GRAPH/NET Computer Integrated Design System

VU/NET 3-D Perspective Simulation

Version 0.h

Introduction

The VU/NET program set allows the designer or renderer to rapidly
examine a large number of different interior or exterior perspective
views of a project. You may choose specific viewpoints, or watch a
sequence of views demonstrate the visual impact of moving around
the project. You may choose to display the hidden lines, or to display
only the facing walls. You may choose to display the wire frame only,
or to tone the walls to give greater substance to the perspective. You
may choose to display the shadows cast by the project, anywhere in
the world, any month of the year, any time of day. Those shadows may
be in outline form, or toned. Or, you may choose not to display the
project in perspective at all, but to examine it in plan or elevation
at various scales.

This powerful program can be used during all of the different stages
of project development. During the early schematic design stage, it
allows the designer to examine the visual impact of various massing
alternatives on a given site. Many alternatives can be stored in the
computer, and the same sequence of views may be requested for each,
to give a truer basis for comparison. As the project gains in detail,
the architect may add detail to the perspective. You may use stored
library elements, such as trees, cars, furniture, to rapidly develop
a detailed perspective. Or you may enter new project-specific elements
into the system rapidly and easily, to increase the library of three-
dimensional elements available for future projects.

As various two-dimensional floor plans are developed in the DRAFT
program, these may be automatically converted into the VU/NET 3-D
format, and displayed in perspective, using the DRAFT3D Program.
This enables the architect to obtain a "roof off" view of the
interior of the project. You can thus assess what a certain
layout will feel like to the individual walking down a corridor,
entering a room, using the spaces. Similarly, a three-dimensional
view may be stored for display in the DRAFT program, using the
VU2D Program.

The renderer can rapidly and easily examine hundreds of perspective
views before selecting the one that displays precisely what he wishes
to illustrate. This view can then be enlarged or reduced until it
is the precise size of the desired rendering, and plotted. The plot
serves as an underlay for the rendering, releasing the renderer from
the drudgery of calculating the three-point perspective, and ensuring
that the final rendering is not a disappointment.

VU/NET 3-D Perspective Simulation

Starting the VU/NET Program

To start the VU/NET program running, first make sure that you are
working in the VUNET area of the disk. If you start the program
but are not in the proper disk area, VU will not be able to find
your files. To get into the VUNET area of the disk, type the
following command on the keyboard and then hit the RETURN key.
(NOTE: you should have already turned on the computer, entered
the date and time if necessary, and logged in.)

     PATH :VUNET

The computer will respond with a message telling you that a new
path has been set, so that any files accessed from now on will be
read from the VUNET area of the disk.

Now you must tell the computer that you wish to run the VU program.
You do this by typing the following command on the keyboard, and
then hitting the RETURN key:

     VU

There will be a short pause while the computer calls up the program,
and then the screen will clear, and the VU/NET menu system
will appear on the screen. VU uses the GRAPH/NET screen oriented
menu system, to minimize the amount of keyboard entry, and to
reduce eye, neck and shoulder strain caused by continuously looking
from the screen to a menu pad in another location. All of the
VU commands will appear on the screen. The commands are structured
so that you select from a Master Menu first, and that selection
causes an appropriate sub-menu to be displayed with further choices.

The menus appear on the lower third of the screen, while the upper
two-thirds is reserved for the display of the drawing file. On the
left-hand side of the screen is the VU/NET Master Menu, which
contains the major options. To the right of that is the VU/NET
Action Menu, which will contain the sub-menus. On the far right
is the Dialogue Window, which prompts you for responses, and displays
coordinates and comments.

If the program does not run when you type in VU, make sure you set
the path to the VUNET area. If you did, and it still will not run,
call your systems manager.

VU/NET 3-D Perspective Simulation

The Master Menu

When the VU program has started running, the MASTER MENU options will
appear, and the following message will appear in the Dialogue Window:

    VU Version 0.h

This Version Number identifies the software release with which you are
working. Always include it in any communications you may have about the
program with GHI, either to report bugs, or to request modifications.

The VU/NET Master Menu contains the following ten options:

    Fetch .VIL File
    Fetch .SAV File
    Set OPTIONS
    Set SITE
    Show OPTIONS
    INTERACTIVE
    SEQUENTIAL
    PLOT Drawing
    SAVE Drawing
    Exit

The following paragraphs will discuss in turn each of these options, and
any sub-menus each may use. In order to make a selection from this or
any menu, slide the puck up and down in the menu area until the black bar
is over the desired option, and then press down the yellow button on the
puck. That registers your selection, and results in the appropriate
action, or in the appearance of the appropriate menu.

Fetch .VIL File
Fetch .SAV File

There are two types of display files that may be accessed by
the VU program: alphanumeric files and binary files. The
alphanumeric files contain the VU Input Language commands, and
are stored on the disk with extension code .VIL. The binary
files are created from .VIL files using the 'SAVE Drawing'
command, and are stored on disk with extension code .SAV. The
binary files will be read in from disk faster than the alpha-
numeric ones, however they are frozen and cannot be edited.
You may have both a .VIL and a .SAV version of the same pro-
ject on the disk at once, but be careful never to delete the
.VIL file.

You may call either type of file from disk into memory by
selecting the appropriate command from the Master Menu. To
do this, slide the puck up and down in the Master Menu area
until the black bar is positioned over either the 'Fetch .VIL
File' option or the 'Fetch .SAV File' option, and then press
down the yellow button on the puck. Type in the file name,
without the extension code, and then hit the RETURN key on the
keyboard.

