AMountains

Michael Böhnisch and billy@psycho.uni-paderborn.de

	COLLABORATORS		

	TITLE : AMountains		
ACTION	*NAME*	*DATE*	*SIGNATURE*
WRITTEN BY	Michael Böhnisch and billy@psycho.uni-paderborn.de	February 12, 2023	

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

```
Copyright 1994 by Stephen Booth, the University of Edinburgh
Copyright 1995-1996 by Michael Böhnisch

  Michael Böhnisch
  Löher Str. 2
  33102 Paderborn
  Federal Republic of Germany

  billy@psycho.uni-paderborn.de
```

1.3 Copyright Notice

Original copyright notice for xmountains:

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.

```
A         B                    A         B                    A    F    B
             stage1                          stage2
              --------->          E          -------->    G    E    H

C         D                    C         D                    C    I    D
```

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
```