings in Vistapro to see how the desired picture is developing. When the scene is properly positioned and lighted, and when the tree line, snow line, and water levels are set as desired, then and only then, render the picture at the time-consuming full resolution mode.

The other alternative method of speeding up Vistapro's rendering process is to add power to your machine. Vistapro is programmed to use every available computing resource as efficiently as possible. The time consuming rendering process is a function of the enormous amount of computation that Vistapro must do, not any lack of optimization of the program itself. Vistapro will automatically look for and use whatever processing resources are supplied.

Realistic ray traced CAD objects, detailed 3-D animations, and realistic landscapes are all a part of the emerging software categories called virtual reality, artificial reality, or computer aided art. These categories all require immense computational capacity, but as the cost of computing power continues to plummet, these types of programs will become the standard.

As a Vistapro user, you are pioneering virtual reality exploration, and it is admittedly a bit tedious on a slower machine. But, viewed another way, it is amazing that this type of rendering can be done at all, let alone on a personal computer. Until the advent of Vistapro, landscape renderings of such realism were only available to users of mainframes and supercomputers for government projects.

MAKING THE MOST OF VISTAPRO

Making a stunning landscape in Vistapro requires the combined eye of a photographer and the artistic sense of a painter, but there are a few tips which can help improve your first attempts:

Lighting

Experiment with the lighting. If the light is coming from behind the camera, then the camera scenes may appear rather flat-there won't be a strong feeling of three-dimensionality. Dramatic shadowing effects can be created by choosing the proper lighting direction and angle.

With the power of Vistapro, an artist can choose to light the scene in ways which could never occur in the real world, or, if realism is desired, the correct solar position for that particular season and geographic location and time of day can be selected. Virtual Reality Labs' Distant Suns Windows program can easily calculate such solar lighting conditions in order to correctly set the light, target, and camera position to obtain maximum realism in a rendering.

If lighting is left to chance, shadows may cover the scene making it too dark. Setting the light source (the sun) at 45 to 90 degrees to the left or right of the camera gives the best results. For example: if the camera is facing due north, placing the sun at the southeast, east, southwest or west, usually makes the best pictures.

Placing the sun directly behind the camera usually results in a lack of three dimensionality and contrast, although there are times when this is the desired effect. Back-lit scenes (for example: camera facing north, sun shining from the north) can also yield interesting images.

Snow and tree line setting considerations

If the normal range of snow line and tree line is known, Vistapro can be used in a very realistic way. Tree line varies with latitude until, in arctic regions, it reaches sea level. Snow levels vary with the weather and altitude.

A little research at the local library or even listening to the weather on the evening news can provide increased realism in Vistapro landscape rendering. Of course an artist needn't follow the real world as an example. Set the tree and snow lines wherever they make the picture most appealing. Imagine a landscape as it might have looked during the last ice age - or how it might look after severe global warming from the greenhouse effect!

Changing colors

Use the Color Control Panel to change the colors, contrast, and exposure used to render the landscape. Most landscape data sets produced by Virtual Reality Labs have shades of green for lower elevations, brown for middle elevations, and white for upper elevations. Try changing the Tree colors to pinks and whites. This makes them look like flowering fruit trees in the spring. Change them to reds, browns and yellows for an autumn scene.

Foreground fat polys or jaggies

Since the accuracy of the data limits the detail that Vistapro can display, some of the foreground features will contain fat polys or jaggies. Vistapro builds all images with polygons - tens of thousands of polygons per scene. The polygons are all about the same size but those near the camera will appear very large on the screen - just as a nearby object looks large in a photograph of a real world landscape.

There are several ways of reducing this effect. One of the simplest is to raise the camera a few hundred meters above the ground. If you use the mouse to position the camera it is automatically set 30 meters above the landscape. Since the nearest polygon (the one right under the camera) is only 30 meters away it will look very large (if it is within the field of view). If you raise the camera 300 meters it will look about 10 times smaller.

The Texture function breaks up nearby polygons into several smaller pieces and renders each at a slightly different shade- giving them higher detail.

Another method of hiding fat polys is Gouraud shading. Gouraud shading blends the edges of the polygons with each other, eliminating the sharp color change from one polygon to the next, and provides a beautiful artistic interpretation of the scene. Gouraud shading blends even very large foreground polygons into oblivion.

Finally, if there is a particularly critical need for a certain viewpoint, you may be able to move the camera very slightly forward to clear local obstacles. If there is still something in the foreground which you would like to remove, export the picture to an art program in order to pull out or modify the unwanted features. Texturizing and Gouraud shading can be combined to generate even more interesting details.

A note about aesthetics

Remember, there is no more a right way to use Vistapro than there is a right way to use a camera. A child using a camera or Vistapro may derive a lot of knowledge and entertainment from a result which would not please a more professional artist. Like the natural world it imitates, Vistapro gives the artist an unlimited number of choices for portrayal. What looks great to one person may not appeal to the next.

Fractals imitate the way nature looks, but they carry no information about geology, plate tectonics or erosion. Pictures produced with Vistapro will be interpretive because Vistapro is producing an artificial reality. The philosophical and aesthetic ramifications of virtual reality construction are immense. Vistapro is an early forerunner of a medium of art and expression, as powerful and unique as photography for creative work.

For many years after their introduction, photographs sparked lively debate about whether they were art. Computer art and virtual reality simulation seem destined to foment a similar debate in the future.

Exploration with Vistapro

As a virtual reality simulator, Vistapro allows people to explore landscapes they will probably never be able to explore first hand. While many people will have the opportunity to visit a few of the national parks, it is highly unlikely that any of us, except a few who are now children, will have the chance to tour the caldera of Mons Olympus on Mars.

As Virtual Reality Labs is able to convert more of the data already available from planetary probes and undersea explorers, Vistapro will allow exploration of forbidding and alien landscapes decades, or even centuries, before the first human explorer is able to take tourist snapshots. By giving its users the ability to wander about distant landscapes, rendering true perspective pictures of their choice, Vistapro and later progeny will free humanity from its current boundaries long before such explorations are economically feasible.

Technical Support

For Technical Support, call Virtual Reality Laboratories, Inc. (805) 237-2311

Chapter 2 User Information

HARD DISK INSTALLATION

At a minimum, you must have the following hardware and software to run Vistapro:

- IBM PC compatible computer with 640 KB memory
- MSDOS or PCDOS operating system
- Microsoft compatible mouse and driver
- VGA, Extended VGA, or Super VGA graphics modes (requires VESA driver)
- DOS hard disk partition with at least 3 MB free space

To run the install program again, place the book's CD-ROM in your CD-ROM drive and follow these steps:

1. From the DOS prompt, type **x:\VISTAPRO\INSTALL drive:** and press Enter. Substitute your CD-ROM drive letter for "x:" and substitute the drive you want to install to for "drive". For example, if your CD drive is D: and you want to install to drive C:, type **D:\VISTAPRO\INSTALL C:** and press Enter.
2. The installation program will display an introductory message. Press any key to continue.

3. The program will begin installing the files to your hard drive.
4. A message will appear when the program is finished—press any key to exit.

MEMORY USAGE BY VISTAPRO

Vistapro requires a lot of memory (RAM) to run. It must have about 540,000 bytes of free memory. You can determine how much memory is free at the DOS prompt by typing:

CHKDSK

Note that the CHKDSK program must be in the search path for this to work. On many system setups, the CHKDSK program is located in C:\DOS\CHKDSK. If after typing CHKDSK, DOS complains about not being able to find the file try the other two options. If you still can't find the CHKDSK program try it on your original DOS floppy disks.

DOS 5 and DOS 6 users can also use the MEM program to obtain the total and free amounts of memory.

A few seconds after starting the CHKDSK program you will see several lines of information printed to the screen. Exactly what's printed out varies with different versions of DOS but you should see two lines that look something like:

```
655360 total bytes memory 595232 bytes free
```

The important line is the second one. The value on this line should be greater than 540,000 for Vistapro to run properly. Most people will have enough memory free, but if you don't, you will have to do something to free up some memory. The simplest option is to remove some memory resident programs from memory.

You might also try removing unused device drivers. ANSI.SYS is often installed but not used. A RAM disk may be eating up some conventional memory, and even though it is desirable to have Vistapro put its temporary files on the RAM disk (see below) you may want to remove it if the existence of the RAM disk eats up too much memory.

Lowering the BUFFERS settings in your CONFIG.SYS file can free up about 500 bytes per buffer; reducing buffers from 30 to 20, for example, will free up about 5 KB of memory. Setting buffers to less than 20 or so is not recommended.

Unfortunately, all these solutions require editing your CONFIG.SYS or AUTOEXEC.BAT files and rebooting the computer. If you are not familiar with these files we don't recommend fiddling with them.

Another good way to free up some memory on 80286, 80386, and 80486 systems is to upgrade to DOS 5, DOS 6 or DR DOS 6.0. Both of these solutions require that you buy these packages and then spend the time installing them - and probably backing up your hard disk too.

ADVANCED SETUP OPTIONS

Vistapro uses several temporary files while it is running. These files contain data that is used internally and a copy of the graphics screen after a picture is rendered. We recommend placing these files on the fastest available drive or partition. If the environmental variable VTEMPDIR is not defined, Vistapro will create these files in its default directory, usually C:\VISTAPRO. If VTEMPDIR is set to a valid drive and pathname, Vistapro will place these working files at that location. These files may total as much as 1.2 MB.

If you can spare the memory we suggest setting VTEMPDIR to point to a RAM disk that is big enough to hold all the temporary files. For example, if your RAM disk is drive D and is 1.2 MB or

greater type:

```
SET VTEMPDIR=D:\
```

to set the variable. You may want to place this command in your autoexec.bat file. Vistapro will run a little faster and more smoothly with its temp file on RAM disk. If VTEMPDIR is set to a drive or directory that doesn't exist Vistapro will complain and abort. You can erase the environmental variable with:

```
SET VTEMPDIR=
```

This will force Vistapro to return to using the default directory for its temporary files.

The screen modes you plan to use will determine how big a RAM disk you need for the temp files:

Graphics mode	Bytes needed
320x200	520,000
640x400	700,000
640x480	750,000
800x600	930,000
1024x768	1,170,000

For example, if you will only be using the lowest resolution graphics mode (320x200) your RAM disk need only be 520,000 bytes.

Note that the RAM disk must be in EMS or XMS and that Vistapro will still need about 540,000 bytes of DOS program memory.

You may also use VTEMPDIR to select another hard disk for the temp files. Many people keep their permanent files on one disk or partition and transitory files on another disk or partition. We suggest putting the temp files (via VTEMPDIR) on your fastest available device.

RUNNING VISTAPRO

To run Vistapro you need to change to the the Vistapro directory and type "VISTAPRO". For example, if you installed Vistapro in C:\VISTAPRO:

1. C: (selects drive C)
2. CD \VISTAPRO (go to \VISTAPRO subdirectory)
3. VISTAPRO (run Vistapro)

It is not recommended that you try to run Vistapro without going to the Vistapro directory first. For example, if you are in the root directory of drive C and type VISTAPRO\VISTAPRO Vistapro will either complain about not being able to find the overlay file or ask for the name of the overlay file. In this case you can type:

```
VISTAPRO\VISTAPRO.EXE
```

You should also not change the name of the VISTAPRO.EXE program since the overlay manager only knows to look for VISTAPRO.EXE for its overlays.

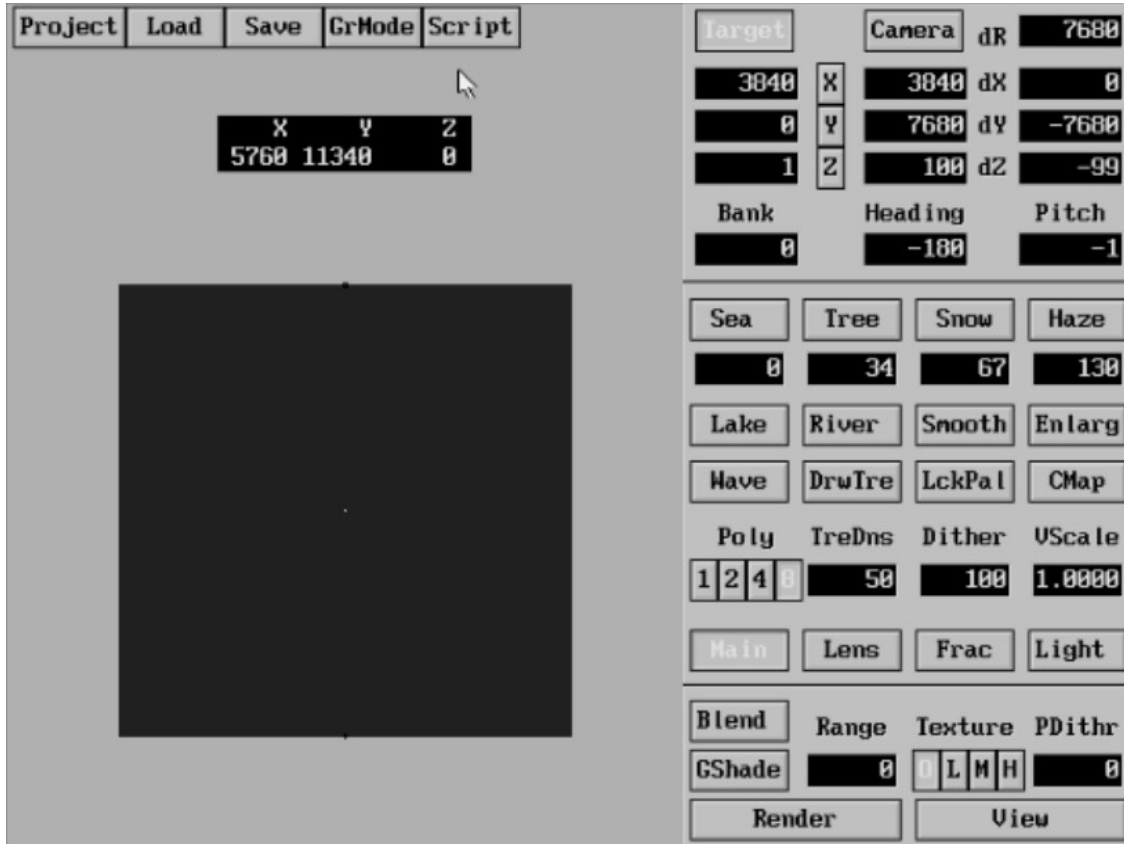
GRAPHICAL USER INTERFACE

Vistapro's graphical user interface is similar to the "point and click" interface found in many windowing packages. Just move the cursor around the screen with the mouse and click its buttons to control the program. Only occasionally is it necessary to type in a number or text from

the keyboard.

In general, the left mouse button is used to select things and the right mouse button is used to abort some operations.

A brief description of the elements of Vistapro's interface is given below.



Mouse

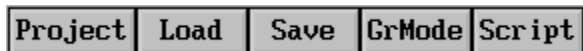
The mouse is the primary input device for controlling Vistapro. As the mouse is moved around on the desk, notice the arrow shaped cursor move around the screen. The active part of the arrow is its tip. The left mouse button is used to select items or locations on the screen. When Vistapro is calculating something or loading/saving files to disk, the mouse cursor will change to an hourglass to indicate that the program is busy. When the hourglass cursor is visible none of the buttons, menus, etc., on the screen may be used; wait for Vistapro to finish the current function and the arrow will reappear.

