RayStorm Documentation

Andreas Heumann

COLLABORATORS			
	TITLE : RayStorm Documentation		
ACTION	*NAME*	*DATE*	*SIGNATURE*
WRITTEN BY	Andreas Heumann	February 8, 2022	

REVISION HISTORY			
NUMBER	DATE	DESCRIPTION	NAME

Contents

Chapter 1

RayStorm Documentation

1.1 indexnode

1.2 RayStorm Documentation

06 August 1995

R a y S t o r m v1.0
Demoversion
by Andreas Heumann and Mike Hesser

1.3 Introduction

INTRODUCTION

RayStorm has been written to be as fast as possible, and use as less memory as possible. Thus we have implemented a octree algorithm, and optimized all calculations as much as we could.

It has been developed on Amiga and also on PC, therefore there also exists a PC-Version.

This demo version is limited to a resolution of 160x128, only 2 lightsources and only 17 objects.

The full version is unlimited.

FUNDAMENTALS ABOUT RAYTRACING

1.4 General

GENERAL

Raytracing makes it possible to generate fotorealistic pictures of objects.

A raytracer casts a ray form the position of the viewer through a scene and calculates the intersections with the objects in that scene.
If a intersection is found, the raytracer decides which color the object at this position has. If the object is reflective or transparent, the raytracer casts new rays from this positon and tests the intersections again and so on ... .

To make the surfaces of the objects more realistic, textures which

simulate marble or clouds or water or other surfaces can be used.

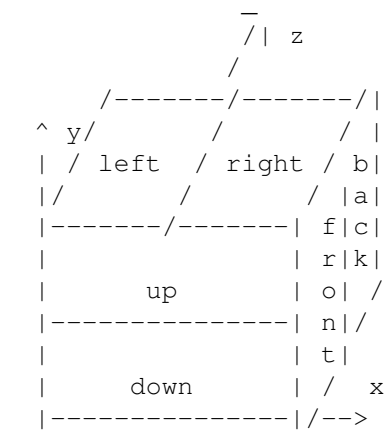
1.5 Octree

```
   OCTREE
```

Simple raytraces determine the intersections with objects by testing all objects. This can lead to long rendering times if there are a lot of objects in the scene.

One solution of this problem is the Octree algorithm.
This algorithm divides the scene in eight childcells and every childcell again in eight cells and so on until there are less than one objects in the cell or the maximum depth of the tree is reached.

Octree division

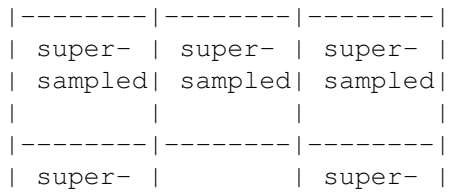


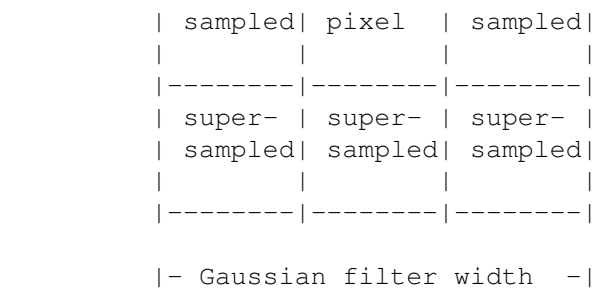
1.6 Antialiasing

```
   ANTIALIASING
```

RayStorm uses a algorithm called 'Adaptive Supersampling' to do antialiasing. This algorithm cast for each pixel which has a high contrast against it's four neighbours new rays which are close to the ray used for the pixel itself. The new color of the pixel is calculated with the supersampled pixels and the gaussian filter.

Example:
  Settings: squareroot of number of samples per pixel: 3





The rendering time increases dramatically if you use antialiasing. The values below depend on the contrast of the picture.

Samplesetting	rendering time
1	x1
2	x4
3	x9
4	x16
...	...

Setting higher than 3 are not leading to significant better results.

1.7 Surfaces

SURFACES

Ambient (set with AMBIENT)

This determines the color of the object in sections, which are in shadow.