If you have recalled an alphanumeric file which contains other
.VIL files as components, you will see the list of those other
components appear in the Dialogue Window as they are read in.

When the file is completely entered into memory, regardless
of whether it is a .VIL file or a .SAV file, a message will
appear in the Dialogue Window telling you how many points
were read in. The current maximum number of points in each
layer of a perspective is 4,000.

If the program cannot find a file of the name you enter, a
message to that effect will appear in the Dialogue Window.
Check your spelling, to be sure you gave the name correctly,
and try again. If the VU program still cannot find the file,
make sure that you are asking for the right type of file. If
in doubt, ask for the alphanumeric version. If the program
still cannot find the file, make sure that you are in the
VUNET area of the disk, and that your file is stored in this
area as well.

VU/NET 3-D Perspective Simulation

Fetch .VIL File
Fetch .SAV File, Cont.

If you have made changes to a .VIL file since the last time
that you created a .SAV file, you MUST recall the .VIL file in
order to see the changes, and then make ANOTHER .SAV file if
you so wish. The older .SAV file will still contain the
unedited version of the .VIL file. This is always the first
thing to check if you recall a binary file and it does not
seem to be quite up to date!

Once you have read a file in using the Fetch .VIL File or
Fetch .SAV File options, you should IGNORE the filename options
in both the Interactive and Sequential Menus. If you select
those, and re-enter the filename, you will have to wait while
the VU program reads in the VU Input Language version of the
file again.

If you have already read in a .VIL file or a .SAV file, and you
then select Fetch .VIL, you will see the following message
appear in the Dialogue Window:

        Do you want to erase the screen? ·[Yes or No]

If you have a layered .VIL file, and you have already read in
and displayed the first layer, you should respond No. This
will result in the first layer remaining on the screen while
you read in and display the second layer, which will appear
superimposed upon the first. Note that it is not possible to
use a .SAV file as the second or subsequent layer; you must
read in a .VIL file in order to avoid erasing the screen.

If you are changing from one display file to another, you should
answer Yes to this question, and the screen will be erased in
readiness to display the new file.

Note that .SAV files cannot be stored or transported on floppies.
These files are intended as temporary user aids, and will degenerate
if you attempt to move them from one system to another. To back
up or copy a display file, copy the .VIL files, and then re-create
the .SAV file on the second system.

VU/NET 3-D Perspective Simulation

Set Options

When you start running the VU program, the program uses a set of
default options to determine how to draw the display the project
file. These default settings cause the program to draw in perspec-
tive every wall of the display file, with no toning or shadows.

You may change these default values by selecting 'Set Options' from
the Master Menu. To do this, slide the puck up and down in the
Master Menu area until the black bar is positioned over 'Set
Options', and then press down the yellow button on the puck. The
Options Menu will then appear in the Action Menu area. The
Options Menu has the following five commands:

    Projection

    Drawing

    Shadowing

    Site

    Master Menu

Each of these options will in turn produce a series of sub-menus,
allowing you to completely control the parameters of the display of
the file. To select one of these options, slide the puck up and
down in the Options Menu area until the black bar is positioned over
the desired selection, and press down the yellow button on the puck.

VU/NET 3-D Perspective Simulation

Projection

If you select the Projection option from the Option Menu,
the VU/NET Select Proj. Menu will appear in the Action
Menu area of the screen. The VU/NET Select Proj. Menu
has the following eight options:

        Perspective

        Plan
        North Elevation
        East Elevation
        South Elevation
        West Elevation

        Scale
        Return

To select any of these options, slide the puck up and down
in the Select Proj. area until the black bar is positioned
over the desired projection method, and then press down the
yellow button on the puck.

        Perspective: This is the default setting, and causes
        the program to draw in three-point perspective.

        Plan: This option will cause the program to draw a
        plan view of the display file. After selecting this
        command, you will see the VU/NET Set Scale Menu appear
        in the Action Menu area. (See Scale below.)

        North Elevation: This option will cause the VU program
        to draw the north elevation view of the display file.
        VU assumes that North lies along the positive y axis.
        After selecting this command, you will see the VU/NET
        Scale Menu appear in the Action Menu area. (See Scale
        below.)

        East Elevation: This option will cause the VU program
        to draw the east elevation view of the display file. VU
        assumes that East lies along the positive x axis. After
        selecting this option, you will see the VU/NET Scale
        Menu appear in the Action Menu area. (See Scale below.)

Projection, Cont.

South Elevation: This command will cause the VU program
to draw the south elevation view of the display file. VU
assumes that South lies along the negative y axis. After
selecting this option, you will see the VU/NET Scale
Menu appear in the Action Menu area. (See Scale below.)

West Elevation: This command will cause the VU program
to draw the west elevation view of the display file. VU
assumes that West lies along the negative x axis. After
selecting this option, you will see the VU/NET Scale Menu
appear in the Action Menu area. (See Scale below.)

Scale: This command will cause the VU/NET Select Scale
Menu to be displayed in the Action Menu area. The default
scale value is 1" = 1'. The Select Scale Menu has the
following options:

        1/4" = 1'
        1/8" = 1'
        1/16" = 1'
        1/32" = 1'
        1/64" = 1'
        Other
        Return

To select one of these options, slide the puck up and down in
the Select Scale area until the black bar is positioned over
the desired scale, and then press down the yellow button on the
puck. The following message will appear in the Dialogue
Window:

        Current Scale: 1/1
        New Scale: _____

After selecting the desired scale, press the yellow button down
when the black bar is positioned over the Return option in order
to get back to the Select Proj. Menu.

