AMountains

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	TITLE : AMountains		
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REVISION HISTORY			
NUMBER	DATE	DESCRIPTION	NAME

Contents

Chapter 1

AMountains

1.1 AMountains Documentation

AMountains is a fractal landscape generator. It is based on xmountains 2.4 (UNIX, X) by Stephen Booth and was ported to the Amiga by Michael Böhnisch .

Please read the original Copyright notice .

AMountains differs from xmountains in several ways. First of all, the UNIX-stylish option handling (-foo 3 -q -z 42 and the like) was replaced by Tooltype keywords. See the option overview for details.

Options specific to the X Window system are removed or are modified to make sense for the Amiga computers.

AMountains runs fine on systems with graphics boards and CyberGfx driver. Other driver software may run as well, but this is untested yet. A fast CPU and a math coprocessor is recommended but for completeness' sake a 68000/FFP compiled version is included. However, Kickstart 3.0 is the minimum supported OS version.

See Algorithm for a description of the technical details of AMountains.

When you click on the window's close gadget, AMountains will terminate the next time the rendering routine is called (you may encounter a short delay).

1.2 Author Information

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1.3 Copyright Notice

Original copyright notice for xmountains:

```
************************************************************************
```



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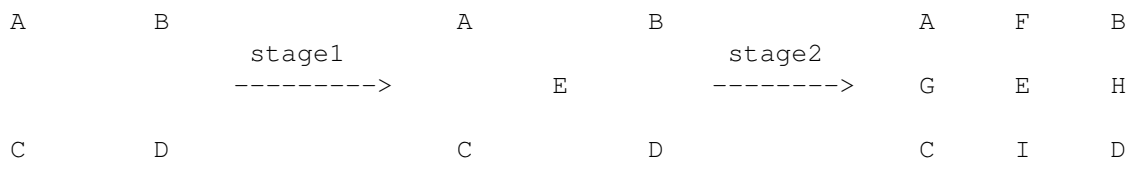
************************************************************************
```

1.4 Description of Algorithm

AMountain's Algorithm

This program uses a modified form the mid-point displacement algorithm

The mid-point displacement algorithm is a recursive algorithm, each iteration doubles the resolution of the grid. This is done in 2 stages.



The new points are generated by taking an average of the surrounding points and adding a random offset.

The modifications to the standard algorith are as follows:

There are three optional regeneration steps to reduce "creasing". A regeneration step recalculates the height of existing points using an average and offset from a newer generation of points. The three regeneration steps are:

step 1: recalculate corner points (A,B,C,D) from the midpoints (E) after the stage1 update.

step 2: recalculate midpoints (E) from the edge points (F,G,H,I) after the stage2 update

step 3: recalculate corner points (A,B,C,D) from the edge points

(F,G,H,I) after the stage2 update

The regeneration stages are turned on by the
SMOOTH
tooltype.

When performing the regeneration steps the random offset is added to a weighted average of the previous value of the point and a the average of the new points. The weighting factors are controlled by the
MIX
and
MIDMIX
tooltypes.

The
CROSS
tooltype (cross update) controls whether the midpoints (E) are included in the average when performing the stage2 update or if only the corner points are used.

1.5 Option Overview

AMountains Options:

Display and size control

3D Mapping options

Colour settings

Fractal generation options

Lighting

Multitasking features

Default values for all options
Options may be entered on the Shell command line or by icon ↩
tooltypes
(which is the preferred way). Use entries like OPTION=value for options with parameters or simply OPTION for switches.

1.6 Display and size control

This page lists the available options to modify the Amiga ↩
specifics of the
graphics display and window sizings.

```
DISPLAYMODE
Select a Monitor ID to use

WIDTH
Width  of the display

HEIGHT
Height "   "     "

DEPTH
Colour depth to use

BACKDROP
Use a special window mode

PUBSCREEN
Open window on a public screen
```

1.7 3D Mapping options

```
This page lists the options that affect the geometry of the  ↩
   landscape and
the position of the viewer.


REFLECTIONS
Implement reflections in the water

MAP
Generate a map view

VSTRETCH
Vertical scaling factor

VSHIFT
Vertical offset

ALTITUDE
Vertical position of the viewer

DISTANCE
Viewing distance
```

1.8 Colour settings

```
This page lists the available options that affect the colors used by AMountains.