Labels

Labels are just for information. Labels appear as black text with a highlighting to make the text look as if it is engraved into the background.

Menus

At the top left corner of the screen are several Menu Header buttons. They are rectangles with highlighted outlines and black text on them. When the mouse cursor is placed over one of these, press down on the left mouse button. Notice the button on the screen depresses, the text within it lights up, and a pull down menu appears just below the button. As long as the left mouse button is held down, the pull down menu will remain visible.



To select one of the menu items, move the mouse down (while still pressing the left mouse button) until the cursor is over the item you want to select. Notice the text of each menu item lights up as the cursor moves over the item - this is to let you know for sure which item the cursor is over. If you release the left mouse button while one of the menu items is lighted, Vistapro will know that item is selected, and take the appropriate action. If the mouse button is released while the cursor is not over one of the items (none of the items is lighted), no action will be taken. In either case the pull down menu will be erased and the Menu Header button will pop back up and darken.

Some pull downs contain items that are mutually exclusive - only one of the items is allowed to be selected at a time. The Graphics Mode pull down is one such menu. The selected mode is indicated by the * that appears at the left edge of the pull down. If a new item is selected, the * will move to the new item.

Buttons

Buttons (other than Menu Header buttons) come in two types:

- Two-state buttons
- Action buttons

Two-state buttons have an on state (button depressed, text lit) and an off state (button up, text dark). Change the state of a button by moving the mouse cursor over it and pressing and releasing the left mouse button. Notice the button change from on to off or from off to on. Each time a Two-state button is pressed, it changes state. For example, turn on shadows by depressing the Shadow button and turn them off by pressing the button again.

Action buttons are used for starting actions rather than changing a state. These buttons will automatically pop back up again after the action is completed. The Render button is an example of an Action button. When Render is pressed, Vistapro renders the screen. When the rendering is finished (or aborted) the button pops back up.

Both types of buttons require release of the left mouse button while the mouse cursor is still on top of the button image. If the mouse cursor is moved off the button and released, the button on the screen will pop back to its original state with no action taken.

Gadgets

Gadgets have two functions. One is to show the current value of a setting within Vistapro. The other is to specify a new value. They appear as white numbers or text on a black background. There are two types of gadgets:

- numerical

- text

Numerical gadgets are for setting numerical variables within Vistapro. The exact value of a variable is displayed within a numerical gadget. A new value can be displayed by clicking the mouse button on one of the gadgets. The Camera position gadgets are examples of numerical gadgets.

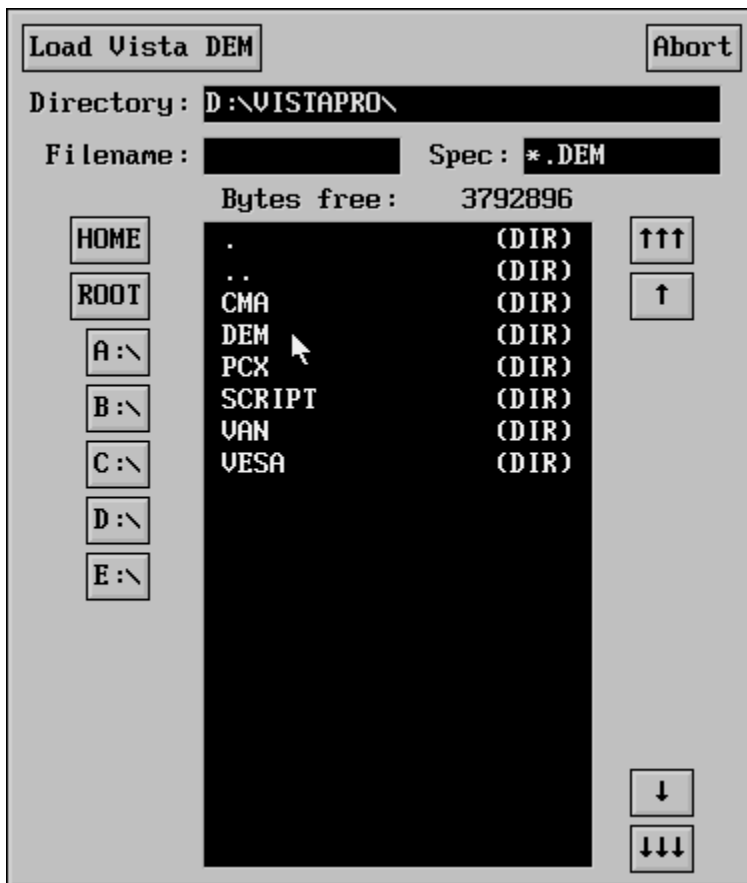
Text gadgets are for inputting text into Vistapro. Their main use is for specifying filenames. As is done with numerical gadgets, they can be changed by clicking the left mouse button on them and editing the text from the keyboard.

To edit either type of gadget, place the mouse cursor on the gadget and press the left mouse button. The mouse cursor disappears, and a text cursor appears within the text at the position of the click. The editor is always in insert mode, meaning that any new characters typed will be placed into the gadget just in front of the character the cursor is on. Move the cursor to the left or right with the left and right arrow keys.

If you press an invalid key for the type of gadget being edited, the background of the screen will flash white. Completely clear the gadget by pressing the space bar. Indicate final acceptance of the new gadget by pressing ENTER on the keyboard or clicking the left mouse button. Abort editing (restoring the edited gadget to its original value) by pressing ESCAPE on the keyboard or clicking the right mouse button.

Vistapro File Requestor

When you perform an operation that requires a file name (loading or saving image files, for example) Vistapro opens its File Requestor window. The File Requestor is a device for selecting or specifying file names. You can select an existing file by clicking on the name displayed in the Filename Window. If you want to create a new file click on the Filename text gadget and type in the new name. You can also navigate around your hard disk(s) and floppy disks in search of files or directories.



At the top of the File Requestor are two buttons. The button at the top left is for confirming the

indicated operation. The exact text on the button varies depending on the operation that is requested. For example, if you selected Load PCX the button reads Load PCX file. Click on this after selecting the desired filename (described below) and Vistapro will continue with the operation; in this case it will load and display the indicated PCX picture. We refer to this button as the Confirm button since its text varies according to operation.

The button at the right of the File requestor is labeled Abort. If you decide that you don't want to continue with the operation you can press this button and Vistapro then ignores the original request. For example if you selected Load PCX and then decide that you don't really want to view any files, click on Abort and Vistapro simply closes the file requestor and returns to the main screen with no actions taken.

The Directory text gadget (to the right of the Directory Label) is for specifying the drive and directory from which to select the file. This also selects the path from which the list of files in the Filename Window is displayed. You can either type in a drive and directory directly or select a drive or directory from the Drive Selector buttons or the Filename Window.

The Filename text gadget is for specifying the exact file name. You can either type in the name or select one from the Filename Window. Of course if you are creating a new file you will have to type the name in, since it will not appear in the Filename Window. If you are creating a new file and you select the name of an existing file Vistapro will warn you after you click on the Confirm button. You are then able to continue with the operation (the old file will be deleted and the new one created) or abort it.

When saving files Vistapro supplies a default filename extension if you do not specify one. For example, if you are saving a DEM file and select the name TESTFILE, Vistapro will automatically add .DEM to the filename before saving. Each of the save functions has its own default extension:

File type	Default extension
DEM	DEM
CMAP	DEM
PCX	PCX
Script	SCR
VANIM	VAN

To override the automatic default extensions place a "." at the end of the name you specify. For example:

TESTFILE.

will force Vistapro to save the file without the default extension. You may also specify your own extension by typing it in:

TESTFILE.EXT

To the right of the Filename text gadget is the Spec text gadget. This is for entering the specification (sometimes called filter or template) for the name of the files that appears in the Filename Window. This gadget initially has the default file specification for the current request. For example if you select LOAD DEM the Spec is then *.DEM and only files ending with .DEM appear in the Filename Window. You can type in your own Spec if desired. The format is the same as for DOS's wildcard specifications. In short "?" means any ONE character and "*" means any number (including none) of any characters. See your DOS manual for further details. In general you do not have to change the file Spec.

At the left edge of the screen are several buttons labeled Home, Root, A:\, B:\, C:\ etc. The exact number of buttons varies depending on your system setup. There is a button for each drive (including substituted drives) on your machine. These buttons are used to select between your different drives. For example, clicking on C:\ will cause the Directory text gadget to change to C:\ and the Filename Window is then updated with the directory of the root directory of drive C. Home selects the default directory from which Vistapro was started. In most cases this will be C:\VISTAPRO. Root selects the root of the default drive, usually C:\. The most Drive buttons that will ever appear is 12, including Home and Root. After Home and Root the rest of the drives then appear in alphabetical order.

The Filename Window is the large window towards the center-bottom of the File requestor. This window has a list of all directories and files that match the File Spec (documented above). Regular files show their name and size in bytes. Directories appear in a slightly brighter text and in place of the file size is the text (DIR). All directories appear in alphabetical order and all are at the top of the list. All filenames that match the File Spec appear after all the directories. If you select a directory (by clicking on it) the directory name is appended to the Directory text gadget and the Filename Window is updated with the directory of the selected directory. Selecting a file copies the filename into the Filename text gadget. After selecting the filename click on the Confirm button.

There are often two special directory names at the top of the list, "." and "..". The "." selects the current directory again. This forces the Filename Window to be updated with the current directory. For instance, if you are looking in directory A:\DEM (Virtual Reality ships all DEM files on floppy diskettes in a subdirectory called DEM) for a particular DEM, and you decide to look on another floppy, you can simply put the new floppy in the drive and press the "." directory name. The Filename Window is then updated with files on the new diskette. Of course you can also press A:\ and then select the DEM directory name to get the same results. The ".." directory name is for stepping up to the parent of the current directory. It is the equivalent of typing CD .. at the DOS prompt.

To the right of the Filename Window are four buttons labeled with up and down arrows. The button with three up arrows scrolls the Filename Window up one page. Three down arrows scrolls down one page. The single up arrow button scrolls up one line, the single down arrow button scrolls down one line. You use these buttons to scroll around in search of the desired filename. Just above the Filename Window is a label indicating how much disk space is free on the currently selected drive. This is especially useful when creating animations, since animation files can be very large, tens, even hundreds of megabytes! The text will appear as:

Bytes free: xxxx

where xxxx is the number of bytes free on the drive.

Aborting operations

Within Vistapro, most operations that take a significant amount of time can be aborted either by pressing the ESCAPE key or by pressing and holding down the right mouse button until you see the operation abort. Rendering is an example of such an operation.

Special Keyboard Commands

There are a few special keyboard commands. These keyboard functions are not active when the Busy cursor is visible or when editing gadgets.

F10 Redraw the screen or File requestor, in case the screen is corrupted.

Alt-Q Quit Vistapro, return to DOS.

0 The "0" (above the "P" key, not the one on the numeric keypad) will cause

Vistapro to set the elevations of the edges of the landscape to 0. This makes the landscape look like it was cut out of the surface of the earth with a cookie cutter. The camera must, of course, be located in a position that shows the outside edge of the landscape.

Chapter 3 Vistapro Menu

Vistapro's menus are accessed via the buttons at the top left of the main screen. To see the menus, place the mouse cursor over one of the buttons and press the left mouse button. A menu with several selections appears immediately below the button. This menu will remain on the screen as long as the left mouse button is held down. To select a menu item, move the mouse pointer down over the menu and release it when the cursor is over the desired item. For more general information on using the menus see the Graphical User Interface section located in Chapter 2 of the manual.

There are five menus in Vistapro:



- The Project Menu allows access to DOS, information about Vistapro, information about the currently loaded landscape, and the quit Vistapro function.
- The Load Menu allows loading of landscapes, colormaps and pictures.
- The Save Menu saves landscapes, colormaps and pictures.
- The GrMode Menu is used for selecting graphics and animation modes.
- The Script Menu is for creating and executing Scripts.

Many of the Menu items involve the use of Vistapro's File Requestor. The File Requestor indicates file names for those functions which require file names—loading and saving files, for example. The File Requestor allows easy navigation through drives and directories to find files. See the section titled Vistapro File Requestor for more details on how to use the File Requestor.

Project	Load	Save	GrMode	Script
Spawn DOS	Load DEM	Save DEM	VGA 320x200	Generate
About Vista	Load CMAP	Save CMAP	VANIM 320X200	Create
About DEM	Load PCX	Save PCX	VESA 640x400	Open
Quit			VESA 640X480	Add
			VESA 800X600	Preview
			VESA 1024x768	Execute

PROJECT MENU

The Project Menu allows temporary transfer to DOS, retrieves the information about the current landscape, and allows you to quit Vistapro.

Spawn DOS

Spawn DOS temporarily transfers you to the DOS command line. Spawn DOS is useful to format a diskette, delete files, view an animation, or perform other DOS tasks. When Spawn DOS is requested, Vistapro returns the screen to the starting mode. It frees about 256K of memory and then attempts to run COMMAND.COM. If an attempt is made to run a program that requires more than 256K of memory, it may not succeed. After the DOS excursion is completed, type EXIT to exit DOS and return to Vistapro. Vistapro returns to the state that it was in when the DOS excursion was initiated.

About Vista

About Vista opens a window with information about Vistapro, its authors, and its publisher. While this window is visible, none of the other Vistapro menus and buttons will be active even though they are still visible. To shut this window click the button labeled OK at the top left corner of the window.

About Landscape

About Landscape opens a window with information about the current landscape. The file name of the landscape and other information from the landscape header file will appear. While this window is visible, none of the other Vistapro menus and buttons are active even though they are still visible. To shut this window click the button labeled OK at the top left corner of the window.

Quit

Quit causes Vistapro to clean up after itself and return to DOS or the program from which you started Vistapro. Vistapro will delete all its temporary files, restore the screen to the mode that it was in when Vistapro was started, and free the memory it was using.

LOAD MENU

Load Menu loads landscapes, colormaps, and picture (PCX format) files into Vistapro. The File Requestor is used for all these functions. See the File Requestor section for details on its use.

Load DEM

DEM is an acronym for Digital Elevation Model—a format used to represent landscape data. Load DEM loads a landscape into Vista. Each Vistapro landscape has elevation data, color data, and usually, some textual information (which can be read via the About Landscape Menu item). All of this information is loaded by Load DEM. Many of the internal settings of Vistapro will be reset to some default values when a landscape is loaded—for instance, the camera is placed at the top center of the contour map and the target is placed at the bottom center. Vistapro recalculates all of its coloring and shading information when rendering starts.

When installing Vistapro, all landscapes are placed in the DEM subdirectory in the Vistapro directory. For example, if Vistapro was installed in C:\VISTAPRO then all its landscapes will be found in C:\VISTAPRO\DEM.

Load CMAP

The CMAP, or colormap, is the group of colors, contrast setting, and exposure setting used to color the landscape and render the picture. (You can see and alter these colors and settings by using the Color Control Panel.) After loading a new CMAP, Vistapro will need to recalculate the color palette used for drawing pictures, and the shading information. By default, when you install Vistapro, the CMAP files will be in a subdirectory called CMA located in your Vistapro directory.