Diffuse reflection (set with DIFFUSE)

The diffuse reflection falls off as the cosine of the angle between the normal and the ray to the light. Diffuse reflection determines the main color of the object (color in Imagine).

Specularly reflected highlights (set with SPECULAR)

Specularly reflected highlights fall off as the cosine of the angle between the reflected ray and the ray to the light source (specular in Imagine)

Specular reflection exponent (set with REFPHONG)

Determines the size of the specularly reflected highlights, the higher the smaller the highlight (hardness in Imagine)

Diffuse transmission (set with DIFFTRANS)

Same as diffuse reflection, but only used if the lightsource is on opposite side of surface. Only applied if tranlucency is not 0.

Specular transmission (set with SPECTRANS)

Same as specular reflection, but only used if the lightsource is on

```
opposite side of surface. Only applied if tranlucency is not 0.

Specular transmission exponent (set with TRANSPHONG)

Same as specular reflection exponent, but only used if the lightsource
is on opposite side of surface.

Specular transmittance (set with TRANSLUC)

Specular transmittance.

Transparency (set with TRANSPAR)

Transparent color (filter in Imagine).

Reflectivity (set with REFLECT)

Reflective color (reflect in Imagine).

Transmission attenuation (set with TRANSATTU)

(fog in Imagine).

Index of refraction (set with REFRINDEX)

Determines how the ray through transparent objects is refracted, the higher
the more (index of refraction in Imagine).
Is calculated with the formula

            lightspeed in vacuum
   index = ----------------------
            lightspeed in object    .
```

1.8 Internals

```
   INTERNALS

Memory requirements

Triangle:      142 Bytes (flat shaded)
               178 Bytes (Phong shaded)
Sphere:         58 Bytes
Plane:          66 Bytes
Surface:       118 Bytes + length of name
Screenbuffer:    4 Bytes per pixel

Memory requirements of the octree depends on the scene.
```

1.9 Requirements

```
   REQUIREMENTS

(1) You will need at least Kickstart 2.0 and a 68020 processor and a
    mathematical coprocessor (68881/882 or internal 68040/060 version).

    The faster the better :-).

(2) ShowObj was written using  MUI . So you need
    muimaster.library V2.0+ or later to run ShowObj.

Tested with:
A2000 68040/30, 9MB, 250+250MB HD, Merlin Gfx-board
A2000 68030/14, 68882/20, 4MB, 720+52MB HD
```

1.10 Features

```
   FEATURES

- Fast. About 20% faster than Imagine.

- ARexx-port. RayStorm can be used by all programs with the ARexx-port.

- Imagine compatible. RayStorm is designed to be almost compatible to
  Imagine. It can load Imagine objects and use Imagine textures.

- Octree algorithm used for rendering.

- Antialiasing possibility (adaptive supersampling).

- Image can be saved as 24Bit IFF-ILBM file.

- Three builtin object types: sphere, plane and triangle.

- Three light types: ambient, point and spot.

- Depth of field
```

1.11 Installation

```
   INSTALLATION

There is a installation script included in the archive which uses the
Commodore Installer. Run it to install RayStorm.
```

1.12 ARexx Interface

```
   AREXX INTERFACE

Address
```

```
The ARexx-address of RayStorm is 'RAYSTORM'.

Parameter conventions:
  /S - Switch.
  /N - Number.
  /A - Required.

  All other numeric parameters are floating point numbers.

ARexx commands

    General
    Objects
    Attributes
    Animation
    Errors

Alphabetically sorted

-A-
  ALIGNMENT
  AMBIENT
  ANTIALIAS
-B-
  BRUSH
  BRUSHPATH
-C-
  CLEANUP
-D-
  DIFFTRANS
  DIFFUSE
  DISPLAY
-I-
  IMTEXTURE
-L-
  LOADOBJ
-M-
  MAXFRAMES
-N-
  NEWSURFACE
-O-
  OBJECTPATH
-P-
  PLANE
  POINTLIGHT
  POSITION
-Q-
  QUIT
-R-
  REFEXP
  REFLECT
  REFRINDEX
-S-
  SAVEPIC
  SETCAMERA
  SETSCREEN
```

```
  SETWORLD
  SIZE
  SPECTRANS
  SPECULAR
  SPHERE
  SPOTLIGHT
  STARTRENDER
-T-
  TEXTUREPATH
  TRANSATTU
  TRANSEXP
  TRANSLUC
  TRANSPAR
  TRIANGLE
-W-
  WINTOFRONT
```