   BANDSIZE  Number of shades to use for each terrain type
   COLOURS   Number of colours to use in whole
```

1.9 Fractal generation options

This page lists the options that affect the algorithm used for the ↩ fractal landscape
generation

SEALEVEL
Height of water line

SLOPE
Reduce variation in the foreground

FORCEHEIGHT
Average foreground height

CONTOUR
Contour parameter

FDIM
Fractal dimension

SEED
Seed for random generator

LEVELS
Number of levels of recursion

STOP
Number of non fractal iterations

CROSS
Cross update

SMOOTH
Smoothing

MIX
Fraction of old value for rg2 & rg3

MIDMIX
Fraction of old value for rg1

1.10 Lighting

This page lists the options affecting the lighting of the view.

VLIGHTANGLE
Vertical angle of light

HLIGHTANGLE
Horizontal angle of light

```
CONTRAST
Contrast

AMBIENT
Ambient light level

VFRACT
Vertical light level
```

1.11 Multitasking features

```
This page describes the options affecting the multitasking ↩
   behaviour
of AMountains.


SCROLLCOLUMNS
Number of colums before scrolling

SLEEP
Time to sleep before scrolling

ACTIVEPRI
Task priority when AMountains window is active

INACTIVEPRI
Task priority when AMountains window is not active
```

1.12 Default values for all options