If Vistapro was installed in C:\VISTAPRO then all your CMAP files will be found in C:\VISTAPRO\CMA. Colormap files are actually DEM files with elevation data for a flat landscape (flat landscapes compress very well and only require about 4K of disk space). Since each DEM file also has a colormap, you can load colormaps from other landscapes. To do this, simply look in the DEM directory instead of the CMA directory and select the DEM file. Only the colormap

portion of the DEM file will be loaded.

Load PCX

Vistapro can load and save pictures in PCX format. Use this menu item to view previously saved pictures. Use the File Requestor to select the desired PCX file. If the PCX image is a different size than the current GrMode, Vistapro gives you the option of changing the GrMode for displaying the image. If you don't change the GrMode and the picture is larger than the current GrMode setting loaded, you will see only the top left corner of the picture.

If the picture is smaller than the current GrMode, the picture will be at the top left corner of the screen. Vistapro pictures are saved in the PCX subdirectory, in the Vistapro directory. This is C:\VISTAPRO\PCX. Vistapro only supports the 256 color PCX format. Pictures created by other programs in the 16 color PCX format (usually EGA programs) cannot be loaded. Vistapro continues to display a loaded PCX file until either mouse button is clicked or the ESCAPE key is pressed.

SAVE MENU

Save Menu items are the opposite of the Load Menu items. They allow saving landscapes, colormaps, and pictures (PCX format) files from Vistapro. The File Requestor is used for all these functions. See the File Requestor section for details on its use.

Save DEM

If a landscape has been modified, or a new fractal landscape created, it can be saved as a landscape file. The elevation data, textual information, and colormap (CMAP) are saved to the file. The color of each polygon is not saved—this means that rivers, lakes and seas will be lost. The DEM subdirectory is recommended for saving landscapes. Subdirectories should be made if a large number of landscapes are planned.

Save CMAP

If you have modified a colormap and wish to save it for quick access later on (you may want to use the same colormap for another landscape) you should use this function. Each CMAP is about 5,000 bytes. You could also save the entire landscape and later load the CMAP from the landscape file, but this would create much larger files (usually about 60,000 bytes). We recommend that you save your CMAP files in the CMA subdirectory, especially since they have the same default filename extension as DEM files.

Save PCX

Vistapro pictures may be saved with Save PCX. (Many other programs also use pictures in this format.) They may be viewed again using the Load PCX function of Vistapro. The picture is displayed on the screen as it is being saved. After the picture is saved the screen returns to the main control panel. The PCX subdirectory is recommended for saving picture files. Created when Vistapro was installed, the directory will usually be C:\VISTAPRO\PCX.. PCX files range in size from a few thousand to about 700,000 bytes depending on the amount of detail and the GrMode in which the picture was rendered.

GRMODE MENU

GrMode Menu selects the graphics mode for rendering pictures or viewing PCX files. Only one of the modes can be selected at a time and its selection is indicated by the "*" next to the menu item. Nothing is seen when one of these items is selected, but subsequent images are rendered in the selected GrMode.

For VESA modes, a VESA driver must be installed before running Vistapro. Some Extended VGA (EVGA) or Super VGA (SVGA) cards have the VESA modes implemented in ROM. A VESA driver may have come with your VGA card.

Note: You'll find VESA drivers for many common video cards in the \VISTAPRO\VESA directory. There is a text file that accompanies each of the drivers, explaining how to install the driver. Look in the directory that describes your graphics adapter. For example, if you have an ATI brand card, look in the VISTAPRO\VESA\ATI directory. For the most up-to-date drivers, contact the manufacturer of your card. Many on-line services (like CompuServe) have updated drivers available for downloading.

Not all VESA drivers implement all the VESA modes. In particular, the drivers cannot produce modes which require more memory than is installed on the VGA card. Most 256K VGA cards can display up to 640x400 pixels in 256 colors; 512K cards can usually display up to 800x600 pixels, and 1024K (1M) cards can usually display 1024x768 pixels. Some drivers do not support certain modes even though there is sufficient memory.

Finally, some drivers report to Vistapro that modes are supported even though the driver does not generate them properly. In this case a black or gray screen with vertical lines will appear when a picture is rendered or displayed. If this happens, select another mode.

Not all VGA monitors can display all the VESA modes. If the picture appears to roll, try adjusting the vertical hold on your monitor. If the screen will not sync, the monitor probably can't support the high refresh and scan rates needed for those VESA modes. Vertical and horizontal size and position settings may require adjustment on older multi-sync monitors.

IF A MONITOR DOES NOT SUPPORT THE HIGHER RESOLUTION MODES , DON'T USE THEM. DOING SO CAN DAMAGE THE MONITOR.

Vistapro only renders images in the 256 color modes available on VGA and SVGA cards.

VGA 320x200

VGA 320x200 is the 256 color mode available on all VGA adaptors. If a VGA card is present, this mode should work. If a Script is executed while in this mode, Vistapro will save a sequence of PCX files in 320x200 mode.

VANIM 320x200

This is actually the same graphics mode as VGA 320x200 but is used to create animations in Vistapro's VANIM format. If a Script is executed while in this mode, Vistapro will save the animation in VANIM format (one large file). All VGA cards should be able to display this format.

VESA 640x400

This is the 640x400 256 color VESA format available on many VGA and SVGA cards. This mode requires 256K of video memory to be installed on the VGA card. Some VESA drivers do not support this mode even though the VGA card has enough memory.

VESA 640x480

VESA 640x480 allows use of the 640x480 256 color VESA format available on many VGA and SVGA cards. This mode requires 256K of video memory to be installed on your SVGA card. Most VESA drivers for SVGA cards with more than 512K or more of memory support this mode.

VESA 800x600

This is the 800x600 256 color VESA format available on many VGA and SVGA cards. It requires 512K of video memory to be installed on the SVGA card. Most VESA drivers for SVGA cards with 512K or more of memory support this mode. The monitor must also be able to support VESA 800x600 mode. Some standard VGA monitors will not be able to sync to this mode. Try adjusting the vertical hold, vertical size, and horizontal size settings of your monitor if the screen appears to roll or if it isn't centered. Most Multi-sync or Multi-scan monitors support this resolution.

VESA 1024x768

This is the 1024x768 256 color VESA format available on many VGA and SVGA cards with 1024K (1M) of video memory. Most VESA drivers for SVGA cards with 1024K (1M) of memory support this mode. A monitor capable of handling this mode is required. Standard VGA monitors do not support this mode. Many Multi-sync or Multi-scan monitors do not support this mode.

SCRIPT MENU

The Scripting functions allow generation of a series of images without having to attend to the computer for each image. There are two uses for Scripts. One generates a sequence of images unattended. The second generates animations. Actually both uses are the same except that the succession of camera positions is more ordered for animations.

Vistapro Scripts can only control the camera location and direction. Lighting, or any of the other settings of Vistapro, can't be controlled from script functions.

Vistapro Script files are plain ASCII text files. You can use any text editor that saves files in ASCII to change them. It is important the first line of the Script file be: Vista Script File. The text must appear exactly as depicted here with no leading or trailing spaces. The second line may have any text or may be left blank—when Vistapro creates a Script file the second line is just a reminder of the order of the data on each line of the Script CamX, CamY, CamZ, Bank, Hdng, Ptch, .

The subsequent lines are a sequence of Camera X, Y, and Z coordinates and Banks, Headings, and Pitches. There is one line for each frame of the animation. The first value on the line is the Camera X position. The second value is the Camera Y position, and the third value is the Camera Z position. The following values are the Camera, Bank, Heading, and Pitch settings. These values are similar to the corresponding values that appear in Vistapro's Control Panel. Leading or trailing spaces are allowed on these lines. Each value must be separated by a comma. Text may be included after the six required values. The values may be either in integer or floating point format. For example, the following constitutes a valid Script file:

```
Vista Script File CamX, CamY, CamZ, Bank, Hdng, Ptch, 0, 0, 1234, -20, +30, 17, 1000, 1000,
2000, 0, 0, 0 1234.56, -2345.67, .34, 0.27, -.123, 3, "Comment"
```

Note that leading spaces are valid.

The simplest way to start a new Vistapro Script file is to use Vistapro's Create Script function. This will create a Script file with the first two lines filled out. Append each of the camera positions to the file.

Generate

This option creates a quick linear path from the current camera position to the current target position. Generate is most useful for generating simple straight-line paths for animations. When this option is selected, Vistapro asks for the name of the Script file to generate. Then it asks for the number of frames. If the camera is 1000 meters from the target and 100 frames are selected, the camera will be 10 meters closer to the target in each subsequent frame. The Bank, Heading, and Pitch will remain constant (the camera will continue to point at the target).

If the name of an existing file is selected, Vistapro will ask you if you want to delete the file or abort the operation. Putting Script files in the SCRIPT subdirectory, usually C:\VISTAPRO\SCRIPT, is recommended.

Create

Create is used to create a new Script file. The new file will have the appropriate first line to identify it as a valid Vistapro Script file. The second line shows the order of the arguments for the subsequent lines. If you select a file name that already exists, Vistapro will ask if you want to

delete it or abort the operation. Putting Script files in the SCRIPT subdirectory, usually C:\VISTAPRO\SCRIPT, is recommended.

Open

Open simply selects a file name for use with the Add function described below. Open a file when you want to append camera positions to an old Script file. If the name of a file that doesn't exist is selected, Vistapro will complain and then do nothing. Script files default to the C:\VISTAPRO\SCRIPT subdirectory.

Add

This function adds the current camera position, Bank, Heading, and Pitch to the current Script file. You must first select the script file with either the Generate, Create, or Open Script functions.

Preview

Preview depicts the path specified by a Script file. It appears as a series of black dots on the contour map. Each dot represents one Camera position.

Execute

This function executes a script. Vistapro asks for the name of the script to execute and the name of the image or animation file(s) to output. Vistapro has two Execute modes that are set by the GrMode (Graphics Mode) Menu items.

If the graphics mode is VANIM 320x200 Vistapro will produce a VANIM animation file which can be viewed with the Viewer utility. In any other graphics mode Vistapro will produce a sequence of PCX files. The PCX files are named: ABCxxxx.PCX where ABC is the filename that you supplied via the File Requestor, xxxx is a five digit number indicating the frame number, and .PCX is the standard extension. For example, if you picked PIC as the filename the output files will be:

PIC00000.PCX PIC00001.PCX PIC00002.PCX etc....

If you picked a filename longer than three characters only the first three characters will be used; if you selected PICTURE.XYZ the same sequence of picture names are generated as with PIC. If you select a name shorter than three characters Vistapro will just append the five digit value to the name you selected. A filename of P will generate the following output files:

P00000.PCX P00001.PCX P00002.PCX etc....

If you are generating an animation in VANIM mode the output file name is exactly the name you specified with the exception that if you didn't supply an extension Vistapro will automatically append .VAN to the file name:

PIC -> PIC.VAN no extension specified

PIC. -> PIC a blank extension specified

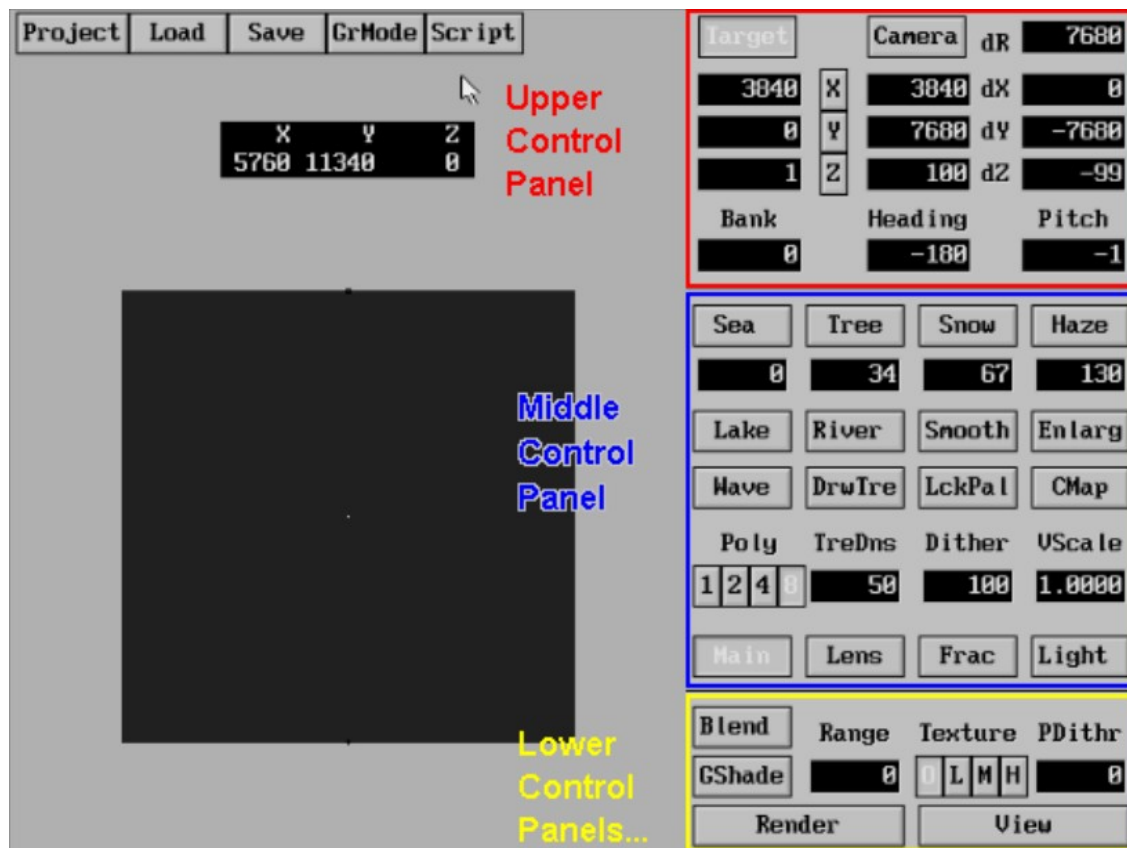
PIC.VNM -> PIC.VNM a different extension specified

We recommend that all your VANIM animations use the .VAN extension.

Chapter 4 CONTROL PANELS

The Vistapro Control Panels are split into three main sections, which we call the Upper, Middle and Lower Control Panels. In addition, there is a Color Control Panel. The map in the window represents the landscape area you loaded into Vistapro. The small black + symbol on the map is

the Target. The small black box symbol is the Camera.



UPPER CONTROL PANEL

The target represents the point at which you are aiming the camera. Its location is measured in meters from the lower left hand corner of the topographic map and in meters above sea level. After selecting the Target button on the Control Panel, you can place the mouse pointer anywhere over the landscape and click the left mouse button, setting a new target position in the X and Y direction. The Z, or height value, is set to the elevation of the landscape at that X-Y coordinate. That is, the Z value in the target represents the actual elevation of the landscape at that point.

As an alternative, you can place the target precisely by entering locations directly into the X, Y and Z numerical gadgets. To change a value, select the appropriate numerical gadget by clicking the left mouse button in the numerical gadget. Use normal editing techniques to change the values. (Backspace, delete, etc.)

You may also delete the entire contents of the gadget by pressing the SPACE bar. This works in all the numerical gadgets in Vistapro. When finished editing press the ENTER key or the left mouse button to accept the new value. Press the ESCAPE key or the right mouse button to stop editing and restore the original value. See also Locking Functions.