1.13 antialias

```
   ANTIALIAS

Arguments:     SAMPLES/N/A    squareroot of number of samples per
                              pixel (max. 8)
               WIDTH          width of gaussian filter
               CONTR,CONTG,CONTB  max. allowed contrast
Description:   Sets antialiasing parameters (see Antialiasing)
Default:       ANTIALIAS 1 1.8 51 38 76
```

1.14 brushpath

```
   BRUSHPATH

Arguments:     PATH/A         pathname
Description:   Defines the path where to search brushes.
```

1.15 cleanup

```
   CLEANUP

Arguments:     none
Description:   Deletes all defined objects, lightsources and surfaces
```

1.16 display

```
   DISPLAY

!!! CAUTION !!!
```

```
THIS COMMAND ISN'T RELEASED IN THIS VERSION YET
!!! CAUTION !!!

Arguments:     FLOYD/S      dither with Floyd-Steinberg algorithm
Description:   Displays rendered pic on screen
```

1.17 objectpath

```
   OBJECTPATH

Arguments:     PATH/A         pathname
Description:   Defines the path where to search Imagine objects.
```

1.18 pointlight

```
   POINTLIGHT

Arguments:     POSX, POSY, POSZ     position
               COLR/N, COLG/N, COLB/N     color
               SHADOW/S             cast shadows if keyword given
Description:   Creates a point lightsource
Default:       POINTLIGHT 0 0 0  255 255 255
```

1.19 quit

```
   QUIT

Arguments:     none
Description:   Quits Raystrom
```

1.20 savepic

```
   SAVEPIC

Arguments:     NAME/A               name of file to save
Description:   Saves rendered pic as IFF-ILBM-file
```

1.21 setcamera

```
   SETCAMERA

Arguments:     POSX/A, POSY/A, POSZ/A  position
               VIEWX, VIEWY, VIEWZ  viewpoint
               VUPX, VUPY, VUPZ     viewupvector
               FOVX, FOVY           field of view (in degree)
```

```
                (20 degree creates camera like Imagine default camera)
              FOCALDIST            distance from eye to focal plane
              APERTURE             aperture width (0 == pinhole)
Description:  Sets the parameters of the camera
Default:      SETCAMERA 0 0 -10  0 0 0  0 1 0  45 45 1. 0.
```

1.22 setscreen

```
   SETSCREEN

Arguments:    RESX/N/A, RESY/N/A   resolution
              COLORS/N             number of colors (not yet implemented)
Description:  sets the screen parameters
Default:      SETSCREEN 128 128 32
```

1.23 setworld

```
   SETWORLD

Arguments:    BACKR/N/A, BACKG/N/A, BACKB/N/A  backgroundcolor
              AMBR/N, AMBG/N, AMBB/N           ambientcolor
Description:  Sets world parameters
Default:      SETWORLD 0 0 0  0 0 0
```

1.24 spotlight

```
   SPOTLIGHT

Arguments:    POSX, POSY, POSZ     position
              COLR/N, COLG/N, COLB/N     color
              DIRX, DIRY, DIRZ     direction
              COEFF                coefficent
              SHADOW/S             cast shadows if keyword given
Description:  Creates a spot lightsource
Default:      SPOTLIGHT 0 0 0  255 255 255
```

1.25 startrender

```
   STARTRENDER

Arguments:    QUICK/S              render quick (no shadows, reflections and
                                   transparency)
              DEPTH/N              depth of generated octree (Default 3)
Description:  Starts rendering process
```

1.26 texturepath

```
   TEXTUREPATH

Arguments:     PATH/A         pathname
Description:   Defines the path where to search textures.
```

1.27 wintofront

```
   WINTOFRONT

Arguments:     none
Description:   Brings RayStorm window in front
```