Return: When you have finished selecting the desired projection
method, and the necessary scale factor, you should select the
Return option in order to continue setting display parameters in
the Set Options Menu.

VU/NET 3-D Perspective Simulation

Drawing

When you start the VU program running, the display parameter Drawing
is set at its default value, Draw Every Wall. To change this you
must select the Drawing option from the Set Options Menu. This will
cause the VU/NET Select Drawing Menu to appear in the Action Menu
area. This Menu has the following six options:

    DRAW
        Every Wall
        Facing Walls
        Roof Lines

    TONE
        Every Wall
        Facing Walls

    RETURN

To tell which of these options is currently in force, look in the
Dialogue Window. Whatever options have been chosen will be dis-
played in the Dialogue Window. When you first start the VU pro-
gram running and select the Set Options Menu, the only thing in
the Dialogue Window will be Draw Every Wall. Later, this Window
will reflect the choices you have made as to how the perspectives
should be drawn.

The options in this Menu are intended to be selected in combination
with each other. For example, it is possible to tell the program
to draw the facing walls and roof lines, and to tone the facing
walls. Or to draw every wall, but to tone only the facing walls.
Or to draw facing walls and shadows, but tone only the shadows.

For many of these options, the VU program makes assumptions about
how the display file was coded. If the file was not coded accord-
ing to these assumptions, the display options either will not
work at all, or will work strangely. These assumptions are
discussed in greater detail in the paragraphs on the VU Input File,
but a short discussion is appropriate here.

    Only areas coded as 'walls' can be toned or shadowed; items
    coded using the 'draw' command cannot. Therefore, a building
    must be coded using the 'wall' command, not the 'draw' command,
    if the user wishes to tone it, or cast its shadows.

Drawing, Cont.

In order to determine which walls are 'facing' the viewer for
a particular set of coordinates, the VU program assumes that
the walls were coded in a counter-clockwise direction, and
that any courtyards or similar spaces were coded in a clockwise
direction.

To turn any of these options ON, slide the puck up and down in the
Select Drawing Menu area until the black bar is positioned over the
desired option, and then press down the yellow button on the puck.
You will then see a message confirming the selection you have just
made appear in the Dialogue Window.

To turn an option OFF, slide the puck up and down in the Select
Drawing Menu area until the black bar is again positioned over the
option, and then again press down the yellow button on the puck. The
message will disappear from the Dialogue Window area.

The following paragraphs describe the various ways of drawing the
views of a building.

Draw Every Wall: This is the default setting. Selection of
this option causes the VU program to draw every wall of the
file. You must turn this option OFF in order for the Draw Facing
Walls and Draw Roof Lines options to work properly.

Draw Facing Walls: This option causes the VU program to
draw only those walls that can be seen from a given set of view
coordinates. If any portion of a wall is visible from a given
viewing position, then the entire wall will be drawn. However,
if the wall is completely out of the viewing field, then it will
be suppressed, thus removing some of the unwanted clutter of
hidden lines from the drawing. Remember that for this option
to work properly, you must also turn OFF the Draw Every Wall
option!

Draw Roof Lines: This option causes the VU program to draw
the roof lines of walls that are not included in the viewing
field. This is very useful for aerial views.

Drawing, Cont.

Tone Every Wall: This option causes the VU program to place a vertical tone on all of the walls, at a user-controlled interval. The default spacing for the toning is 1., however, you may set any interval you desire, both narrower and wider.

After selecting this option, the following message will appear in the Dialogue Window:

        Current wall toning interval is 1.000
        Do you want to change it? [Yes or No]

If you want toning spacing of 1., type No and then hit the RETURN key on the keyboard. If you want to change the spacing, type Yes, and then hit the RETURN key. Then type the new spacing interval, and hit the RETURN key again. When the spacing has been determined, the Tone Every Wall message will appear in the Dialogue Window.

Tone Facing Walls: This option causes the VU program to place a vertical tone on just the facing walls, at a user-controlled interval. The default spacing for the toning is 1., however, you may set any interval you desire, both narrower and wider.

When you have selected this option, the following message will appear in the Dialogue Window:

        Current wall toning interval is 1.000
        Do you want to change it? [Yes or No]

If you want toning spacing of 1., type No, and then hit the RETURN key on the keyboard. If you want to change the spacing, type Yes, and then hit the RETURN key. Now type in the new spacing interval, and hit the RETURN key again. When the spacing has been determined, the Tone Facing Walls message will appear in the Dialogue Window.

Return: When you have finished setting the drawing parameters, you should select the Return option in order to get back to the Set Options Menu.

VU/NET 3-D Perspective Simulation

Shadowing

In order to see the sun shadows cast by the building, you must
set the shadow parameters. To do this, select the Shadowing
option from the Set Options Menu. Slide the puck up and down
in the Set Options Menu until the black bar is positioned over
the Shadowing option, and then press down the yellow button on
the puck. This will cause the VU/NET Select Shadow Menu to
appear in the Action Menu area. The Select Shadow Menu has the
following three options:

    DRAW Shadows

    TONE Shadows

    Return

To correctly cast the shadows of a building, the VU program
assumes that North lies along the positive y axis, and East
along the positive x axis. If the display file has not been
coded in this way, then the shadows will not be correct.