Camera

The camera represents the location of a hypothetical camera used to take a scenic picture. Its location is measured in meters from the lower left hand corner of the topographic map and in meters above sea level. The X coordinate is from left to right on the topographic map. The Y

coordinate is from bottom to top on the topographic map, and the Z coordinate is in meters above sea level. Select Camera on the Control Panel.

By placing the pointer anywhere over the landscape and clicking the left mouse button, you can select a new camera position in the X and Y direction, and the Z or height value changes with the elevation of the landscape. The Z value of the camera is set to 30 meters above the landscape. Alternatively, one can place the camera precisely by entering locations directly into the X, Y and Z numerical gadgets.

To change a value, select the appropriate numerical gadget by clicking the left mouse button inside the gadget. Use normal editing techniques to change the gadget values (backspace, delete, etc.). Delete the entire contents of the gadget by pressing the SPACE bar. This works in all the numerical gadgets in Vistapro. When finished editing press the ENTER key or the left mouse button to accept the new value. Press the ESCAPE key or the right mouse button to stop editing and restore the original value. See also Locking Functions

Locking Functions

Other tools that you can use with both the camera and target functions are the X, Y and Z locks. You can use the locks when you want to restrain the target or camera from moving in one or more directions. For instance, if you want to move the camera to a new location on the landscape without changing its altitude, you could depress the Z lock and then click on a new camera location. You will see that the X and Y coordinates of the camera have changed but that the Z value has remained the same.

Of course there are two other ways of achieving this same result: you could simply type the new X and Y locations into the camera X and Y numerical gadgets, or you could click the mouse on the new camera location (with the Z lock not set) and then type in the desired altitude. Vistapro will restrain both the camera and target X, Y, and Z values as long as the locks are depressed.

dR

dR displays the distance in meters between camera and target. This distance is the radius from the target. You can use this value to step closer to or away from the target—just as one might do when taking a photograph. When you type in a new distance value Vistapro will change the camera's X, Y, and Z coordinates to match the desired distance as well as it can. The Bank, Heading, and Pitch values will not change.

dX

dX displays the difference between camera and target X dimension values. The user can change this value by entering a new value in the dX numerical gadget. Changing this value moves the camera to reflect the new distance. The Heading and Pitch of the camera may also change to keep the camera pointed at the target.

dY

dY displays the difference between camera and target Y dimension values. The user can change this value by entering a new value in the dY numerical gadget. Changing this value moves the camera to reflect the new distance. The Heading and Pitch of the camera may also change to keep the camera pointed at the target.

dZ

dZ displays the difference between camera and target Z dimension values. The user can change this value by entering a new value in the dZ numerical gadget. Changing this value moves the camera to reflect the new distance. The Heading and Pitch of the camera may also change to keep the camera pointed at the target. The following descriptions use an airplane as a model to explain axes.

Bank

Bank controls the rotational angle of the camera around its longitudinal axis. Imagine an airplane. You can describe the longitudinal axis as an invisible line drawn from the tail of the airplane to the nose. Any rotation that causes one wing to dip and the other to raise is a rotation around the longitudinal axis. A positive rotation around this axis would cause rotation in a clockwise fashion as viewed from the tail. The left wing would raise and the right wing would lower. Note that when the camera rotates clockwise the view that is rendered will appear to have rotated in the opposite direction.

Head

Heading describes the rotational angle of the camera around its Z axis relative to the landscape. Imagine an airplane. You can describe the Z axis as a line drawn from the top of the airplane to its bottom. Any rotation around this axis causes the airplane to turn right or left. A positive rotation causes the airplane to turn right.

Pitch

Pitch is the rotational angle of the camera around its wing axis. Once again, imagine an airplane. A line drawn through the wings from the left side of the airplane to the right side describes the pitch axis. Any rotation around this axis causes the airplane to move the nose either up or down, with a positive rotation causing the nose to go up.

MIDDLE CONTROL PANEL

Sea

By setting the sea level, you can sink the landscape into the sea to that level. All points below this level become sea level (0 meters), and all points above this level have that value subtracted.

For example, if you select 1000 meters as sea level, all points below 1000 meters will sink to 0, 2000 meters will sink down to 1000 meters, 3000 meters will sink to 2000 meters, etc. Vistapro will erase rivers and lakes (if present) when it generates a new sea level. Vistapro will need to color and shade the landscape again. Vistapro has a button for selecting sea level. You click on the Sea button and then select the level by clicking on the topographic map. You can specify the Sea level explicitly by typing the value into the numerical gadget immediately below the Sea button (See also Waves).

Tree

You can use the Tree level button to set the timber line, the altitude above which there are no trees. The timber line is a "fuzzy" value. Just as in nature, some trees will appear above the tree line and some bare areas will appear below it.

Vistapro's AI (Artificial Intelligence) rules will compensate for features of the landscape. Trees generally will not cover the face of a cliff even though the entire cliff may be below the tree line. Trees may grow upward into a valley (more water is available at the bottom of a valley) and a ridge will tend to be devoid of trees (ridges tend to dry out from exposure to the wind).

If the DrwTre (draw tree) button is not selected Vistapro will not actually draw the trees, it will just use the tree colors to color the ground. You can use the Tree button to select the tree level. Depress the Tree button and then click on the topographic map at a location which has the desired altitude. You may also numerically specify a tree level by typing a value into the numerical gadget located below the Tree button.

Snow

The Snow level is the lowest elevation where Vistapro will cover the landscape with snow. The AI rules in Vistapro use this value to calculate where to use the snow colors. Vistapro will compensate for cliffs, ridges, valleys, rivers and lakes in an attempt to mimic natural snow cover. Snow colors don't have to be the colors of snow.

You can use any colors you like—just keep in mind that the snow colors will be placed on the landscape following the AI rules for snow. For instance, you can set the snow colors to shades of gray to make mountain tops look like barren rock. The barren rocky areas will appear to flow down into valleys just as snow would.

You can use the Snow button to select the snow level. Depress the Snow button and then click on the topographic map at a location which has the desired altitude. You may also numerically specify a snow line by typing a value into the numerical gadget located below the Snow button.

Haze

In the real world, the farther away an object is, the more it is occluded by the atmosphere. The haze function in Vistapro simulates this effect, adding to the three-dimensional feel of the resulting image.

You can specify how thick the haze is by changing the Haze value in Vistapro. (You can also change the color of the haze—see Chapter 6, Color Control Panel.) You enter the Haze value by entering a number in the numerical gadget below the Haze button.

- A value of 0 will completely eliminate the haze effect
- Small values (below 100) will give very little haze
- Medium values (100-1000) will give medium haze
- High values (over 1000) will create very thick fog.

You can also "automatically" calculate the haze value by pressing the Haze button. Vistapro will generate a value based upon the distance between the camera and the target. The closer the two are, the thicker (higher value) the haze.

We tried to arrange it so that setting the haze value this way generates haze that first becomes significant at distances about the same as that between the camera and target.

Lake

The lake function adds lakes to a landscape. Select Lake on the Control Panel. Then, using the mouse, place the pointer on the landscape at the lake level desired, and click the left mouse button.

Example: If one places the pointer in a shallow valley at 2100 meters, water will begin to fill the valley until it reaches the 2100 meter mark, as it would in nature.

If there is any portion along the edge of the valley that is below the 2100 meter mark, water will spill out of the valley and begin to flood other parts of the landscape. This may not be the desired effect, and it should be kept in mind when using the Lake function.

If uncertain about landscape heights, move the mouse pointer around any suspect areas watching the Z value on the status line. Then find the lowest point in the pass to determine the maximum safe altitude for creating the lake. Lake generation can be aborted by pressing the ESCAPE key or the right mouse button while the lake is being generated.

To create a lake, press the Lake button and then click on a starting point on the topographic map. You will see the lake being created on the topographic map in black. Once the lake has been completed the black lake will be redrawn in blue.

River

Vistapro's River function creates rivers which flow downhill from the selected starting point. If a river reaches a depression it will slowly fill it (creating a pond or lake) until the lake overflows.

The river will continue flowing down hill until it reaches the ocean or the edge of the topographic map. You may stop the flow of a river by pressing the ESCAPE key or the right mouse button. Although you can always fill a lake using the River function and wait until the lake fills up, it is generally faster to fill lakes using the Lake function.

To create a river, press the River button and then click on a starting point on the topographic map. You will see the river being created on the topographic map in black. Once the river has been completed the black river will be redrawn in blue.

If you start a river on an existing river or lake, the river will continue until it reaches sea level or the edge of the topo map. A new river (one started where there was not originally a river or lake) will also stop at any existing water. This allows you to create many tributaries to a river without the main river getting very wide and deep.

Of course, if you want the main river to significantly widen, start a new river on top of the old one as many times as you like. It will grow wider with each iteration. You generally will want to start rivers at the head of a valley, but it is possible to start a river anywhere on the topographic map.

Smooth

The Smoothing function smooths or erodes the landscape, removing the harsher, more jagged edges of hills and mountains. Smoothing often improves the appearance of landscapes, and it is especially useful when dealing with fractal landscapes. You should use the smoothing function sparingly with DEM files if data integrity is important, as it distorts data.

Pressing the Smooth button on the Control Panel will invoke the smoothing function. This is a repeatable, refining function, meaning that it can be run over and over again, smoothing (eroding) the landscape more on each pass.

Smoothing is also used to obtain snow covered peaks. Because of the design rules of the AI algorithms, and as is also true in nature, it is very rare that the summits or peaks of mountains are completely snow covered. It is more often the case that due to the steep nature of the cliff faces and other contributing aspects, such as wind and snow weight, snow does not cover the peaks of most mountains. However, since it may be desirable artistically to create a completely snow-covered mountain, smoothing the mountains will often give this effect.

Enlarge

The enlarge function allows you to select a portion of the landscape and enlarge it to fill the entire topographic area. The intermediate data points are either filled with the average of the points around them or filled with duplicates of the nearest point.

To invoke this function press the Enlarge button. You will then see a box that follows the mouse cursor around the screen. Place the box over the section that you want to enlarge and press the left mouse button. Vistapro will open a requestor near the top of the screen asking you to select either the Interpolate (average) or Duplicate mode. Select the desired mode and the area inside the box will be enlarged to fit the entire topographic area. Any rivers, lakes, or oceans will be lost.

The differences between the two modes is best described by a diagram. Consider the side of a small hill viewed from a cross-section; in Interpolate mode, the hill will double in size in all dimensions and the side of the hill will remain smooth; in Duplicate mode the hill will also double in size, but it will become stepped.

Waves

Vistapro can generate waves on the sea. To enable this feature, select Waves from the main control panel before creating the sea. To deselect the waves feature, re-select the Waves button. When you enable waves, Vistapro will generate them along with any new sea that is generated.

You can add waves to an already generated sea by selecting the Waves function and setting a new sea level, or the same sea level (value 0). While Vistapro is generating waves, it displays a message on the status line.

Vistapro generates waves (if specified) only when a new sea level is set, both on fractal and real-world landscapes.

DrwTre

Vistapro has two types of trees that it can draw while rendering. Vistapro draws the trees only if the DrwTre (Draw Tree) button is depressed. When you press the button a requestor will appear at the top left corner of the screen. From it you specify the size and type of trees to draw.

The size is specified by the numerical gadget at the center of the requestor. You must select the size before the type since pressing either of the type buttons will close the requestor. Good sizes range from 20 to 80 meters. Very small trees may appear too sparse; very large trees will be distorted or overwritten by subsequent polygons of the landscape.

After selecting the tree size (or accepting the default) select the type by pressing either the Pine or Oak button. Pine trees will have roughly triangular shapes like a Christmas tree. Oak trees will have roughly round shapes.

Trees may be drawn anywhere that TREE1 through TREE4 (see CMap section) colors are used. In addition the number of trees drawn is affected by the TreDns (Tree Density) setting. Trees are drawn using TREE1 through TREE4 colors, plus a small randomizer so that they are not all the same color. You cannot select the brown shades Vistapro will use for the tree trunks. The ground underneath trees is drawn as a slightly darker shades of BARE1 through BARE4.

Trees can take a very long time to draw. Depending on how many trees are drawn, trees may take more than twice as long to render as the same scene without any trees for Vistapro to draw.

LckPal

Vistapro renders pictures using the PC's 256 color modes. Vistapro calculates the best 256 colors to use just before rendering each image. The colors it picks are based on the colors in the landscape, the current Contrast and Exposure settings, and the Haze colors and value. Calculating a new 256 color palette can be time consuming (about 40 seconds on a 20 MHz 386) so we have given you the ability to lock the color palette.

When the palette is locked Vistapro will continue to use the last palette generated. All succeeding images will be drawn with that palette until the color palette is unlocked. Locking the palette is especially useful when previewing an image, playing with the haze settings or the Color Map. When you are ready to render the final image, unlock the palette so that Vistapro will generate the best possible palette for that image. The palette is locked when the LckPal button is depressed. It is unlocked when the button is up.

CMap

You can select the CMap button to display and activate the Color Control Panel. See Color Control Panel for more information.

Poly

Vistapro produces 131,072 polygons at its finest resolution. The Polygon Size function controls the relative coarseness of the landscape image. A size of 8 generates 1/64th as many polygons (1/8th on each axis) as a size of 1, and they are 64 (8 x 8) times as large. That is, a landscape can consist of 131,072 size 1 polygons, 32,768 size 2 polygons, 8192 size 4 polygons, or 2048 size 8 polygons.

You can use the larger polygons to generate quick previews of landscapes. When you are happy with your camera and target placement, use smaller polygons. The smaller the polygons, the longer it takes to generate the image. The larger the polygon size number, the less detail that will show up in the image, because Vistapro is displaying only a fraction of the original data.

The lower resolutions (higher poly number, i.e. 4, 8) are useful for quick test renderings to check for landscape color, light placement, proper framing and exposure settings.

TreDns

TreDns (Tree Density) controls how many of the polygons assigned TREE1 through TREE4 colors will also have trees drawn on them. Useful values range from 0 to 300 with low values giving low tree densities, high values giving high densities. Values below 0 are treated the same as 0, values above 300 are treated the same as 300. A value of 150 will result in one half of the TREE colored polygons having trees rendered.

To change the Tree Density value, click on the numerical gadget immediately below the TreDns label and type in a new value. Press ENTER when finished.

Dither

Vistapro generally colors landscapes by altitude. The lowest altitudes are colored with TREE1 through TREE4 colors, middle altitudes are colored with BARE1 through BARE4 colors, and the highest altitudes are colored with SNOW1 through SNOW4 colors. Each of the 130,000 triangles that make up the landscape is assigned a color, based on its altitude and several other factors.

The Dither value sets the fuzziness of the division between color bands in Vistapro. A setting of 0 will give the tree-line and snow-line very sharp boundaries. The default setting of 200 gives a moderate amount of dithering of the colors. A large value like 1000 will make the colors so dithered that there is no visible relationship between altitude and color. To set this value, click the mouse pointer on the Dither numerical gadget on the Main Control Panel. Change the number from the keyboard and press ENTER. Useful values range from 0 to 1000.