1.28 loadobj

```
   LOADOBJ

Arguments:     NAME/A               filename
               POSX, POSY, POSZ     position
               ALIGNX, ALIGNY, ALIGNZ  alignment (in degrees)
               SCALEX, SCALEY, SCALEZ  scaling
Description:   Loads an Imagine TDDD-file object with attributes, brushes
               and textures
```

1.29 plane

```
   PLANE

Arguments:     SURF/A               surface name
               POSX, POSY, POSZ     position
               NORMX, NORMY, NORMZ  normal
Description:   Creates a plane
Default:       PLANE ??? 0 0 0  0 1 0
```

1.30 sphere

```
   SPHERE

Arguments:     SURF/A               surface name
               POSX/A, POSY/A, POSZ/A  position
               RADIUS/A             radius
Description:   Creates a sphere
```

1.31 triangle

```
   TRIANGLE

Arguments:     SURF/A                surface name
               P1X/A, P1Y/A, P1Z/A   first point
               P2X/A, P2Y/A, P2Z/A   second point
               P3X/A, P3Y/A, P3Z/A   third point
               N1X, N1Y, N1Z         first normal
               N2X, N2Y, N2Z         second normal
               N3X, N3Y, N3Z         third normal
Description:   Creates a triangle
```

1.32 newsurface

```
   NEWSURFACE

Arguments:     NAME/A
Description:   Creates a new surface with name 'NAME'
```

1.33 ambient

```
   AMBIENT

Arguments:     COLR/N/A, COLG/N/A, COLB/N/A     color
Description:   Sets the ambient color of surface
Default:       AMBIENT 255 255 255
```

1.34 brush

```
   BRUSH

Arguments:     NAME/A               name of brush file (IFF-ILBM)
               TYPE/A               Brush type: valid strings
                                    COLOR, REFLECT, FILTER, ALTITUDE
               WRAP/A               Brush wrapping method: valid strings
                                    FLAT, WRAPX, WRAPY, WRAPXY
               PX/A, PY/A, PZ/A     position
               AX/A, AY/A, AZ/A     alignment
               LX/A, LY/A, LZ/A     length of each axis
Description:   Adds a brush to surface (only 24Bit-IFF-ILBM images are
               supported)
```

1.35 difftrans

```
   DIFFTRANS

Arguments:     COLR/N/A, COLG/N/A, COLB/N/A     color
Description:   Sets the diffuse transmission color of surface
Default:       DIFFTRANS 0 0 0
```

1.36 diffuse

```
   DIFFUSE

Arguments:     COLR/N/A, COLG/N/A, COLB/N/A     color
Description:   Sets the diffuse color of surface
Default:       DIFFUSE 255 255 255
```

1.37 imtexture

```
   IMTEXTURE

Arguments:     NAME/A           name of Imagine texture file
               PX, PY, PZ       position
               AX, AY, AZ       alignment
               LX, LY, LZ       length of each axis
               P1, P2, P3, P4, P5, P6, P7, P8, P9, P10, P11, P12, P13,
               P14, P15, P16    texture parameters
Description:   Adds a Imagine texture to surface
Default:       defaults are take from texture if not all paramters are given
```

1.38 refexp

```
   REFEXP

Arguments:     VALUE/A              specular reflection exponent
Description:   Sets the specular reflection exponent of surface
Default:       REFEXP 12.
```

1.39 reflect

```
   REFLECT

Arguments:     COLR/N/A, COLG/N/A, COLB/N/A     color
Description:   Sets the specular reflectivity of surface
Default:       REFLECT 0 0 0
```