```
BACKDROP
Not set

WIDTH
320

HEIGHT
240

PUBSCREEN
Workbench

DISPLAYMODE
No default

DEPTH
No default
```

```
                MAP
                Not set

                REFLECTIONS
                Not set

                SCROLLCOLUMNS
                20
BANDSIZE         80
COLOURS          245

                SLEEP
                0

                VLIGHTANGLE
                40.0

                HLIGHTANGLE
                0.0

                VSTRETCH
                0.6

                VSHIFT
                0.5

                SEALEVEL
                0.0

                SLOPE
                2

                FORCEHEIGHT
                -1.0

                CONTOUR
                0.3

                ALTITUDE
                2.5

                DISTANCE
                4.0

                CONTRAST
                1.0

                AMBIENT
                0.3

                VFRACT
                0.6

                FDIM
                0.65

                SEED
```

```
0

LEVELS
10

CROSS
Not set

SMOOTH
1

MIX
0.0

MIDMIX
0.0

STOP
2

ACTIVEPRI
0

INACTIVEPRI
-25
```

1.13 BACKDROP

BACKDROP

When this tooltype is present, AMountains uses a Backdrop window for it's graphic rendition. This maximizes the viewable portion of the landscape since Intuition does no window border rendering to this window type.

Use BACKDROP with care, there is no close gadget attached to the window and you will not be able to terminate AMountains without rebooting.

The default behaviour of AMountains is not to use a Backdrop window.

1.14 WIDTH

WIDTH=«width»

This option sets the viewable width of the AMountains window in pixels. Window borders are not included in this value, so the actual window is slightly bigger. Note that screen size limits the size of windows and your width setting may be adopted to fit the window on the screen.

The default value for «width» is 320 pixels.

See also:
HEIGHT

1.15 HEIGHT

HEIGHT=«height»

This option sets the viewable height of the AMountains window in pixels. Window borders are not included in this value, so the actual window is slightly bigger. Note that screen size limits the size of windows and your height setting may be adopted to fit the window on the screen.

The default value for «height» is 240 pixels.

See also:
WIDTH

1.16 PUBSCREEN

PUBSCREEN=«public screen name»

Open the AMountain window on the named public screen. This option is ignored if
DISPLAYMODE
is also set.
The named screen already must exist, it is not created by AMountains.

The default value for «public screen name» is "Workbench".

1.17 DISPLAYMODE

DISPLAYMODE=«display mode identifier»

Open the AMountain window on a private screen, specified by «display mode identifier». Use the representation shown by the ScreenMode preferences program, e.g. NTSC:HighRes Interlace.
Spaces must be included exactly as listed by ScreenMode whereas capital/lower case letters can be used as preferred by you. Thus, NTSC:HIGHRES INTERLACE and ntsc:hIgHrEs InTeRLacE are also valid and specify the same screen mode.
In order to make this option work you also must set the
DEPTH
tooltype.

If the specified screen cannot be opened for any reason, AMountains

will fall back to the default public screen.

This option overrides the
PUBSCREEN
option.

There is no default for «display mode identifier».

1.18 DEPTH

DEPTH=«colour depth»

In combination with
DISPLAYMODE
this option specifies the colour depth of the screen to open. «colour depth» must be set to a valid value or else the specified screen cannot be opened. In this case AMountains will fall back to the default public screen.

There is no default for «colour depth».

1.19 MAP

MAP

If this tooltype is present, AMountains generates a map view of the landscape instead of the panorama display.

By default MAP is not set.

1.20 REFLECTIONS

REFLECTIONS

If this tooltype is present, AMountains generates reflections of the mountains on the water surface. Greatly adds realism to the scene.

By default REFLECTIONS is not set.

1.21 SCROLLCOLUMNS

SCROLLCOLUMNS=«columns»

This tooltype defines the number of columns the display scrolls to the left when calculation reaches the right window border. Due to

the
algorithm
used, «columns» should be an even number. In case you disregard this, 1 is added internally to «columns».

The default for «columns» is 20 pixels. For smooth scrolling I recommend a setting of 2.

See also:
SLEEP

1.22 VLIGHTANGLE

VLIGHTANGLE=«angle»

This tooltype affects the vertical angle of the imaginary light source. A value of 0.0 means sunrise, 90.0 noon and 180.0 sunset. Values outside the interval from 0.0 to 180.0 are rounded to the nearest legal bound. «angle» is a floating point number in degrees, fractional digits and exponents (e.g. 5.7453E1) are fine and are taken into account.
The light source itself is invisible, you will only note the shadows it casts.

The default value for «angle» is 40.0 degrees.

See also:
HLIGHTANGLE
,
AMBIENT

1.23 HLIGHTANGLE

HLIGHTANGLE=«angle»

This tooltype affects the horizontal angle of the imaginary light source. A value of 0.0 means left side, 90.0 you look directly in direction of the light source and 180.0 right side.
Values outside the interval from 0.0 to 180.0 are rounded to the nearest legal bound. «angle» is a floating point number in degrees, fractional digits and exponents (e.g. 5.7453E1) are fine and are taken into account.
The light source itself is invisible, you will only note the shadows it casts.

The default value for «angle» is 0.0 degrees.

See also:
VLIGHTANGLE
,
AMBIENT

1.24 VSTRETCH

VSTRETCH=«factor»

VSTRETCH defines a multiplicative factor that is taken into account when calculating the height of a landscape point. Higher values mean, the mountains get higher and pointier, lower values lead to soft, flat hills.

«factor» is an arbitrary floating point number, reasonable values range from 0.2 to 3.0.

The default value for «factor» is 0.6.

1.25 VSHIFT

VSHIFT=«shift»

VSHIFT defines an additive constant offset to the landscape's height. Higher values result in a wintry scene with large snowcaps on the mountains. Lower (even negative) values result in a tropical isle landscape.

«shift» is an arbitrary floating point number. Use your imagination and experiment to find a value that best suites your esthetic feelings.

The default value for «shift» is 0.5.

1.26 SEALEVEL

SEALEVEL=«height»