VScale

Vistapro allows you to vertically re-scale any landscape. Typing a number into the Scale numerical gadget will cause Vistapro to scale the landscape as requested. For example, if you type in 2.0, Vistapro will stretch the landscape out vertically so that mountains are twice as tall, etc. Values between 0.0 and 1.0 will cause Vistapro to flatten the landscape. Values below 0 cause the landscape to flip over (valleys become ridges, mountains become pits) before Vistapro scales them. The number typed in always results in a landscape which is that value times the original landscape. The user can save landscapes after scaling.

You can generate some interesting effects with the scaling function. You can flip landscapes upside down by using negative values. Scaling mountains so that the top will exceed 32000 meters and then scaling it back down to normal will result in mountains with big pits or calderas. Scaling to very large values can even cause several layers of this effect. The result shows a mountain inside a collapsed mountain inside a collapsed mountain. Scaling mountains down until they are very small and scaling them back up will result in stepped mountains.

Main

The Main button enables and displays the Main Lower Control Panel. See Main Lower Control Panel for details.

Lens

The Lens button enables and displays the Lens Lower Control Panel. You can use this to select the type of lens the Camera is using. See Lens Lower Control Panel for details.

Frac

The Frac button enables and displays the Fractal Lower Control Panel. You should use this when generating random fractal landscapes. See Fractal Lower Control Panel for details.

Light

The Light button enables and displays the Light Lower Control Panel. Use this when selecting the direction and intensity of the light source. See Light Lower Control Panel for details.

LOWER CONTROL PANELS

The Lower Control Panels consist of four separate Control Panels overlaid on a common space.

MAIN LOWER CONTROL PANEL

Blend

Blend helps reduce the coarse texture of distant parts of the landscape. If you select the Blend button, Vistapro will draw each polygon with a weighted average color of that polygon and the three polygons that border it. This reduces the aliasing of distant polygons. It also reduces the color saturation of polygons, so its use is optional.

Gshade

Gouraud shading produces smooth looking surfaces without obvious triangles. It requires about 50% more rendering time. Gouraud shading gives a brush like feeling to the landscape, as if an artist painted it using oils, rather than the computer playing with numbers. Besides filtering out large polygons, it adds mood to the landscape. The foreground may appear blurry with Gouraud shading.

Range

The range value allows you to clip away parts of the landscape which are farther away than the range value. For example, if the range value is set to 1000, Vistapro will not draw parts of the landscape farther away than 1000 meters. The primary reason for this function is to show only the parts of the landscape very near the camera, making sure that something is not blocking the view. You don't want to wait thirty minutes for a picture to render just to find out that a tree completely blocks the view.

The value 0 is a special case; it disables the Range function. Otherwise the value represents the distance from the camera, at which the landscape is clipped away. Values below 100 are usually not useful. The sky and horizon are not affected by the Range function.

The range function can be used to generate a special effect while executing a script file. As the camera moves around the landscape, only the parts of the landscape near the camera (within the Range) will be visible.

Texture

Vistapro can add additional texture to nearby polygons by breaking them into smaller pieces and drawing each of the pieces as slightly different shades. This adds artificial detail to nearby areas. There are four different levels of detail:

- Off
- Low
- Medium
- High

They are selected by the **O**, **L**, **M**, and **H** buttons below the Texture label. The higher the detail level the longer a picture will take to render.

PDthr

Dithering at the pixel level increases the apparent number of colors in the display. Vistapro uses a dithering method which allows you to set the amount of dithering used within the display. It can be set anywhere from no dithering to so much dithering you can no longer recognize the picture. Normal values will range from 0 (no dithering), to 100 (a little dithering), to 300 and above (significant dithering). When a new dither value is entered, Vistapro prompts for ordered or random dithering.

Render

This starts the generation of a new picture using the current settings in the control panels. Vistapro performs several functions while rendering. It displays its progress above the topographic map in a status window. For most functions, there is a continuously updated status count, so that you can monitor Vistapro's progress. (See Vistapro Status Window for more information.) You can abort the rendering process by pressing the ESCAPE key or by pressing and holding down the right mouse button until the rendering stops.

View

When rendering is complete Vistapro waits for you to press either mouse button or the ESCAPE key. It then redisplayes the control panel and topographic map. If you want to see the same picture again you can view it by pressing the View button. The picture will remain visible until you press either of the mouse buttons or the ESCAPE key.

LENS LOWER CONTROL PANEL

The camera lens feature represents the lens type of Vistapro's imaginary camera.

Wide: The wide angle lens gives a 90 degree field of view. It allows you to see a wide area with minimal spherical distortion. The wide angle lens has a zoom value (similar to the focal length of a real camera) of 16.

Zoom: The Zoom lens has about half the field of view of the wide angle lens (about 45 degrees), or you can think of it as having twice the magnification. It allows you to zoom in on the target. Very little distortion is noticeable. The Zoom lens has a zoom value of 32.

Zoom Value: The Zoom value is similar to the focal length of a real camera. It represents the width of the field of view or the amount of magnification. The lower the Zoom value is, the wider the field of view. The higher the Zoom value is, the narrower the field of view and the greater the magnification.

The lowest valid Zoom value is 1. This is an extremely wide angle lens with severe spherical distortion. Values below 8 are generally impractical but fun to try. You can set the Zoom value as high as 30,000, but such high numbers are only useful when the camera is very far from the landscape (a million meters or so). You will probably usually use Zoom values from 16 to 100.

FRACTAL LOWER CONTROL PANEL

Random

Random Landscape Generation allows creation of a vast number of completely artificial landscapes. Vistapro supports over four billion random fractal landscapes. Each different number in the Fractal numerical gadget represents a different landscape. You can use negative numbers. Using a number such as -1,231,541 will create a different landscape than its positive counterpart 1,231,541. Select Random on the Fractal Lower Control Panel. Notice that a new number has appeared in the numerical gadget. The software will then proceed to create a new landscape. If this landscape is one which you may want to use again, be certain to write down the number so that you can recall it again, or save the landscape, using the Save DEM Menu Item.

To recreate a desired landscape, simply reenter its number in the numerical gadget and Vistapro

will create the same landscape again. This method conserves disk storage space much more efficiently than saving the entire landscape as a DEM file. Alternatively, enter any number desired into the numerical gadget and explore landscapes in this fashion. Various methods include using special dates such as birthdays (minus hyphens or slashes, i.e.. 52262 not 5-22-62), holidays and anniversaries. Keep a list of numbers for those landscapes that prove to be interesting so that you can share them with other owners of Vistapro.

Like the fingerprints of the four billion inhabitants of this planet, some Vistapro scenes may look similar, but, upon closer examination, each one is individual and distinctive.

Island

There are two modes for generating fractal landscapes, Island and Floating. In Island mode the four edges of the fractal landscape are at the same altitude. This allows you to create islands by setting the sea level higher than this edge altitude. It also will create seas surrounded by land. See the Sea function for details on its function.

In floating mode, the four edges of the landscape are allowed to float—that is they are allowed to vary in altitude. Floating mode landscapes look like they were clipped out of a larger area—similar to real world DEM landscapes.

If the Island button is depressed, fractal landscapes will be generated in Island mode; otherwise they will be generated in Floating mode.

FrDim

The FrDim value controls the Fractal Dimension (height and roughness) of the fractal mountains. The value is used for subsequently generated fractal landscapes. Typing in a new value does not affect the current landscape unless you regenerate it. The default value is 100. Larger values will generate taller, rougher landscapes. Smaller values will generate flatter, smoother landscapes.

Fractlz

You can fractalize the current landscape to add fractal detail. If the Fractal Dimension is set to low values the effect is to smooth the landscape. If the Fractal Dimension setting is high, the landscape will become rougher. The fractal divisor buttons 1, 2, 4, and 8, immediately below the Fractlz button control the scale where the fractalizing occurs. At lower values fractal noise is added only at very small scales—the landscape will look basically the same shape, just rougher. At higher values the landscape will start looking rougher, and at larger scales may no longer resemble the original landscape.

Stretch

The stretch function changes landscapes by vertically stretching existing features. Peaks will grow taller, valleys and pits will grow deeper. The scale at which this happens is controlled by the Fractal Divisor buttons (1, 2, 4, and 8, immediately above the Stretch button). At lower values only the smallest features are stretched. At higher values only the larger features are stretched. You can stretch landscapes over and over again to create a caricature of the original landscape.

Fractal Landscape Number

This numerical gadget located below the Random button is for entering the number of the fractal landscape you want to generate. Alternatively, it displays the random number generated when you press the Random button. Whether you enter a number or it is generated randomly, Vistapro uses the number to generate a fractal landscape. To enter your own value, position the mouse pointer over the gadget and press the left mouse button. The pointer will disappear. Type in your number from the keyboard and press ENTER. Vistapro will then generate that landscape. Note that the Fractal Dimension and Fractal Divisor values are used while generating the landscape.

Fractal Divisor

The Fractal Divisor buttons are the four buttons located between the Fractlz and Stretch buttons. They are labeled 1, 2, 4, and 8. The values they represent are used by the fractal generation routines. When Vistapro generates a fractal landscape (after you press the Random button or enter a value into the Fractal Landscape Number gadget) it uses the current divisor setting. The smaller the fractal divisor, the larger the features of the landscape.

At a setting of 1 very large mountains are generated. At 8, many small mountains are built. For the Fractalize and Stretch functions the divisor value represents the frequency at which the existing landscape data is sampled in order to generate the new landscape. See the sections for Fractalize and Stretch for more details.

LIGHT LOWER CONTROL PANEL

Light Source Direction is the direction from which the sun is shining, and you use it in combination with the exposure, contrast, and shadow settings to determine the location and depth of shadows when generating an image. This function "moves" the sun.

Whenever this panel is selected several concentric circles will be drawn in black over the landscape. These circles are reference points so that you can visually estimate the declination of the sun. The circles are labeled with the declinations that they represent, 75, 60, 45, 30 and 0 degrees above the horizon.

A line (the Sun Vector) will be drawn from the center of the bulls eye out toward the edge of the landscape. The direction of the line indicates the azimuth (direction around the horizon) from which the sun is shining. The length of the line indicates the declination of the light source. You should think of the Sun Vector as a stick stuck in the center of the landscape which is pointing at the sun.

Since the topographic map is being viewed from directly overhead, the longer the stick appears, the closer the sun is to the horizon. If the stick appears very short it is pointing nearly straight up.

NSEW

Use the North, South, East, and West buttons (labeled N, S, E, and W) to quickly set one of four "standard" lighting positions. These buttons are positioned so that you can easily see from which direction the sun will be shining. When using one of these positions the sun is at 45 degrees above the horizon. Using these pre-programmed directions speeds up the shading phase of rendering when shadows are enabled. After clicking on one of these buttons you can see the Sun Vector (the line radiating from the center of the "bulls eye") change to indicate the new direction.

Custom

The Custom button gives you complete control over the direction and angle of the light source. Selecting this button causes the Sun Vector to follow the mouse pointer as it moves around the screen. This represents the position of the sun in the sky. Think of the line as a stick pointing at the sun from the center of the landscape. Since you are looking down onto the landscape from above, the longer the stick is, the closer the sun is to the horizon; the shorter the stick is, the closer the sun is to directly overhead. The stick points in the direction of the sun.

When you have located the desired direction and angle, a single click with the left mouse button locks this in place. Using a custom light source may increase the amount of time required to complete the shading phase of the rendering process when shadows are enabled.

Exager

The Exager (Exaggeration) button enables exaggerated shading. Imagine a ball in front of you, with a light shining on it from above. The top of the ball faces the light, and appears very bright. Points farther down the sides of the ball reflect less light and appear darker. Halfway down the

side, the light no longer shines on the surface, and it is in shadow. Exaggerated shading increases the rate at which the shades darken around the sides of the ball. This technique can add detail to the image by exaggerating small irregularities on the landscape. You will probably want to disable this function when setting the sun at low declinations, since the exaggeration makes all the flat areas appear very dark.

Azimuth

Use the Azimuth gadget to set the direction (in degrees from due south) from which the sun shines. Zero degrees is due south, 90 degrees, due west, 180 degrees, due north and 270 (or D90) degrees is due east. Note that this differs from the heading, which is measured from due north, as is common in navigation.

Declin

Use the Declin gadget to set the declination, the angle from the horizon from which the sun shines. Zero degrees of declination puts the sun right on the horizon, while 90 degrees put the sun directly overhead. This is similar to the way Pitch is measured for the camera.

Rough

The Rough button sets the apparent roughness of the landscape when rendered. Vistapro accomplishes this by adding a scaled random number to the shade of each polygon, so that some of the polygons will be darker than normal and some will be lighter. By doing this, large flat areas will appear to have a little more detail than they otherwise might. To set this value, click the mouse on the Light button located on the Middle Control Panel. Click the mouse pointer on the Rough numerical gadget. Change the number from the keyboard and press ENTER. Useful values range from 0 to 300, with higher values giving rougher appearing landscapes. Very large roughness values result in unnatural shading.

Shadow

Vistapro has the ability to render landscapes with shadows. True shadows are very difficult and time consuming to render so Vistapro uses a quick, less precise method. Only the landscape itself casts shadows; trees do not cast shadows. Shadows will not be cast outside the area of the topographic data. Shadows are enabled when the Shadow button is depressed. The Shading phase will require more time when Shadows are enabled.

Chapter 5 The Vistapro Status Window

The Status Window is the area just above the topographic map. Vistapro uses this area to give you messages about what it is doing while rendering. It also indicates the mouse position while in the Camera / Target placement modes. The following sections describe the messages that will be displayed in the Status Window.

X, Y, Z

You can see the X, Y, and Z values in the Status gadget while moving the mouse pointer over the landscape. These are the X, Y, and Z coordinates of the landscape surface at that point. If you think of North being the top of the screen, the X coordinate represents the distance in meters East of the left edge of the topographic map. The Y coordinate represents the distance in meters from the bottom of the topographic map. The Z coordinate represents the elevation above sea level in meters of that point of the topographic map.

Generate

Vistapro is generating a new fractal landscape or fractalizing an existing one.

Color

Vistapro is calculating the colors of the polygons comprising the landscape based upon their altitude and the topography of the terrain. Vistapro does coloring whenever you modify the snow line, tree line, or sea level, or if you render an image at a smaller polygon size than before.

Cliffs

Vistapro is placing cliff colors on the steep areas. Recalculating cliffs takes place whenever you change snow or tree lines, or if you render an image at a smaller polygon size than before.

Shade

The Shade function is calculating the amount of light reflected by each polygon. Vistapro recalculates shade when you draw a river or lake, select a smaller polygon size, smooth the landscape, or vary the light position.

Palette

Vistapro is calculating a 256 color palette for the VGA display. Palette colors are selected based upon the colors used to color the landscape (the CMAP), how often these colors appear in the landscape, the current haze value and haze colors, the position of the sun, etc. Since calculating a palette takes a fair amount of time, and at times you may not want to recalculate the palette (e.g. while previewing an image), you can inhibit the re-calculation of the palette by selecting the LockP (lock palette) button.

General

Vistapro calculates steps such as coloring or shading only to the level of detail required for the current polygon size. Vistapro saves the results of these calculations in memory, so that it will not have to recalculate them. The program doesn't recalculate these tables when switched from a small polygon size to a large polygon size. It uses the data from the small polygons to draw the larger polygons. Therefore, Vistapro will not have to recalculate tables if you re-select smaller size polygons. Once Vistapro has made the calculations for small polygons, it will not produce color or shade renderings with large polygons precisely. This is preferable to recalculating because it saves time. Large polygon sizes are usually used for previewing, so it doesn't matter if the image generated is not precise. But, you can force Vistapro to recalculate the color tables for large polygons by changing the tree line or snow line. Even entering the same value again will force recalculation. To force reshading, reset one of the values or buttons on the Light Sub Panel.