1.40 refrindex

```
   REFRINDEX

Arguments:     VALUE/A                  index of refraction
Description:   Sets the index of refraction of surface
Default:       REFRINDEX 1.
Examples:      MATERIAL                        Index
               ------------------------------------
               Vacuum ..................... 1.00000 (exactly)

               Air (STP)................... 1.00029
               Acetone .................... 1.36
               Alcohol .................... 1.329
               Amorphous Selenium ......... 2.92
               Calspar1 ................... 1.66
               Calspar2 ................... 1.486
               Carbon Disulfide ........... 1.63
               Chromium Oxide ............. 2.705
               Copper Oxide ............... 2.705
               Crown Glass ................ 1.52
               Crystal .................... 2.00
               Diamond .................... 2.417
               Emerald .................... 1.57
               Ethyl Alcohol .............. 1.36
               Flourite ................... 1.434
               Fused Quartz ............... 1.46
               Heaviest Flint Glass ....... 1.89
               Heavy Flint Glass .......... 1.65
               Glass ...................... 1.5
               Ice ........................ 1.309
               Iodine Crystal ............. 3.34
               Lapis Lazuli ............... 1.61
               Light Flint Glass .......... 1.575
               Liquid Carbon Dioxide ...... 1.20
               Polystyrene ................ 1.55
               Quartz 1 ................... 1.644
               Quartz 2 ................... 1.553
               Ruby ....................... 1.77
               Sapphire ................... 1.77
               Sodium Chloride (Salt) 1 .... 1.544
               Sodium Chloride (Salt) 2 .... 1.644
               Sugar Solution (30%) ....... 1.38
               Sugar Solution (80%) ....... 1.49
               Topaz ...................... 1.61
               Water (20 C) ............... 1.333
               Zinc Crown Glass ........... 1.517
```

1.41 spectrans

```
   SPECTRANS

Arguments:     COLR/N/A, COLG/N/A, COLB/N/A     color
Description:   Sets the specular transmission color of surface
```

```
Default:       SETSPECTRANS 255 255 255
```

1.42 specular

```
   SPECULAR

Arguments:     COLR/N/A, COLG/N/A, COLB/N/A     color
Description:   Sets the specular color of surface
Default:       SPECULAR 255 255 255
```

1.43 transattu

```
   TRANSATTU

Arguments:     VALUE/A              specular transmission attenuation
Description:   Sets the specular transmission attenuation of surface
Default:       TRANSATTU 1.
```

1.44 transexp

```
   TRANSEXP

Arguments:     VALUE/A              specular transmission exponent
Description:   Sets the specular transmission exponent of surface
               object
Default:       TRANSEXP 12.
```

1.45 transluc

```
   TRANSLUC

Arguments:     VALUE/A              diffuse transmittance
Description:   Sets the specular transmittance of surface
Default:       TRANSLUC 0
```

1.46 transpar

```
   TRANSPAR

Arguments:     COLR/N/A, COLG/N/A, COLB/N/A     color
Description:   Sets the diffuse transmittance of surface
Default:       TRANS 0 0 0
```

1.47 alignment

```
    ALIGNMENT

!!! CAUTION !!!
THIS COMMAND ISN'T RELEASED IN THIS VERSION YET
!!! CAUTION !!!

Arguments:     BEGIN/N,END/N           begin and end of position
               ALIGNX/A, ALIGNY/A, ALIGNZ/A  alignment
Description:   Sets the alignment of the object
```

1.48 maxframes

```
    MAXFRAMES

!!! CAUTION !!!
THIS COMMAND ISN'T RELEASED IN THIS VERSION YET
!!! CAUTION !!!

Arguments:      FRAMES/N       amount of frames
Description:    Sets the amount of objects
```

1.49 newactor

```
    NEWACTOR

!!! CAUTION !!!
THIS COMMAND ISN'T RELEASED IN THIS VERSION YET
!!! CAUTION !!!

Arguments:     NAME               name of new actor
Description:   creates a new actor
```

1.50 position

```
    POSITION

!!! CAUTION !!!
THIS COMMAND ISN'T RELEASED IN THIS VERSION YET
!!! CAUTION !!!

Arguments:     BEGIN/N,END/N           begin and end of position
               POSX/A, POSY/A, POSZ/A  position
Description:   Sets the position of the object
```

1.51 size

```
    SIZE

!!! CAUTION !!!
THIS COMMAND ISN'T RELEASED IN THIS VERSION YET
!!! CAUTION !!!

Arguments:     BEGIN/N,END/N           begin and end of position
               SIZE/A,SIZEY/A,SIZEZ/A  position
Description:   Sets the size of the object
```