This option defines the level of the sea surface. Any landscape point below this level is considered underwater and consequently is not shown.

«height» is an arbitrary floating point number. However, if you choose a too high value, you will drown the landscape and you'll see water only. If your setting is too low, black dropouts at the bottom of the land will appear.

The default value for «height» is 0.0.

1.27 SLOPE

SLOPE=«iterations»

Reduce the variation in the forground height to ensure a good view of the

surface. This tooltype sets the number of iterations for which the forground height is constrained to a constant value.

The default value for «iterations» is 2.

1.28 FORCEHEIGHT

FORCEHEIGHT=«altitude»

Mean altitude for the forground.

The default value for «altitude» is -1.0.

1.29 CONTOUR

CONTOUR=«contour»

Set the contour parameter. The base coulour of a point depends on its height and how flat the surface is. CONTOUR controls the relative importance of these factors.

The default value for «contour» is 0.3.

1.30 ALTITUDE

ALTITUDE=«height»

Set the Altitude of the viewpoint.

The default value for «height» is 2.5.

1.31 DISTANCE

DISTANCE=«dist»

Set the distance of the viewpoint from the front of the surface.

The default value for «dist» is 4.0.

1.32 CONTRAST

CONTRAST=«contrast»

Set the contrast parameter. Values too far from 1.0 will give strange results

The default value for «contrast» is 1.0.

1.33 AMBIENT

AMBIENT=«level»

Set the ambient light level. This is a fractional value that sets how bright shaded areas will be compared to fully illuminated ground.

The default value for «level» is 0.6.

1.34 VFRACT

VFRACT=«level»

Set the vertical light level. The program also implements a secondary light source shining from directly above the surface. This tooltype sets how bright this light source is relative to the main light source.

The default value for «height» is 0.6.

1.35 FDIM

FDIM=«dim»

Set the fractal dimension of the surface. This should be in the range 0.5 - 1.0.

The default value for «dim» is 0.65.

1.36 SEED

SEED=«seed»

Set the seed for the random number generator. A value of 0 causes the seed to be set from the clock.

The default value for «seed» is 0.

1.37 LEVELS

LEVELS=«levels»

Set the width of the surface. Increasing this value by one doubles the width of the surface.

The default value for «levels» is 10.

1.38 STOP

STOP=«iterations»

Set the number of non-fractal iterations. Increasing this value by one doubles the average number of mountains across the width of the surface.

The default value for «iterations» is 2.

1.39 CROSS

CROSS

Use cross updates, see
Algorithm
By default CROSS is not set.

1.40 SMOOTH

SMOOTH=«flags»

SMOOTH controls which optional regeneration steps are performed by AMontains, see
Algorithm
for details.

«flags» can take values from 0 to 7 which mean:

«flags»	Step 3	Step 2	Step 1
0	off	off	off
1	on	off	off
2	off	on	off
3	on	on	off
4	off	off	on
5	on	off	on
6	off	on	on
7	on	on	on

By default «flags» is 1, so only regeneration step 3 is performed.

1.41 MIX

MIX=«weight»

When performing the regeneration steps (see Algorithm) the random offset is added to a weighted average of the previous value of the point and a the average of the new points. The weighting factors are controlled by the MIX and MIDMIX tooltypes.

MIX gives the weight of the corner points (A,B,C,D)

By default «weight» has a value of 0.0.

1.42 MIDMIX

MIDMIX=«weight»

When performing the regeneration steps (see Algorithm) the random offset is added to a weighted average of the previous value of the point and a the average of the new points. The weighting factors are controlled by the MIX and MIDMIX tooltypes.

MIDMIX gives the weight of the midpoint (E).

By default «weight» has a value of 0.0.

1.43 ACTIVEPRI

ACTIVEPRI=«task priority»

AmigaOS is a pre-emptive multitasking operating system which allows to run processes concurrently. CPU time is shared between applications based on a value called "task priority". Processes with a high task priority are considered more urgent than others and may block lower prioritized processes when busy.

Of course, this should happen only when there really is something to do and not when the process is waiting for user input or idle otherwise.

Unfortunately AMountains is a very CPU time intensive program and it makes sense to assign it a low task priority so other applications

have a chance to get their job done.

AMountains supports two different priorities, one if it’s window is active and another when it is not active.

ACTIVEPRI controls the priority of the first case,
INACTIVEPRI
the
latter case.

By default «task pri» has a value of 0, which is default for most other applications, too. Do not set this value higher than 5 or you stir up problems when processes vital for your Amiga’s operation get blocked.

You may make AMountains more multitasking friendly by the use of the

SLEEP
tooltype.

1.44 INACTIVEPRI

INACTIVEPRI=«task priority»

AmigaOS is a pre-emptive multitasking operating system which allows to run processes concurrently. CPU time is shared between applications based on a value called "task priority". Processes with a high task priority are considered more urgent than others and may block lower prioritized processes when busy.

Of course, this should happen only when there really is something to do and not when the process is waiting for user input or idle otherwise.

Unfortunately AMountains is a very CPU time intensive program and it makes sense to assign it a low task priority so other applications have a chance to get their job done.

AMountains supports two different priorities, one if it’s window is active and another when it is not active.

ACTIVEPRI
controls the priority of the first case, INACTIVEPRI the
latter case.

By default «task pri» has a value of -25, which is sufficiently low not to block other applications. Do not set this value higher than 5 or you stir up problems when processes vital for your Amiga’s operation get blocked.

You may make AMountains more multitasking friendly by the use of the

SLEEP

tooltype.

1.45 SLEEP

SLEEP=«delay»

When AMountains filled the window, scrolling starts. Between each scroll step AMountains waits for «delay» seconds giving lower prioritized processes a chance to get their job done.

By default «delay» is 0, and AMountains will not have any idle time at all.

See also:
ACTIVEPRI
,
INACTIVEPRI