Chapter 6 Color Control Panel

The Color Control Panel controls the choice of colors that are used to paint the landscape. (Note that this is not the VGA palette that is used to render the pictures—it is more like the fixed colors that come in a water color kit; Vistapro will mix and blend them to generate the VGA palette.)

The R(ed) G(reen) B(lue) sliders on the left hand part of the screen allow you to modify the individual colors in the palette. The center part of the panel is devoted to choosing which of the colors is being modified by the sliders. The Accept button accepts your current modifications and returns control to the main control panel. You can find out how to use the various features on the Color Control Panel below.

COLORS

You can use the Color palette to change the color ranges for Sky, Cliffs, Snow, Bare Earth, Vegetation (Trees or Brush), and Water. These are the colors of the polygons that make up the landscape. Each of the colors will be shaded and faded by Vistapro as it renders.

For example, an apple may be a uniform shade of red, but the side that faces the light is brighter than the side that faces away from the light. The apple will fade towards haze color, as you move it farther into the haze. Even though there are only 24 different object colors in Vistapro, each of the colors may produce a number of shades.

Vistapro maps Snow, Bare, and Tree colors to the landscape fundamentally by elevation. Vistapro gives the lowest elevations Tree colors, middle elevations Bare colors, and high elevations Snow colors. The same is true for each of the four colors within each segment. It assigns the lowest elevations Tree color 1, slightly higher elevations Tree color 2, and so forth. The designation of colors as Tree, Bare and Snow is arbitrary.

The user is able, for instance, to make them all different shades of red for a Martian landscape, or any colors desired for an especially bizarre picture. The boundary between the different zones is fuzzy. For instance, setting the tree line at 1000 meters doesn't mean that everything below 1000 meters will be tree and everything above it will be set to Bare or Snow. The local shape of the landscape and some random dithering affect all the colors.

Vistapro uses Cliff colors for portions of the landscape where the terrain is very steep. Cliff color 1 is for slightly steep regions, Cliff color 2 for steeper portions, and so on through the range of cliff colorations. It uses Beach color for the boundary (if any) between the sea and the land. Vistapro uses River colors for rivers and lakes. It assigns to flat bodies of water River colors 1 and 2. River colors 3 and 4 indicate rapids. Waterfalls are River color 5. Ocean color is the color of the region surrounding the Elevation Model data. This color need not be the color of the sea or of water at all. Depending upon the effect desired, it might be green to match the lowest landscape colors.

Sky color is simply the color of the sky. You can obtain an interesting effect by making Sky and Ocean colors black and by setting the Haze value to 0. This creates landscapes that appear to be floating in space. Sky Haze is the color that the sky fades to in the distance. Haze is the color that the land/water fade to in the distance. Keep in mind that the thickness of the haze (or magnitude of the haze effect) is set by the Haze setting on the main Control Panel.

You can produce another interesting effect by setting the Haze and Sky Haze to black and the Haze value to a high number like 300. This makes the landscape look like a night scene lit up by a light behind the camera.

Set the exposure and contrast settings with the Exposure and Contrast controls. Higher Exposure settings lead to brighter pictures. Higher Contrast settings lead to more contrast in the images. You can use only the Red slider to control Exposure and Contrast settings.

ACCEPT

You can return to the main Vistapro Control Panels with the Accept Button, with any changes you have made intact. You may return to the main Vistapro Control Panel by using the Reject button. This resets the colors back to what they were before you entered the Color Control Panel.

SPREAD

The Spread function provides for a smooth series of color changes from one color to another. In

order to use the Spread function, click on the upper color, click on Spread and then click on the lower color.

As an example, suppose you want the lowest elevation of brush to be a dark green and the highest to be a light green. You would set the Tree 1 color to a light green, and the Tree 4 color to a dark green, and use Spread to fill in the colors for Tree 2 and Tree 3.

COPY

The Copy button copies a color from one palette segment to another. Click on the color you want to copy, then click on Copy, and finally click on the color you want to change. You will see the second color change to be the same as the first.

SWAP

The Swap button swaps two colors around. Click on one of the colors you want to swap. Then click on the Swap button. Finally, click on the color with which you want to swap. You will see that the colors have swapped places.

COLORS

Sky: This is the primary color that Vistapro will use in generating the sky. Haze and Sky Haze will alter this when appropriate.

Cliff 1-4: These are the primary colors that Vistapro will use in generating Cliff regions in a landscape. Cliff 4 represents the steepest cliffs, and Cliff 1 the gentlest slope.

Snow 1-4: These are the primary colors that Vistapro will use in generating regions of the landscape that are above the snow line. Snow 4 is the highest elevation above the snow line and Snow 1 is the lowest.

Bare 1-4: These are the primary colors that Vistapro will use in generating regions of the landscape that lie between the tree line and the snow line, and that are not as steep as cliffs. Bare 4 is the highest such elevation and Bare 1 the lowest.

Tree 1-4: These are the primary colors that Vistapro will use in generating the region of the landscape between sea level and the timber line. Tree 4 is the highest such elevation and Tree 1 the lowest.

Beach: This is the primary color that Vistapro will use to separate the lower level of the landscape area from any sea that has been generated.

Ocean: This is the primary color of the area that is at sea level surrounding the topographic data.

Water 1-5: These are the primary colors that Vistapro will use for rivers and lakes. Water 5 represents the fastest water, and Water 1 the most placid.

SkyHaze: Vistapro will add this color to the sky near the surface, depending upon the amount of haze selected. There will be a smooth transition from sky color to sky haze color as the sky approaches the horizon in the distance.

Haze: Vistapro will add this color to land areas based upon the distance from the camera and the amount of haze selected.

Exposure: This is similar to the "F" stop on a camera lens. The larger the number, the lighter the final image.

Contrast: This regulates the contrast of the final image. High contrast will make the darker areas very dark, and the lighter areas very light. Low contrast will lessen the difference between the dark and light areas.

Chapter 7 Animation Viewer

Viewer is a proprietary animation player. It allows you to play VANIM files at up to 16 frames per second from your hard disk or 30 frames per second from a RAM disk. It has a very simple straightforward interface, and is quite easy to use.

To use Viewer, simply type:
Viewer <filename>

where <filename> is the name of the animation you created with Vistapro using the VANIM format.

You can control the speed with which Viewer plays your animation by pressing the number keys on your main keyboard. (Not the numeric keypad!) The number 1 is slowest, and the number 0 is fastest. The numbers between 1 and 0 represent increments of speed change.

You can use the numeric keypad to control the direction that your animation plays, as well as single frame, skip 10 frames, go to beginning and go to end.

7 Go to 1st Frame	8 Forward	9 Go to last Frame
4 Go back 10 frames	5	6 Go forward 10 frames
3 Go back 1 frame	2 Reverse	1 Go forward 1 frame
0 Stop		

You may exit from the Viewer program using the ESC key.

Tutorial #1 The Basics

To use the following tutorials, Vistapro must be installed on your hard drive. If this has not been done then refer to the Installation instructions in Chapters 1 and 2. These tutorials have been written with the idea that you will start at the beginning and work your way down to the end. Descriptions will be more extensive earlier on and become less extensive. The idea being that the reader, through the use of Vistapro, is increasingly familiar with the program. If you skip sections and find something unclear, you will most likely find clarification in an earlier section.

RUNNING VISTAPRO

To run Vistapro you will need to be at the DOS prompt. Change to the hard drive that Vistapro was installed on by typing the drive reference letter. For example:

C:

followed by pressing the ENTER key. Change to the Vistapro directory by typing:

CD\VISTAPRO

followed by pressing the ENTER key. Next run Vistapro by typing:

VISTAPRO

followed by pressing the ENTER key. You will be ready to start when you see a screen with the gray Control Panels on the right hand side and the empty green topographical map on the left.

A QUICK INTRODUCTION

When Vistapro is first loaded, it starts out with a flat landscape. Although it's not very interesting, let's take a quick look at it. Locate the Render button at the lower left hand corner of the Lower Control Panel. Move the mouse pointer to the Render button. Press and release the left mouse button to activate the Render button.

You should now see a sequence of status messages on the screen in the blue area immediately above the topographic map. Exactly what these messages mean is documented in Chapter 5 of this manual -- for now just note that Vistapro needs to make some calculations before drawing.

After a few seconds you should see the screen switch to the View screen. At first it will be black, then you will see Vistapro draw the sky and ground. Then it will draw the landscape. If you look closely, off in the distance, you will see a small pyramid. At the current settings (assuming you haven't changed anything) the pyramid will be barely discernible.

Well, it's not much to look at, but you just rendered your first Vistapro image. To switch back to the Control Panels and topographical map, just click on the left mouse button. Let's go on to something more interesting.

LOADING A DEM LANDSCAPE

To load a landscape, position the mouse pointer over the Load button at the top of the screen. Press and hold the left mouse button. The Load Menu will drop down to reveal several options. Move the mouse pointer (while still holding the left button) to the first option, Load DEM, and release the button.

Now you should see the Vistapro Load DEM File Requestor. The Vistapro File Requestor is used anytime a file is to be loaded or saved. At the top of the Load DEM File Requestor is a button labeled Load Vista DEM and a button labeled Abort. The Load Vista DEM button is this File Requestor's confirm button. Clicking on it means to go ahead and load the file. The label on the confirm button varies depending on the File Requestor.

For example, if you were saving a DEM instead of loading it, the button would read Save Vista DEM. The Abort button is used to exit the File Requestor without taking an action. Clicking on this with the mouse pointer means no file will be loaded (or saved depending on the File Requestor).

Immediately below the confirm and Abort buttons are the Directory:, Filename:, and Spec: text gadgets. The gadget is the black box to the right of the description. The terms text gadget and numerical gadget will be used throughout this tutorial. A text gadget is a field that accepts text entered using the keyboard and a numerical gadget accepts numbers. To start entering information in a text or numerical gadget, click on it with the mouse pointer. To end and have the information accepted, press the ENTER key. To abort, press the ESC key. You will not need to enter anything into these particular text gadgets for this tutorial.

At the center bottom of the File Requestor is the Filename Window. It will currently be displaying a list of directories (the names with "(DIR)" in the right hand column) and possibly some files ending with ".DEM". Look through the list until you find the DEM directory. If there are more files than fit in the window use the buttons to the right of the Filename Window to scroll up and down the list.

The single up arrow button scrolls up one line and the single down arrow button scrolls down one line. The three up arrows scroll up one page and the three down arrows scroll down one page. After you have located the DEM directory, position the mouse pointer over it and click the left mouse button. You will now be presented with a list of the DEM directory. You should see a list of files ending with .DEM. You can scroll up and down the list of files by using the up and down arrow buttons as described earlier.

Find the file TUTORIAL.DEM and click on it. Notice that above, in the Filename text gadget, is the name TUTORIAL.DEM. We could have typed the file name directly into this filename text gadget, but for small lists it's much faster to click on the name with the mouse pointer. Click on the confirm button, which is the button labeled Load Vista DEM at the top left of the File Requestor.

The screen will switch back to the topographical map and Control Panel and Vistapro will begin loading the landscape. It could take several seconds to complete.

Once Vistapro is finished loading the landscape, you will see a topographical view of the landscape in the box near the left side of the screen.

The topographic map is colored by elevation. Dark greens represent the lowest altitudes, browns represent the middle altitudes, and gray-whites are the highest. Move your mouse pointer over the landscape. Notice that the X, Y, and Z figures in the Status Window (located above the topographical map) change. The X and Y values represent the location of the pointer on the map, and the Z value represents the elevation of the terrain under the pointer.

SETTING CAMERA AND TARGET LOCATIONS

When you first rendered the flat landscape at the beginning of this tutorial, you used the default camera and target position. Let's take a look at moving your viewpoint.

If you look at the very top of the topographical map, you will see a little black box. This is your camera position on the landscape. At the very bottom of the map you will see a little black plus (+). This is your target position (the point your camera will be aimed at).

Look at the X, Y, and Z gadgets located below the Camera button on the Upper Control Panel. The values in these gadgets represent the location of your camera on the landscape.

To move the Camera position, click on the Camera button. Move the mouse pointer over to the topographic map to where you would like to be standing if you were taking a picture. When you have found this point, click once with the left mouse button to set the camera location. You will notice that the little black box is now at the location you selected.

If you would like to be above the surface, as if on a tall ladder, click on the numerical gadget below the Camera button and to the right of the Z button. Enter the altitude (height of your camera on the ladder) and press the ENTER key. This raises you up off of the surface, but leaves you in the same location. You may also lower the camera by entering a smaller value.

Now you need to tell the camera which way to be pointing when taking the picture. This is done by clicking on the Target button with the left mouse button, and then positioning the mouse to the point at which you want to aim the camera, and clicking the left mouse button again. You can change the vertical position of the target in the same way you did with the camera.

Let's pick a point to look at. If you have been following this tutorial from the beginning, the landscape TUTORIAL.DEM should already be loaded and displayed in the topographical map.

This landscape has five distinctive objects. Two at the top, one in the middle, and two at the bottom. Most landscape will not look like this, but this landscape was made especially for this tutorial. Also the sky color has been turned off in order to speed up rendering time.

Click on the Camera button. Now click on the blue square in the middle of the landscape. Your camera X, Y, and Z position are set.

Look at the Z value under the Camera button. You'll notice that it is 30. When setting a camera location, Vistapro will set the Z value to 30 meters above the landscape. In this case the landscape under the camera was 0 meters (above sea level). Let's lift the camera up a bit higher. Click on the Z numerical gadget under the Camera button and press the number 5 followed by pressing the ENTER key. The Z position of the camera should now be 530.

To set the target, click on the Target button and then click on the oddly shaped object at the top left hand corner. You are now ready to produce your initial rendering.

VIEWING FROM YOUR CAMERA POSITION

Right below the word "Poly" on the Middle Control Panel you will find four buttons. They are "1", "2", "4", "8". These buttons are used by Vistapro to determine the size of the polygons used to draw the landscape. Only one can be selected at a time. If you just want to get an idea of your camera position, click on the "8" button. This will cause Vistapro to use large polygons and fewer of them. As you can see, the larger the "Poly" setting, the less detail the image will have. The advantage of less detail is more speed.

Another way to decrease rendering time is to click on the LckPal button located on the Middle Control Panel. This will prevent Vistapro from calculating a new color palette (which can be time consuming) each time it renders a picture. Before rendering your final image, you will want to unlock the color palette (click on LckPal again) so that Vistapro will calculate the best colors to use for the image.

Let's take a quick look at the landscape, click on the "8" button. Click on the LckPal button, just to speed things up. Now click on the Render button, and wait while Vistapro renders the landscape.

As you can see, the landscape looks very blocky, but it gives you an idea of your camera position. Return to the topographical map and Control Panel screen by clicking the left mouse button. At this point, you can change your camera and target positions as outlined above, and re-render until you have the camera position that you like. Once you like the camera position, select a smaller "Poly" setting and then click on the Render button.