To turn one of these options ON, slide-the puck up and down in
the Select Shadow area until the black bar is positioned over
the desired option, and then press down the yellow button on
the puck. This will cause a message confirming your selection
to appear in the Dialogue Window. To turn the option OFF,
slide the black bar up and down in the Select Shadow Menu until
the black bar is again positioned over the option, and again
press down the yellow button on the puck. The message will then
disappear from the Dialogue Window.

    Draw Shadows: This option causes the VU program to draw
    the outline of the shadows generated by the building.
    (Note: The location of the building, the month, and the
    time of day must all be set using the Site option in the
    Set Options Menu.)

    Tone Shadows: This option causes the VU program to place
    a tone inside the shadow outline at a user-controlled
    interval. The default spacing for the toning is 1., however,
    the user may set any interval he desires, both narrower and

Shadowing, Cont.

wider.   If the Draw Shadows command is OFF and the Tone
Shadows command is ON, then only the tones will be drawn,
without the shadow outline.   This may be prefered if you
are viewing the shadows in perspective instead of plan,
and have selected the Draw Facing Walls option, since the
shadow outline might then draw the walls that otherwise
would not appear.

When you select the Tone Shadows option, the following
message will appear in the Dialogue Window:

     Current toning interval is 1.000
     Do you want to change it? [Yes or No]

If you want toning spacing of 1., type No, and then hit
the RETURN key on the keyboard.   If you want to change
the spacing interval, type Yes, and then hit the RETURN
key.   Now type in the new spacing interval, and hit the
RETURN key again.   When the spacing interval has been
determined, the Tone Shadows message will appear in the
Dialogue Window.

Return: When you have finished setting the options for the
shadows, you must return to the Set Options Menu, to set the
proper parameters for the shadows or to return to the Master
Menu to view the display file.

VU/NET 3-D Perspective Simulation

Site

In order for the VU program to determine the sun shadows cast by
a given building, it must know the location of that building,
the month of the year, and the time of day. To set these, select
the Site option from the Set Options Menu. To do this, slide the
puck up and down in the Set Options Menu area until the black bar
is positioned over the Site option, and then press down the yellow
button on the puck. This will cause the Select Site Menu to
appear in the Action Menu area. The Select Site Menu has the
following five options:

        U. S. Cities
        Latitude
        Month of Year
        Time of Day
        Return

To select only of these options, slide the puck up and down in the
Select Site area until the black bar is positioned over the desired
option, and then press down the yellow button on the puck. The
appropriate sub-menu will then appear in the Action Menu area.

        U. S. Cities: The latitudes of nine cities across the United
        States have been entered into the VU program so that the user
        does not need to look them up. To display the menu of these
        cities, you must select the U.S. Cities option from the Select
        Site Menu. The Select Site Menu will disappear, to be replaced
        by the list of available cities.

        Atlanta
        Boston
        Chicago
        Denver
        Houston
        Los Angeles
        Miami
        San Francisco
        Seattle

        Return

        Select the desired city and then select the Return option.
        This will return you to the Set Site Menu.

Set Site, Cont.

Latitude: If you want to cast the shadows for a city other
than those listed in the U.S. Cities above, you may set a
specific latitude. To do this, select the Latitude option
from the Set Site menu. You will then see the following
message in the Dialogue Window :

What is the site latitude?

Type it in, and then hit the RETURN key on the keyboard.

Note that you MUST enter the decimal point after you type
the site latitude.

Month of Year: The sun shadow patterns are quite different
depending on the month of the year. However, there are some
pairs of months which cast the same pattern. Select the
Month of Year option, and a sub-menu will be displayed with
the possible options:

December 21
Jan/Nov 21
Feb/Oct 21
Mar/Sept 21

Apr/Aug 21
May/Jul 21
June 21

Return

Select the desired month and then select the Return option.

Time of Day: The final shadow parameter that you must set in
order for the shadows to be cast correctly is the time of day.
Select the Time of Day option, and the following menu will
appear:

Local Time
    6:00 AM
    9:00 AM
    12:00 Noon
    3:00 PM
    6:00 PM
    Other
    Return

Set Site, Cont.

Select the desired time. If you select the Other option, you
will see the following message appear in the Dialogue Window:

Please enter time of day
using a 0000 to 2400 clock.

Type in the desired time, using a 24 hour clock, and hit the
RETURN key on the keyboard. If you select a time at which
the sun is not above the horizon during the month previously
selected, an error message will appear in the Dialogue Window.
Select another time in the same way as above. Then select
the Return option.

Return: When all of the site parameters have been set, you
must return to the Set Options Menu.

VU/NET 3-D Perspective Simulation

Show Options

The Show Options command causes all of the selected options to be
printed out in the Dialogue Window. This enables you to review
the shadow settings and the perspective drawing parameters to see
if they are still set appropriately. After the options have been
printed out, you are returned to the Master Menu automatically,
so that you can proceed to producing the drawings, or go back to
Set Options to adjust the parameters.

To select this option, slide the puck up and down in the Master Menu
area until the black bar is positioned over the Show Options command,
and then press down the yellow button on the puck.