1.52 General ARexx-commands

```
   GENERAL AREXX-COMMANDS

ANTIALIAS    sets antialiasing parameters
BRUSHPATH    sets brush path
CLEANUP      cleanups scene
DISPLAY      displays scene
OBJECTPATH   sets object path
POINTLIGHT   creates point lightsource
QUIT         quits RayStorm
SAVEPIC      saves scene as IFF-ILBM-file
SETCAMERA    sets camera parameters
SETSCREEN    sets screen parameters
SETWORLD     sets world parameters
SPOTLIGHT    creates spot lightsource
STARTRENDER  starts rendering
TEXTUREPATH  sets texture path
WINTOFRONT   brings window to front
```

1.53 ARexx-commands for creating objects

```
   AREXX-COMMANDS FOR CREATING OBJECTS

LOADOBJ   loads an Imagine TDDD-file
PLANE     creates a plane (ground in Imagine)
SPHERE    creates a sphere
TRIANGLE  creates a triangle
```

1.54 ARexx-commands for setting attributes

```
   AREXX-COMMANDS FOR SETTING ATTRIBUTES

NEWSURFACE  creates a new surface
AMBIENT     sets ambient color
BRUSH       adds a brush
DIFFTRANS   sets diffuse transmission color
```

```
DIFFUSE     sets diffuse color
IMTEXTURE   adds a Imagine texture
REFEXP      sets the specular reflection exponent
REFLECT     sets the specular reflectivity
REFRINDEX   sets the index of refraction
SPECTRANS   sets the specular transmission
SPECULAR    sets the specular color
TRANSATTU   sets the specular transmission attenuation
TRANSEXP    sets the specular transmission exponent
TRANSLUC    sets the specular transmittance
TRANSPAR    sets the diffuce transmittance
```

1.55 ARexx-commands for animation control

```
   AREXX-COMMANDS FOR ANIMATION CONTROL

ALIGNMENT  sets alignment
MAXFRAMES  sets amount of frames
NEWACTOR   creates a new actor
POSITION   sets position
SIZE       sets size
```

1.56 ARexx-errors

```
   AREXX-ERRORS

10    Error in argumentstring
11    Unknown command
12    Error using Imagine texture
13    Not enough memory for this command
14    File not found
15    Error reading IFF-ILBM file
16    Error reading IFF-TDDD file
17    Surface not defined
```

1.57 Examples

```
   EXAMPLES

There are several examples in the directories 'rexx' and 'examples'.

In the 'arexx' directory are examples scripts which show the usage of
RayStorm with ARexx. Start them simply by typing 'rx ???.ray' in a shell
(???.ray is the name of the script).

Attrtest.ray

Several examples for attributes.

Attrtest1.ray
```

Several examples for attributes.

Brush.ray

Demonstrates usage of brush mapping.

Bump.ray

Test of bump texture.

Chess.ray

Chess scene.

Dof.ray

Test of depth of field.

Eight.ray

Billard scene.

Im_texture.ray

Example for usage of Imagine textures.

Marble.ray

Test of marble texture.

Randomsphere.ray

Randomly colored sphere.

Supersample.ray

Demonstrates adaptptive supersampling.

Title.ray

Renders the RayStorm title.

Title1.ray

Renders the RayStorm title.

Wood.ray

Test of wood texture.

In the 'examples' directory are C-programms which show the usage of
RayStorm directly with a program. They can only be run from a shell.
These programs are producing a couple of pictures no animation, which must
be glued together with a utility like MainActor.

```
Sphanim

Animation of several spheres which jump over a checker board. Camera
follows them.

Worldanim

Rotating world.
```

1.58 Textures

```
   TEXTURES

Textures are mathematical generated patterns which can be applied to the
surface of a object.
There are several textures in the directory 'textures'.

    Bump
    Checker
    Linear
    Marble
    Wood
```

1.59 Bump

```
   BUMP

This texture applies a bumps to the surface.
Size of texture determines size of bumps.

Parameters:

X bump size - Y bump size - Z bump size
Sets the 'depth' of the bumps.
```

1.60 Checker

```
   CHECKER

This texture applies a normal checks pattern to the surface.

Parameters:

Color Red -  Color Green - Color Blue
Color of the checks, other color is taken from object.

Reflect Red - Reflect Green - Reflect Blue
Reflect color of the checks.

Filter Red - Filter Green - Filter Blue
```

```
Filter color of the checks.
```