Try rendering using each of the "Poly" settings. You will notice that a "Poly" setting of "1" can take a bit of time to render. That's why it's a good idea to use the larger and faster setting to fine

tune your camera position.

If you want to abort a rendering in progress, simply press the ESC key.

ADJUSTING THE CAMERA LENS

Your imaginary camera also has an imaginary lens. To zoom in, or out, click on the Lens button on the Middle Control Panel. Once you click on the Lens button, you will notice that the Lower Control Panel switches to become the Lens Lower Control Panel. There are two buttons located on this Panel:

* Wide * Zoom

The Wide button is the default selection and has a focal length similar to a wide angle lens on a real camera.

Click on the Zoom button. Now click on the Main button to get the Lower Control Panel back. Click on the Render button. Notice that the object (mound) is now larger.

Click the left mouse button to return to the Control Panels. Click on the Lens button again. At the bottom of the Lens Control Panel, you'll notice a numeric gadget. This contains the zoom value. This value can be changed for a custom zoom value. The larger the number, the greater the magnification.

MAKING A "SMOOTHER" IMAGE

When rendering a landscape, even at Polygon size "1", you will often see small triangles in the close up portions of the picture. This is because the USGS data used to make the Vistapro DEM files is made up of elevation points that are about 30 meters apart. When that distance is more than 1 pixel wide, then that point in the landscape will render as a triangular block. There are several methods of hiding these blocks when rendering.

Blend

Blending smooths the changes in color from polygon to polygon, causing the small polygons to be less apparent, especially in the distance. To use blending, click on the Blend button, on the Middle Control Panel, before you render a picture. The button will remain depressed until you again click on it to disable it.

Gouraud Shading

Gouraud Shading smooths the boundary between polygons, making it much less apparent that they are even there. It also eliminates sharp transitions from one color to another, giving the image more of the quality of an artist's rendition. Gouraud Shading may be enabled by pressing the GShade button, in the Main Lower Control Panel, before rendering a picture. The button will remain depressed until you again click on it to disable it.

Dither

There are two methods of dithering available with Vistapro. The first, using the Dither button causes a blending of the elevation colors, reducing the sharpness of the snow and tree lines. This can be changed by clicking on the numerical gadget below the word Dither in the Middle Control Panel, and entering a new value. Larger values result in more dithering, smaller values result in less dithering.

The second method is called pixel dithering, mixing slightly different colored pixels to simulate more colors. This can be set by clicking on the numerical gadget below the PDthr button on the Main Lower Control Panel, and entering a new value. Larger values result in more dithering, smaller values result in less dithering. You can add so much dithering so as to make the image

entirely unrecognizable.

EXPERIMENT

Spend some time experimenting with the features we have discussed. Try changing your camera and target location and rendering at different "Poly" levels with the different blending features. After you have a good feel for the operation of the program, go on to the next tutorial.

Tutorial #2 Making a Prettier Picture

Before starting this tutorial, you should have Vistapro running and have the DEM file TUTORIAL.DEM loaded. If you are not at this stage, refer to Tutorial #1.

LOADING A PCX IMAGE

Before we further explore Vistapro features, let's take a look at a saved PCX image of the TUTORIAL.DEM landscape.

Select the Load PCX option from the LOAD menu (top of the screen). You should now see the Vistapro File Requester. If you are unfamiliar with the File Requester, refer to Tutorial #1: Loading a DEM Landscape.

Position the mouse pointer over the PCX directory and click the left button. Search the list of files until you find the file: "TUTORIAL.PCX". Click the left mouse button on this file. Vistapro will now load and display the PCX image.

The image that you are looking at was created using the TUTORIAL.DEM landscape and several of Vistapro's options. It probably looks a lot different than what you were able to achieve using the features in Tutorial #1. Through the use of Vistapro's features, this relatively dull landscape has been "prettied" up a bit.

Let's examine some of the options used to give this image its look.

To get back to the topographical map and Control Panel, click the left mouse button.

ADDING TEXTURE

Artificial detail can be added to a landscape by using the Texture buttons. They are located on the Lower Control Panel under the word: Texture. They consist of four buttons, of which only one can be activated at a time. The buttons are: "O", "L", "M", and "H". They stand for Off, Low, Medium, and High.

The higher the texture setting, the more Vistapro will break up displayed polygons into smaller pieces. Each piece is drawn as a slightly different shade, thereby giving the landscape a more textured look.

Set your camera and target location and try rendering the images using each of the texture settings.

SETTING THE TIMBER LINE

Locate the Tree button. Right below the Tree button is a numerical gadget. The number in this gadget indicates the timber line, which is the altitude above which there are no trees. Just as in nature, the timber line is a fuzzy value. Some trees will appear above the timber line and some

bare areas will appear below it.

An altitude can be entered into the numerical gadget, or you can use the Tree button to select the tree level by clicking on the Tree button and then clicking on the topographic map at a location which has the desired altitude.

If the DwrTre button is not selected; Vistapro will not actually draw trees, instead it uses the tree colors (see CMAP) to color the ground.

Try rendering the current landscape with different values for the tree line.

DRAWING TREES

Through the use of the DrwTre button, you can specify whether Vistapro will draw trees on the landscape or not. Trees may be drawn anywhere that the tree colors are used (see Timber Line above).

Trees are time consuming to draw and may take from twice as long to render as the same scene without any trees. To draw trees, click on the DrwTre button. You will then see a requestor giving you the option to change the tree size and type.

The numerical gadget in the center of the requestor specifies the tree size in meters. You will also see a Pine and Oak button. Click on one of these to specify the type of tree to draw.

SETTING TREE DENSITY

Use the TreDns numerical gadget located on the Middle Control Panel to specify how many of the polygons drawn with tree colors will have trees drawn on them (if the DrwTre button is selected). Useful values range from 0 to 300. A value of 150 will result in one half of the tree colored polygons having trees.

SETTING SNOW LEVEL

The snow level is the lowest elevation where Vistapro covers the landscape with snow. Just like the timber line, this is a fuzzy value. The snow level can be entered directly into the numerical gadget under the Snow button, or you can click on the Snow button and then click on the topographical map.

ADDING A LAKE

To add a lake to your landscape, first select a location for your lake. It needs to be an area of landscape surrounded by landscape of a higher elevation. Move your mouse around until you find the lowest point in the surrounding landscape.

Now click on the Lake button and then click on the topographical map at an altitude just a bit lower than the lowest elevation of the surrounding landscape. If you select an altitude that is higher, the lake will spill over into other areas where you may not want it.

ADDING A RIVER

The River button is used to create rivers that flow downhill, from the selected starting point, following the curves of the landscape. A river will continue to flow downhill until it reaches the ocean, the edge of the topographic map, or until it runs into another river. Placing a river on top of an existing river will widen the existing one. You may stop the flow of a river by pressing the ESC key or the right mouse button.

To select the river location, click on the River button and then on the topographical map.

CHANGING THE HAZE LEVEL

The haze level is the amount of haze that will appear between the camera, target, and horizon. With a 0 haze level, the horizon will be crystal clear, but you will lose a little of the depth of the image. To set or change the haze level, click on the Haze button. Vistapro will generate a value based upon the distance between the camera and the target. Alternately, you can enter a value in the numerical gadget below the Haze button.

SETTING THE LIGHT DIRECTION

To change the light direction, click on the Light button on the Middle Control Panel. You will see a target drawn around the topographical map. Each circular line represents the altitude of the light source in degrees. Notice that there is a line radiating out from the center (or bulls eye). This line represents the direction of the light source.

You will also see a new Lower Control Panel. On the left of the panel are the "N", "E", "S", and "W" buttons for the most simple light directions. These represent light coming from the north, east, south or west at 45 degrees above the horizon.

If you want your light source to come from one of these directions, then click on the button representing the direction from which you want the light to come. If, however, you want the light to come from a different direction, click on the Custom button.

After clicking on the Custom button, move the mouse pointer to the topographical map. Notice that moving the position of the mouse pointer on the map changes the end point of the light source direction/altitude line. Once you have the direction and altitude set to your liking, click the left mouse button to accept the setting.

Alternately you can use the numerical gadgets on the Light Lower Control Panel to input values.

SHADOWS AND EXAGGERATION

You will also see two buttons on the Light Lower Control Panel; they are Shadows and Exager.

If the Shadows button is selected, Vistapro will take into account the light source direction and create shadows on the landscape.

The Exager button exaggerates the shading of the landscape. With this button selected, the rate at which shadowed areas darken is increased.

CHANGING COLORS

Vistapro allows you to change its color map. This allows you to fine tune your image to get that perfect look of realism. It also allows you to tamper with nature; imagine flaming red snow, or pink lakes and rivers. By altering the color map, you can drastically change the look of your landscape.

Before you change colors, make sure that the LckPal button is not selected. If the button is depressed, click on it to raise it.

To change the colors, click on the CMap button in the Middle Control Panel. This will activate the Color Control Panel. You will see two rows of buttons labeled with the names of landscape features. To the left are red, green, and blue slider bars. To change the color of a landscape feature, click on the button and use the slider bars to change the color.

To exit the Color Control Panel and keep the new colors, click on the Accept button. If you don't

want to keep any changes made, click on the Reject button.

At this point take a minute to look over chapter 6 of this manual. After you have read chapter 6, experiment with different colors until you find a set that you would like to save.

SAVING THE COLOR MAP

The Vistapro color map can be saved by using the Save CMAP option from the Save menu (top of the screen). Once you pick this option, you will be presented with the Vistapro File Requestor. The Filename Window will contain a list of directories. Click on the CMAP directory. You should see a list of CMAP files (they have a DEM extension).

Click on the Filename: text gadget and enter the filename:

TESTCMAP

followed by pressing the ENTER key. This is the name under which the current color map will be saved. Now click on the Save CMAP button at the top left of the File Requestor.

Your color map has now been saved.

LOADING A COLOR MAP

Let's load a different color map. Pick the Load CMAP option from the Load menu. You will now be at the Vistapro File Requestor. Switch to the CMAP directory and click on the file "TUTCMAP.DEM". Now click on the Load CMAP button.

Set your camera and target positions and render an image. As you can see the landscape looks quite different.

Pick the Load CMAP again and load the file that you previously saved: "TESTCMAP.DEM".

SAVING YOUR RENDERED IMAGE

Now that you know how to create beautiful and bizarre images, the next step is to be able to save your masterpiece for viewing at a later date. Using the techniques covered in earlier sections, render an image that you would like to save.

Now pick the Save PCX option from the Save menu. You will see the Vistapro File Requestor. Switch to the PCX directory and then click on the Filename: text gadget. Enter:

MYPIC

followed by pressing the ENTER key. Now click on the Save PCX button.

Your picture is now saved and can be viewed by using the Load PCX option or by using any IBM paint or viewer program that supports the 256 color PCX format.

Tutorial #3 Manipulating the Landscape

In past tutorials we have covered how to change the look of your landscape; now let's change the landscape itself.

CREATING AN IMAGINARY FRACTAL LANDSCAPE

Let's start by creating a completely new random landscape.

Click on the Frac button on the Middle Control Panel. You will notice the Lower Control Panel change to become the Fractal Lower Control Panel. Located on the Fractal Lower Control Panel are several buttons and two numerical gadgets.

The Random button causes a random landscape to be generated. Clicking on the Island button prior to clicking on the Random button will cause the generated landscape to have peaks surrounded by lower elevations. The peaks can be made into islands by adjusting the sea level (see Chapter 4: Sea). Landscapes that are generated without the Island button selected look like they were cut from a piece of terrain.

Click on the Random button and notice the numerical gadget right below.

You can regenerate this identical landscape at any time by remembering the state of the Island button and the number located in the numerical gadget right below the Random button. To regenerate a landscape that was created earlier, just set the Island button, click on the numerical gadget, enter the number and press the ENTER key.

The FrDim numerical gadget is used to change the vertical scale and roughness of the mountains and hills on the random landscape.

Larger values generate taller and rougher landscapes, while smaller values generate flatter and smoother landscapes. Changing FrDim value does not affect the current landscape, only landscapes generated after the new value has been entered. This value is also used by the Fractlz button when determining the amount of fractalization to be performed on an existing landscape.

FRACTALIZE YOUR LANDSCAPE

The Frctlz button is used to change the roughness of the current landscape. Clicking on it causes Vistapro to fractalize the landscape (add detail). It uses the number in the FrDim numerical gadget to determine the amount of fractalization to be done on the landscape. Low values smooth the landscape, while higher values cause the landscape to become rougher.

The buttons right below the Fractlz button are the fractal divisor. These buttons determine the scale where fractalization occurs. If the "1" button is selected, then the fractal detail will be added at a very small scale, whereas if the "8" button is selected the landscape will look much rougher and may not even resemble the original landscape.

Fractalizing at fractal divisor "1" is useful for adding small details after enlarging a landscape. Fractalizing is also good for adding detail to landscapes that don't have much detail of their own.

TO STRETCH A LANDSCAPE

Use the Stretch button to vertically stretch an existing landscape. This button causes peaks to grow taller and valleys to grow deeper. The scale at which this happens is controlled by the Fractal Divisor buttons immediately above the Stretch button. Smaller values cause only the smallest features to be stretched, whereas larger values cause the larger features to be stretched.

You will need to experiment a bit to find the settings that are most to your liking. Take some time and generate some landscapes using different settings.

TURNING YOUR WORLD UPSIDE DOWN ...and other not so drastic alterations

By entering a number into the VScale numerical gadget (located on the Middle Control Panel) the currently loaded landscape can be re-scaled. So, for example, if you enter a value of 2.0 into the VScale gadget, then the landscape will become twice as tall. A value below 1.0 causes the landscape to become flattened. Entering a -1.0 causes the landscape to flip over (become inverted).

Try entering different VScale values. Try scaling up the landscape so a mountain will exceed 32000 meters and then scaling it back down again. This will result in a pit in the top of the mountain. Add a lake in the pit at the top of the mountain. Now enter a VScale value of -1.0. As you can see, some pretty interesting things can be done with the VScale option.

Vertical scaling can be used to give relatively boring landscapes dramatic features.

ENLARGING YOUR LANDSCAPE

Vistapro has an option which allows you to enlarge a portion of the landscape so it fills the entire topographic area.

Click on the Enlarge button located on the Middle Control Panel. You will see a box that follows the mouse cursor around the screen.

Pick a spot on the topographical map, and click the left mouse button. At this point, a requestor will open asking you to select either the Interpolate (average) or Duplicate mode. Choosing the Interpolate mode will result in a smooth transition between elevation points. The Duplicate mode will result in a coarse or step effect.

After enlarging a portion of the landscape, it's a good idea to fractalize it to regain that natural look. Try fractalizing at a fractal dimension of 100 to 200 with the fractal divisor set to "1" after each enlargement.

SMOOTH YOUR LANDSCAPE

With the Smooth button, the power of erosion is at your finger tips. Clicking on the Smooth button will remove the harsher, more jagged edges of your landscape, often improving the landscape's appearance. You can click on the Smooth button as many times as you like, but remember, each time you use it your landscape is eroded even more.

Tutorial #4 ANIMATION

Vistapro has the ability to do animated fly throughs of landscapes. This is done by producing a series of images with a slightly different camera and/or target location for each frame. Sitting and rendering each frame could get tedious, so Vistapro provides the ability to run the rendering process by way of a script. Each of the camera and target locations are contained in a script file.