VU/NET 3-D Perspective Simulation

Interactive Mode

To display single views of a perspective on the screen, choosing
the display coordinates as you go, you must choose the Interactive
Mode from the Master Menu. To do this, slide the puck up and
down in the VU/NET Master Menu area until the black bar is posi-
tioned over the Interactive option, and then press down the yellow
button on the puck. This will cause the VU/NET Interactive Menu
to appear in the Action Menu window. There are two possible
variations of the Interactive Menu, one that will appear if you
are in Perspective Mode, and another if you are in Plan or Elevation
Mode. These two menus look as follows:

            (Perspective Mode)   (Plan/Elevation Mode)

                Show Values   Show Values

                Filename: Filename:

                Center at x   Center at x
                Center at y   Center at y
                Center at z   Center at z
                View from x
                View from y   Change Scale
                View from z

                GO   GO

                Master Menu   Master Menu

The differences between these two menus lie in the fact that
when viewing the file in plan or elevation, the viewing point
is pre-determined, so that you only enter the center point.
However, in plan and elevation you must also give a scale,
whereas perspective is scaleless.

Interactive Mode, Cont.

To make a selection from either of these menus, slide the puck
up and down in the Action Menu area until the black bar is
positioned over the appropriate option, and then press down the
yellow button on the puck.

        Filename: Before you can display a perspective on the screen,
you must tell the program the name of the display file, so that
it can be read into memory. If you have read in a binary version
of the desired file using the Fetch .VIL File or Fetch .SAV File
options in the Master Menu, then you can proceed immediately to
giving view coordinates. If, however, you have not used the Fetch
.VIL File or Fetch .SAV File options, you must now read in a .VIL
file.

To do this, you must pick the Filename option from the Interactive
Menu. Type in the filename, and then hit the RETURN key on the
keyboard. The VU program assumes the file extension is .VIL, so
you do not need to type the extension. If the file is not in the
correct format, an error message will be printed out in the VU/NET
Dialogue Window. The correctly formatted file will be read in,
and a list of the names of the elements used to make up the file
will be printed out in the Dialogue Window. If there is a problem
inside the file, you can tell from this list approximately where
to look for the error.

Once the display file has been read in, you can leave the Inter-
active Menu, change display options, or move into the Sequential
Mode, without having to re-enter the file.

        View Coordinates: When the file has been read in, you must
tell the VU program how to display it. In perspective, six coor-
dinates must be entered: the x,y and z coordinates of the center
of the view, the point you are looking at, and the x,y and z coor-
dinates of the viewer's position, the point you are looking from.
X and y are the horizontal plane, while z is the elevation. In
plan and elevation, only three coordinates must be entered, the
x,y and z coordinates of the center of the view. If you do not
enter a value for a certain coordinate, the program assumes that
the desired value is zero.

Interactive Mode, Cont.

To enter the view coordinates, slide the puck up and down in the Interactive Menu area until the black bar is over a coordinate, press down the yellow button on the puck, type in the desired value on the keyboard, and then hit the RETURN key on the keyboard. You do not need to type a '.' after the numbers. You also do not need to enter the values in any particular order.

The 'center at' coordinates determine where the perspective file will be displayed with respect to the center of the screen. If you are using a perspective file created automatically from a floor plan, or if you coded the file with the 0,0,0 point at the center of the building, then you can start by leaving the 'center at' coordinates at 0. If, however, you coded the building and placed the 0,0,0 point at its lower left corner, then you will need to center the drawing on the screen by having a positive 'center at x' value. A good starting point is to halve the length of the building along the x-axis. You may also wish to set the 'center at z' coordinate to 5, to approximate eye level.

The 'view from' coordinates determine the viewer's position. A positive x value moves the viewer to the right along the x axis, a negative x value to the left. A positive y value moves the viewer in toward the displayed file, whereas a negative y moves him out in front of the building. Z is the viewer's elevation, so the larger the z value, the more aerial the perspective view.

        Show Values: If you get confused as to exactly what values you have entered into the program, you may ask to have them displayed on the screen for you. To do this, slide the puck up and down in the Interactive Menu area until the black bar is positioned over the Show Values option, and then press down the yellow button on the puck. The values will appear in the Dialogue Window.

        Go: When you have entered the desired values and checked to be sure they are what you wanted, you must tell the program to go ahead and generate the perspective. To do this, slide the puck up and down in the menu area until the black bar is over the 'Go' option, and then press the yellow button. The file will be drawn on the screen from the coordinates you selected.

Interactive Mode, Cont.

     Change Scale: If you are viewing in plan or elevation, and
the scale that you have chosen in the Projection option of the
Set Options menu is too large or too small, you may change it by
selecting the Change Scale option from the Interactive Menu. This
will result in the VU/NET Select Scale Menu being displayed in the
Action Menu area. Select the new scale, and then select the
RETURN option, which will restore the Interactive Menu.

When the VU program has finished drawing the project, you may
change the view just by changing one or more of the coordinates
previously entered, changing either the centerpoint or the view-
point, and then selecting 'Go' again. The VU program will re-use
the prior values for any coordinates you do not change. In this
way, you may quickly examine dozens of different views.

When the VU program is drawing the perspective, plan or ele-
vation, it will display the pertinent projection mode, scale,
and display coordinates in the Dialogue Window.

     Master Menu: When you have finished examining the file
in the projection mode currently in use, or if you wish to
change some of the display parameters or to get a hard copy
of a particular view, you must return to the Master Menu. To
do this, slide the puck up and down in the Interactive Menu
area until the black bar is positioned over the Master Menu
option, and then press down the yellow button on the puck.
This will return you to the Master Menu so that you can make
your next selection.

VU/NET 3-D Perspective Simulation

Sequential Mode

To display a sequence of views of a perspective file, you must
select the Sequential mode. Note that the Sequential Mode is
an inappropriate selection unless you are in perspective mode,
because the view from coordinates of the plan and elevation
modes are fixed. Selecting sequential when in plan or elevation
mode will result in the same drawing being displayed upon the
screen over and over, until the center point changes or the
sequence ends.

The Sequential Menu has the following four options:

        Filename
        Sequence Name
        Go
        Master Menu

        Filename: Unless you have previously entered a display file
using the Fetch .VIL File or Fetch .SAV File options in the Master
Menu, or using the Filename option in the Interactive Menu, you
must now tell the VU program which file you wish to look at. To
do this, slide the puck up and down in the Sequential Menu area
until the black bar is over the menu option 'Filename', and then
press down the yellow button on the puck. Type in the filename,
and then hit the RETURN key on the keyboard. The program assumes
that the file extension is .VIL, so you do not need to enter this.

If the file is not in the correct format, an error message will be
printed out in the VU/NET Dialogue Window. The correctly formatted
file will be read in, and a list of the names of the elements used
to make up the file, if any, will be printed out in the VU/NET
Dialogue Window. If there is a problem inside the file, you can
tell by seeing where the program stopped reading in the file from
this list approximately where to look for the error. When the
display file has been read into memory, the program will tell you
how many 'points' are in the file. The current maximum number
of points for any file is 4,000.

Sequential Mode, Cont.

     Sequence Name: When the file has been read in, you must
tell the VU program what the name of the sequence file is. The
sequence file contains the instructions for the VU program as to
the views you want to see, how many steps to take from one to
the next, and how long to hold each perspective drawing on the
screen. To enter the sequence name, slide the puck up and down
in the Sequential Menu area until the black bar is over the
'Sequence Name' option, and then press down the yellow button on
the puck. Type in the sequence filename, and then hit the RETURN
key on the keyboard. The VU program assumes that the extension
code for the sequence file is .SEQ, and therefore you do not need
to type this. The program then reads in the sequence file.

     GO: When both the display file and the sequence file have been
read in to the computer memory, you can tell the VU program to start
drawing the sequence of views. To do this, slide the puck up and
down in the Sequential Menu area until the black bar is positioned
over the Menu option 'GO', and then press down the yellow button on
the puck. The file will be drawn on the screen, view after view,
until the program reaches the end of the sequence. You cannot
interrupt a sequence; you must either wait until the VU program has
finished the sequence, or crash the program, re-start it, and then
re-enter the display file and sequence file.

When the sequence ends, you may re-start it simply by moving the puck
up and down in the Sequential Menu area until the black bar is again
over the option 'Go', and then pressing down the yellow button on the
puck. You do not need to read in the file or the sequence file again.
If, however, you return to the Master Menu and change any of the
display options, then you must re-enter the sequence filename. You
still do not need to re-enter the display file name.

If you do not wish to view this file again, you may enter another file,
by sliding the puck up and down in the Sequential Menu area until the
black bar is over the option 'Filename', and then pressing down the
yellow button. Type in the new filename, and then hit the RETURN key
on the keyboard. If this file is to be viewed from the same sequence
file as the previous one, you may now select the 'Go' option from the
Sequential Menu. If not, you must select the 'Sequence Name' option,
and enter the new sequence filename, and then hit the RETURN key on
the keyboard. Then select the 'Go' option and the VU program will start
to draw the sequence of views of the new file.

VU/NET 3-D Perspective Simulation

Sequential Mode, Cont.

Note that it is not yet possible to generate sequential perspective
views of a layered display file. The sequencing portion of the VU
program only allows a single display file to be displayed.

     Master Menu: If you do not wish to do any further viewing in
the Sequential Mode, or you wish to change the way in which the per-
spective is generated, to add toning or shadows, for instance, you
must return to the Master Menu to make another selection. To do this,
slide the puck up and down in the Sequential Menu area until the black
bar is positioned over the 'Master Menu' option and then press down
the yellow button on the puck. This will return you to the
Master Menu, where you may either select another option or exit
the program.

VU/NET 3-D Perspective Simulation

Plot Drawing

The Plot Drawing option allows you to make hard copies of a given
perspective view. To select this option, slide the puck up and down
in the Master Menu area until the black bar is positioned over the
Plot Drawing option, and then press down the yellow button on the puck.
This will cause the Plotter Menu to appear in the Action Menu area.
The Plotter Menu has the following four options:

        Plot Device
            File
            H. I. DMP-42 Plotter
            Screen (Prism 132)

        Return

        File: Selection of the 'File' option will cause a list of plot
commands for the H. I. DMP-42 plotter to be stored on the disk. This
file may then be plotted later, using the Print command.

        H. I. DMP-42 Plotter: Selection of the 'Plotter' command will
cause a pen plot to be produced immediately on the H. I. DMP-42 plotter.
The plotter should be initialized, and loaded with paper and pen before
this command is selected. After you have chosen the 'Plotter' command,
a series of questions will appear in the Dialogue Window. You may
change the scale of the plot, to make it larger or smaller. While the
program is sending the plot to the plotter, you will see the hand-like
pointer appear on the screen. When the hand reaches the bottom of the
screen, the plot will have been completely sent into the memory buffer
of the plotter, and you can continue to look at other views, or reset
the view parameters.

        Screen (Prism 132): Selection of the 'Prism' option will cause
a screen dump of the drawing currently on the screen to be sent to the
Prism printer/plotter. The printer will start to advance, and the
hand-like pointer will appear on the screen, to indicate how far the
printer has gotten. When the hand reaches the bottom of the screen,
the print will be complete, and you can continue to look at other
views, or to reset the view parameters.