Animations can be saved as a series of PCX files or in the VANIM format. Animations saved as a VANIM file can be played back by using the VIEWER program that was distributed with Vistapro. To view a PCX animation, you would need to have a different software package that allowed loading and viewing a series of PCX files as an animation.

CREATING A SCRIPT

There are two ways to create a script file in Vistapro. The first is to use the Generate option from the script menu. Choosing this option will result in a script file that starts with your current camera and target position and with each frame moves the camera toward the target. The script generation ends when the camera and target locations are the same.

The second way to create a script file is by manually specifying the camera and target location for each image (frame).

Choose the Create option from the Script menu. Vistapro will create a blank script file using the name that you specify.

The next thing to do is to begin adding frames to your script file. Position the camera and the target at the position where you want your flight to begin. Next choose the Add option from the script menu to have the camera and target positions added to the script file. Now reposition the camera and target slightly along the path that you plan to take, and repeat the Add option. Repeat this until your camera has flown the desired path.

If you want to add on to a script file that was created during a previous session, then choose the Open option from the Script menu and specify the script name. You can then continue to Add on to the script file.

After a script has been created, the camera positions can be viewed by choosing the Preview option from the Script menu.

PREVIEWING A SCRIPT

Choosing the Preview option from the Script menu and specifying an existing script name will result in a series of little black dots being displayed on the topographical map. Each of these dots represents a camera location within the script.

CREATING A VANIM FILE

Let's create a VANIM animation. Load a landscape and create a script using one of the methods described earlier. For this tutorial, call the script:

TESTSCR.SCR

Under the GrMode menu, pick the VANIM 320X200 option. This is the only graphics mode in which VANIM animations can be created. Picking any of the other options will result in a series of PCX files rather than one VANIM file.

At this point adjust the settings (poly, shading, timber line, snow line, etc.) to the desired values.

Now select the Execute option from the Script menu. Specify the name of the script that you created earlier (TESTSCR.SCR). Next specify the name that you would like the VANIM to be stored under. Call it:

TESTPIC.VAN

Vistapro will now begin rendering each frame in the script file. This can take some time depending on the speed of your machine and the number of frames in the animation.

VIEWING A VANIM FILE

After your machine is finished rendering each of the frames, you are ready to view the animation.

To do this, you must be at the DOS prompt and in the directory that you specified for the file TESTPIC.VAN. The file VIEWER must also be present in the directory (unless there is a DOS path to it). Pick the Quit option from the Projects menu to exit Vistapro. Type:

VIEWER TESTPIC.VAN

followed by pressing the ENTER key. You will now be viewing your animation. Use the numbers on your keyboard to change the playback speed. To exit the VIEWER program, press the ESC key.

Reference the Animation Viewer section of this manual for more details on keyboard controls.

Appendix A What are Fractals and Fractal Geometry?

by Daniel Wolf, Ph.D.

The concept of fractal geometry is the basis of Vistapro's capacity to generate imaginary scenes. Many computer graphics enthusiasts have become interested in fractal graphics through programs such as Vistapro, and public domain Mandelbrot and scenery programs. The popularity of fractal graphics using personal computers traces back to the appearance of stunning images of the Mandelbrot Set (a type of fractal object) on the cover of Scientific American in August of 1985. That widespread exposure of these strangely beautiful abstract objects led many amateur and professional programmers to the original source book on fractals: The Fractal Geometry of Nature (by Benoit Mandelbrot).

While fractals and fractal geometry have become hot buzzwords in the computer graphics field, it is not obvious what they are. The following description is simplified, and interested students and readers should read Mandelbrot's book on the subject.

We owe the word fractal to Mr. Mandelbrot, a mathematician and Fellow at IBM's Watson research organization in New York. Fractal refers to objects with fractional dimensions, that is, objects which don't really fit into the ordinary world of things like lines (1-dimensional), surfaces (2-dimensional) and solids (3-dimensional). Fractals are objects which fit in-between these normal-dimensional objects.

Mandelbrot took an interest in a long neglected area of mathematics which originated at the turn of this century. Some devotees of geometry at that time began to study lines which didn't behave like ordinary lines.

If you read Mandelbrot's book you'll become familiar with some of the mathematical history of things like Peano curves, Hilbert curves, and Koch snowflakes. What makes these objects so strange, and what led Mandelbrot to look deeper, are two properties: these lines tend to fill up a 2-dimensional surface (they act as if they are something in between lines and planes), and their appearance seems to be identical no matter how much they are magnified. Magnified small portions of these fractal lines tend to look like the whole unmagnified line. Odd indeed!

Mathematicians at the turn of the century tended to call such objects pathological and didn't have a good way of integrating them into the rest of mathematics, especially geometry. Geometry was mostly dominated by the study of well-behaved, smooth, simple forms like lines, planes, and solids. Mandelbrot made a systematic study of these weird fractional dimension geometric forms and helped bring them into the mathematical fold.

Mandelbrot also showed how these objects are models of many things found in the natural world, like surface textures of mountains, coastlines of islands, and branching designs of plants, trees, blood vessels, and lung tubes (bronchi).

If you want to envision a mental picture of how Vistapro exploits fractal geometry to generate

natural looking land surface textures, take the following little mental journey into the process of crumpling a sheet of paper:

1. Imagine a flat triangular sheet of paper.
2. Divide the sheet into a small number of sub-triangles.
3. Randomly select some of the intersection points and raise or lower them (by a large amount) above the original plane of the flat sheet.
4. Now divide the sub-triangles into smaller sub-triangles.
5. Randomly raise and lower some of the newly created corner points like you did in step 3, but by a smaller amount than in step 3.
6. Keep repeating steps 4 and 5 making smaller and smaller sub- triangles and raising and lowering corner points randomly by smaller and smaller amounts at each step.
7. Stop when you've reached a point where each smaller division into sub-triangles can't make any more difference in appearance on a limited resolution display like a computer monitor.
8. Now color all the little sub-triangles by a method which makes the highest corner points white (snow on the mountain tops), lower ones brown and green (mountain sides with trees) and the lowest ones blue (a lake at the bottom of the mountain valley).

If we did Steps 4 and 5 using some regular (non-random) technique, in the end the highly crumpled surface would be a lot like the first fractals explored by Mandelbrot; they would look similar at any degree of magnification they were viewed. The introduction of randomness to the process makes them look similarly random at different degrees of magnification.

If you are interested in further exploring fractal geometry, here are some great books:

The Fractal Geometry of Nature (by B. Mandelbrot) The Beauty of Fractals (by H. Peitgen and P. Richter) The Science of Fractal Images (by H. Peitgen and D. Saupe)

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Appendix B The Landscapes

Most of the landscape DEM files were obtained from the USGS and are accurate to within 7 meters. Some of the files were assembled to fit into Vistapro and therefore may not be perfect where they are joined.

ELCAP.DEM

ElCap is a section of Yosemite Valley in California out of which rises El Capitan, a very large (about 1000 meters) granite cliff formation at coordinate 2520,5760 (X, Y) in the DEM data. This landscape was created by joining together two USGS DEM files and then clipping out the section of interest. A small "scar" that runs North/South where the USGS data did not quite line up can be seen. The joining scar is most apparent in the Valley with the sun shining from the east or west at approximately 3400,4980. This DEM file is as accurate as the original USGS data.

HALFDOME.DEM

The Half Dome section of Yosemite Valley contains the famous granite formation know as Half

Dome at location 5100,7260. The method used by the USGS to digitize the terrain led to some distortion at the top and edges of Half Dome. The jaggy bump at the top of Half Dome is a USGS artifact. This DEM file is as accurate as the original USGS data since it was simply clipped out of one DEM file.

CRATERL.DEM

Crater Lake is the caldera of an ancient volcano in Oregon. The walls of the caldera rise approximately 1250 meters from the bottom of the lake to the top of the caldera. The DEM data includes the underwater elevations. The lake fills the caldera to a level about half way up the walls. The mound near the west edge of the caldera is Wizard Island. It is separated from the edge by the lake. The circular mound near the top of the caldera is completely submerged. The lake can be filled with water using the Lake function of Vistapro. Clicking the mouse button about halfway from Wizard Island to the edge of the caldera gives approximately the right water level. In order to include the entire lake in the file, everything was adjusted down by a factor of 0.6. Therefore, to convert elevations or distances into actual meters, take the values given by Vistapro and divide them by 0.6.

MSHB.DEM and MSHA.DEM

Mt. St. Helens is the volcano in Washington that blew its top on May 18, 1980. The explosive eruption was preceded by amounts of intense earthquake activity. A 150 meter bulge started to grow in April at a rate of 5 meters per day. A magnitude 5.1 earthquake set into motion the collapse of the bulge and the following explosion. Winds from the blast were calculated at 670 miles per hour. Almost everything within 8 miles of the blast was obliterated. Virtually all trees were flattened at distances up to 19 miles from the volcano. Significant amounts of volcanic ash fell as far as one thousand miles away. The new crater is about 3 kilometers wide and 700 meters deep. The "before" data was generated from stereo photographs taken in 1979. The "after" data comes from photographs taken late in 1980.

MONS.DEM

Olympus Mons is a huge volcano on the surface of Mars that is roughly twice as tall as Mt. Everest on earth! It is about 500 kilometers in diameter and rises approximately 18 kilometers above the surrounding landscape. The original DEM file which contains the entire volcano is over 4 megabytes! The DEM file included here contains only the interesting caldera portion of the volcano. The technique used by the USGS to generate this kind of extra-terrestrial data creates extensive artifacting resulting in raked lines in the landscape. One or two smoothing passes will remove these artifacts. The data on the vertical axis is exaggerated by 4 fold to make the landscape more dramatic. Elevations are measured from an arbitrary reference, because there is no sea level on Mars.

JULIA.DEM and MANDELBR.DEM

Julia and Mandelbrot landscapes are artificially generated by a mathematical algorithm. The user may have seen Julia sets and Mandelbrot sets displayed as colors on a 2-D screen. If the user has a Mandelbrot generating program that will handle Julia sets, or a Julia generating program, the locations are as follows: The Mandelbrot is 1.255525 real -0.381060 imaginary, with a diameter of approximately 0.007; the location of the Julia set is 0.75 real -0.11 imaginary, relative to the Mandelbrot set.

ARROWHD.DEM

This is the Lake Arrowhead region of the San Bernardino Mountains in Southern California. The low-lying region forms a lake that is in the shape of an arrowhead, hence the name. The lake was formed by the addition of a man-made dam, which is not part of the DEM data, so it is impossible to fill the lake without flooding the landscape below. This is clipped from a larger data set that is also available from VRLI, called "Lake Arrowhead and Environs".

VANTAGE.DEM

This is a portion of the Columbia River in the state of Washington that forms the north portion of

Wanapum Lake. It is located in Ginkgo State Park near Vantage, Washington.

SANLUISO.DEM

This is the area that we see when we look out our windows. VRLI is located toward the southeast portion of the topographic map. The mountains are not of spectacular height, but it forms quite a pleasing landscape.

SANGORGO.DEM

This is south of the Big Bear Lake region of the San Bernardino Mountains in Southern California. It contains Mt. San Gorgonio, a 3500 meter peak in an area known as the San Gabriel wilderness. This is clipped from a larger data set that is available from VRLI, called the "San Gorgonio Mountain and Environs".

BIGSUR.DEM

This is the Big Sur area along the coast of north central California, just south of the Monterey Peninsula. It contains the Pfeiffer Big Sur National Park. It is one of the more beautiful camping areas in California, and contains one of the southernmost groves of redwoods. It is clipped from a larger data set that is available from VRLI, called "Big Sur and Environs".

MORROBAY.DEM

This is the data set for Morro Bay, one of our local tourist attractions on the central coast of California. There is a large rock that juts up into the fog called Morro Rock. This is visible as a mound in the northwest corner of the topographic map.

MTBALDY.DEM

Contrary to popular belief there is no such mountain as Mt. Baldy in southern California. That is the name of the village on the slopes of Mt. San Antonio. This is located in the San Gabriel mountains south of Wrightwood. This has been clipped from a larger data set that is available from VRLI, called "Mt. Baldy and Environs".

MTADAMS.DEM

This contains Mt. Adams, in the southern portion of Washington State. It is part of the Mt. Adams Wilderness, and is a good example of a volcano, reaching from a height of over 3700 meters at its peak. It was clipped from a larger data set that is available from VRLI, called "Mt. Adams and Environs".

WOODSH.DEM

This is the first of our undersea data, a volcanic region located at 21 degrees 13 minutes north and 166 degrees 24 minutes east, 500 miles north of Wake Island. This is actually several thousand meters below sea level, but has been scaled to appear above sea level for rendering purposes.

Appendix C Glossary of Terms

AI

Artificial Intelligence. The ability of a program to incorporate expert judgment enabling it to imitate intelligent decision making.

Aliasing Artifacts

Objects which appear in a landscape which are not derived from mapping data. They may reside in the data or they may be formed as a result of the program.

Caldera

The crater at the top of a volcano.

DEM

Digital Elevation Model is a model of a landscape reduced to three dimensional digital coordinates.

Digital Elevation Model

Digital Elevation Model is a model of a landscape reduced to three dimensional digital coordinates. Abbreviated: DEM.

Dithering

A program function which blurs the boundaries between polygons in order to more closely simulate realism in landscape creation.

Fat Polys

Foreground polygons which are relatively larger than the polygons in distant scenes. Fat Polys are a function of perspective and the accuracy of the data being rendered.

Fractal

Fractional dimension. Most math deals with whole numbered dimensions. One dimension is a point. Two dimensions are a line. Three dimensions are a solid. Four dimensions are a space-time solid, and so on. Fractals deal with non-whole numbered dimensions, and fractal geometry is capable of producing pictures which are remarkably similar to natural phenomena - particularly geological shapes.

Gadget

A gadget is a black box which contains numerical or textual information. It shows Vistapro settings and allows modification of these settings. See the Gadget section in the Graphical User Interface portion of Chapter 2 of this manual on page 2-10.

Haze

The atmospheric occlusion that increases with the distance between the eye and the target.

PCX

A standard graphic file format used by computers.

Jaggies

Partial polygons which produce jagged lines often at the ridge line of a landscape and sometimes in the foreground. Jaggies distort the realism of a scene.

Olympus Mons

A volcano on Mars. Olympus Mons is an extremely vast feature. The base of the volcano covers an area the size of Nebraska. Olympus Mons also has a feature which is unique within the solar system. The base of the volcano is well within the thin atmosphere of Mars, but the peak of the volcano is virtually above the Martian atmosphere.

Polygons

The basic geometric units with which Vistapro renders landscapes. A polygon is a two dimensional shape having at least three linear sides.

Ray Tracing

A method of image generation where a hypothetical ray of light is projected, reflecting off the target and ultimately colliding with the camera.

Topography

Science of drawing maps representing the surface features of a region.

Topology

The study of the surface features of a region.

USGS

United States Geological Survey. The USGS has created three dimensional maps of much of the United States, some undersea landscapes, and some extra terrestrial landscapes. Much of the work done by USGS is in the public domain and can be adapted for display by Vistapro.

XYZ Coordinates

To define a solid object. By translating the topology of a landscape into XYZ coordinates, the three dimensional topography can be stored in digital format and can be easily manipulated by Vistapro's landscape rendering engine.