VU/NET 3-D Perspective Simulation

Exit

To exit from the VU program, simply slide the puck up and down
in the Master Menu area until the black bar is positioned over
the Exit option, and press down the yellow button on the puck.
This will return you to the Shell.

VU/NET 3-D Perspective Simulation

VU/NET File Structures

The files for display in the VU/NET program are entered in one of
two ways. They may be generated automatically from floor plans
developed in the DRAFT program, or they may be coded and typed in
using the GRAPH/NET Text Editor. (You should read the Manual
describing the Text Editor first, so that you are familiar with
its use, which will not be described here.)

There are two types of files for the VU/NET program, display files
and sequence files. Each will be described here. Display files
created from DRAFT floor plans are formatted exactly like coded
display files, to allow for easy edit if needed. See the manual
on the DRAFT3D program for conversion of DRAFT floor plans into
perspective display files. Once floor plans have been converted
into perspective display files, they are identical to coded files,
and may be modified and added to as described below.

Coded Display Files

Display files are made up of a sequence of commands that cause the
computer to either draw a line, or a wall, of a given size at a
given point.

    The first step in coding an object for display in VU/NET is to
    pick an 'origin', a point that will have the coordinates 0,0,0
    and from which all other points will be measured. Any point
    may be selected but you must remember which point it is.

    IMPORTANT: If you may wish to draw the shadows of the project,
    you must set the x, y and z axes so that the positive y axis
    is to the north, and the positive x axis is to the east. See
    'Coding Conventions' below.

    The first line of the display file is a 'Begin' command. It
    tells the program that you are starting a new object, and gives
    it the name of that object. This line has the format:
        BEGIN OBJECTNAME

    The second line of the display file may be the start of either
    a line segment or a wall. For simplicity's sake, we will deal
    with line segments first, and then walls. To draw a line
    segment, you must first give a 'Move' command, followed by
    a set of x,y,z coordinates. This identifies the starting

Display Files, Cont.

      point of a line segment. This line has the format:
         MOVE   X1,Y1,Z1

         Note that x and y are the horizontal plane, while z is the
         elevation. The program does not care how many spaces are
         between the word MOVE and the coordinates. Nor does it
         care if you enter decimal points after the numbers or not.

      The 'Draw' command gives the endpoint of the line segment that
      was begun with the 'Move' command. This line has the format:
         DRAW   X2,Y2,Z2

         Note that only 1 coordinate needs to be different from that
         specified in the 'Move' command to draw a line segment. Any
         two of the three coordinates, x2, y2 and z2 may be the same
         as x1, y1 and z1. If all three are the same, however, the
         starting and ending points of the line segment will be the
         same, and there will be no visible line segment.

      To draw a second line segment whose starting point is the endpoint
      of the last line segment, you do not need to give another 'Move'
      command. You simply repeat the 'Draw' command, giving the new
      set of endpoint coordinates. This line has the format:
         DRAW   X3,Y3,Z3

      You can continue to specify endpoints of line segments as long as
      the starting point of each is the previous endpoint. When you
      wish to specify a new starting point, however, you must use the
      'Move' command again.

      To specify a wall, you also use two commands. The 'Place' command
      gives the starting point of the wall, which is its lower left
      corner. This line has the format:
         PLACE X1,Y1,Z1

      To finish the wall, you must give its endpoint, which is the
      upper right corner of the wall. You must also indicate if you
      want any rotation, either horizontal or vertical, applied to
      the wall. This line has the format:
         WALL   X2,Y2,Z2,AZ,EL

Display Files, Cont.

> Note that if you do not wish any horizontal or vertical
> rotation applied to the wall, you may omit the Azimuth
> and Elevation coordinates completely. You do not need
> to enter zeros.

IMPORTANT: If you wish to tone the perspective, or to view
only the facing walls, code the walls in a counter-clockwise
direction! Code any courtyards or similar internal spaces
in a clockwise direction. See 'Coding Conventions' below.

To specify a second wall which abuts the first, you only need
to enter the 'wall' command. The program will assume that the
starting point of the second wall is the ending point of the
previous wall. This line has the format:
    WALL   X3,Y3,Z3,AZ,EL

Of course, if the second wall does not connect to the first,
you must specify its starting point, using the 'Place' command.
You must also do this if the base of the second wall is lower
than the base of the previous wall.

Remember that a four-sided building has four walls, so you
will need four 'Wall' commands. The 'Place' command does
not actually result in a wall being drawn, so FIVE commands
are necessary to draw such a building.

Each display file may include any number of other display files.
To nest a display file within another, you simply give the name
of the desired display file as if it were a command, and enter
the coordinates where its origin should be placed. This line
has the format:
        OBJECTNAME X1,Y1,Z1,AZ,EL

If you have included display files within a display file, and
any of them have a rotation factor in the azimuth or elevation
columns, then you must include azimuth and elevation for all
future files nested in this file. Any display files to be
nested which should have an azimuth or elevation of 0 should
be coded with an azimuth or elevation of 360.

Display Files, Cont.

When you have finished coding all of the line segments, walls, and other objects that are needed to display the object, you must close the file, using the 'End' command. This line has the format:
     END

If you do not close the file in this way, the VU program will display an error message in the Dialogue Window when you try to read the display file into memory.

Coding Conventions

There are certain conventions and assumptions that must be kept
in mind when coding VU display files. First, only walls can be
toned and shadowed, so you may want to use the 'wall' command in
certain situations where otherwise you would have used the 'draw'
command. It is important to keep in mind that even though you
may not wish to tone or shadow a display file at the present time,
that may be an important capability later on, and one that should
not be foreclosed.

Secondly, in order to be toned and shadowed properly, and in order
for the VU program to be able to discern which are the 'facing'
walls, you must code the walls in the display file moving in a
counter-clockwise direction. The reverse is true of courtyards
or other similar spaces which are essentially hollows within the
outer area of the display file. These must be coded moving in a
clockwise direction. This does not mean that you must always
do a string of walls one after the other. It does mean, however,
that if you have a wall lying along the x axis, for example, you
will code it from the lower LEFT corner to the upper RIGHT corner.

Thirdly, in order to cast the shadows correctly, the VU program
assumes that North lies along the positive y axis, and East along
the positive x axis. This is usually the orientation of a plan
on a sheet of paper, but it is a good idea to verify that that is
so before spending a lot of time coding the display file.

Remembering these conventions can save a great deal of time and
effort later on in the course of a project, when you may wish to
re-use a display file for a different purpose.

VU/NET 3-D Perspective Simulation

Examples of VU/NET Display Files

The following are some examples of the preceeding commands. It is a
good idea to enter them in the computer using the GRAPH/NET Text
Editor, to gain facility with both the coding process, and with
the Text Editor.

The first object is a square, with no height or elevation at all. Its
sides are 10 feet long. It would be coded as follows:

```
BEGIN SQUARE
MOVE   0,0,0
DRAW   10,0,0
DRAW   10,10,0
DRAW   0,10,0
DRAW   0,0,0
END
```

The second object is a building, with two sides 25 feet long, and
two sides 50 feet long. The building is 12 feet high. It would be
coded as follows:

```
BEGIN BUILDING
PLACE 0,0,0
WALL   25,0,12
WALL   25,50,12
WALL   0,50,12
WALL   0,0,12
END
```

Note that the building has been coded moving in a counter-
clockwise direction. This will allow me to view the facing
walls only, and to tone them if I wish.

If the walls were not coded in this way, then I would only
be able to view them correctly using the 'Draw Every Line'
default viewing command.

Examples of VU/NET Display Files, Cont.

The third object is the same building, but with a central courtyard inside it.

```
BEGIN BUILDING
PLACE 0,0,0
WALL  25,0,12
WALL  25,50,12
WALL  0,50,12
WALL  0,0,12
PLACE 10,10,0
WALL  10,30,12
WALL  18,30,12
WALL  18,10,12
WALL  10,10,12
END
```

> Note that the building has again been coded moving in a
> counter-clockwise direction, but that the courtyard, which
> begins at the second 'Place' command, has been coded moving
> in a clockwise direction. This means that I can view the
> facing walls of the building and the courtyard, or tone them,
> correctly.

It is possible to combine elements in a single object in any
pattern, such as the following, which alternates them end to end with
a five foot interval between them.

```
BEGIN COMBO
SQUARE   0,0,0
BUILDING  15,0,0
SQUARE   45,0,0
BUILDING  60,0,0
SQUARE   90,0,0
BUILDING  105,0,0
END
```

> Note that I can combine the elements in any order, moving in
> any direction, because each element has itself been coded following
> the appropriate coding conventions.

Sequence Files

The second type of file used by the VU/NET program is the Sequence
file. This file specifies first the center point for the views,
and then key viewpoints, with the number of steps you wish drawn
in between viewpoints. There is no specific number of spaces
required between the x, y and z coordinates; however, it is
recommended that the user leave 3 or 4 for visual clarity. Also
please note wherever decimal points are indicated and where they
are not.

    The first line of this file specifies the centerpoint. It
    is entered in the following format:

        CENTER   X1.   Y1.   Z1.

        Note that it is not possible to take any steps prior
        to establishing the centerpoint.

The succeeding line of the sequence file is the first view
point.

        EYE   X1.   Y1.   Z1.

The next lines of the sequence file are the subsequent key
viewpoints, as well as the number of steps to be taken
between this and the preceeding viewpoint. These lines are
entered in the following format:

        TRACK   nsteps   X2.   Y2.   Z2.
        TRACK   nsteps   X3.   Y3.   Z3.
        TRACK   nsteps   X4.   Y4.   Z4.

There is no limit to the number of viewpoints that can be
specified. Typically, however, the number of steps for the
second line of the file is 1, to establish that this is the
first viewpoint. Thereafter, you may specify any number
of steps between the first viewpoint and the second, and a
different number of steps between the second viewpoint and
the third.

Sequence Files, Cont.

It is possible to control the length of time that each
perspective remains on the screen after it has been drawn
using the TIME command. This command may occur anywhere
in the sequence file, and it will affect all subsequent
commands. The default setting is 3000 mseconds (3 seconds).
This command is entered in the following manner:

TIME mseconds

A similar command is the PAUSE command, which changes the
length of time that the current view only will be displayed.
This command is entered in the following way:

PAUSE mseconds

It is also possible to move the viewer while holding the
viewer's eye pointed in a constant direction - in other
words both the center of vision and the viewpoint are changed
in each step. This command is entered in the following format:

PAN   nsteps   X2.   Y2.   Z2.

There is no end command for sequence files. Simply close the
file, and store it on disk.

Since the name of the display file is not included in the sequence
file in its current form, it is a good idea to make the name of the
sequence file identical to the name of the display file. Since the
extension code of the display file is .VIL and the extension code
of the sequence file is .SEQ, there will not be a problem telling
them apart, or overwriting one with the other.