1.61 Linear

```
   LINEAR

This texture varies the color of the object in the y-direction of the
texture.

Parameters:

Color Red -  Color Green - Color Blue
Color to inerpolate to.

Reflect Red - Reflect Green - Reflect Blue
Reflect to inerpolate to.

Filter Red - Filter Green - Filter Blue
Filter to inerpolate to.
```

1.62 Wood

```
   WOOD

This texture applies a wood like texture to the surface.
Size of texture determines size of wood.

Parameters:

Color Red -  Color Green - Color Blue
Color. Other color is taken from object.

Reflect Red - Reflect Green - Reflect Blue
Reflect color.

Filter Red - Filter Green - Filter Blue
Filter color.

Octave
Than higher the octave than noisier are the wood rings.

Frequency
Than higher the frequency than smaller the wood rings.
```

1.63 Marble

```
   Marble

This texture applies a marble like texture to the surface.
Size of texture determines size of bumps.
```

Parameters:

Color Red - Color Green - Color Blue
Color. Other color is taken from object.

Reflect Red - Reflect Green - Reflect Blue
Reflect color.

Filter Red - Filter Green - Filter Blue
Filter color.

Octave
Than higher the octave than noisier is the texture.

1.64 Legal Stuff

DISCLAIMER

THERE IS NO WARRANTY FOR THIS PROGRAM TO THE EXTENT PERMITTED BY APPLICABLE LAW. EXCEPT WHERE OTHERWISE STATED IN WRITING THE COPYRIGHT HOLDER AND/OR OTHER PARTIES PROVIDE THE PROGRAM "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF THE PROGRAM IS WITH YOU. SHOULD THE PROGRAM PROVE DEFECTIVE, YOU ASSUME THE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION.

IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN WRITING WILL ANY COPYRIGHT HOLDER, OR ANY OTHER PARTY WHO MAY REDISTRIBUTE THE PROGRAM AS PERMITTED ABOVE, BE LIABLE TO YOU FOR DAMAGES, INCLUDING ANY GENERAL, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE PROGRAM (INCLUDING BUT NOT LIMITED TO LOSS OF DATA OR DATA BEING RENDERED INACCURATE OR LOSSES SUSTAINED BY YOU OR THIRD PARTIES OR A FAILURE OF THE PROGRAM TO OPERATE WITH ANY OTHER PROGRAMS), EVEN IF SUCH HOLDER OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

COPYRIGHT

The archive of the RayStorm Demo may only be distributed in unmodified form. No files may be added, changed or removed. You may not charge for this archive, other than the cost of the media and duplication fees. Distribution is allowed in all forms, such as BB systems, floppy or compact disks, and ftp sites.

MUI

1.65 MUI

This application uses

MUI - MagicUserInterface

MUI is a system to generate and maintain graphical user interfaces. With the aid of a preferences program, the user of an application has the ability to customize the outfit according to his personal taste.

MUI is distributed as shareware. To obtain a complete package containing lots of examples and more information about registration please look for a file called "muiXXusr.lha" (XX means the latest version number) on your local bulletin boards or on public domain disks.

If you want to register directly, feel free to send

DM 30.- or US$ 20.-

to

Stefan Stuntz
Eduard-Spranger-Straße 7
80935 München
GERMANY

1.66 Credits

CREDITS

I want to thank the following person:

- Stephan Dorenkamp - for testing

1.67 Register

REGISTER

If you like RayStorm send me 20 DM or 15 US $ and a empty disk and you get the full version of RayStorm.

1.68 Author

```
   AUTHORS

For bug reports, comments, suggestions ... you can contact us at the
following addresses.

   Andreas Heumann

   E-mail:  heumann@hugo.rz.fh-ulm.de
   S-mail:  Heilmeyersteige 105
            89075 Ulm
            Germany


   Mike Hesser

   E-mail:  s_hesser@rzmain.rz.uni-ulm.de
            hessermi@pcpool1.informatik.uni-ulm.de
   S-mail:  Heilmeyersteige 105
            89075 Ulm
            Germany
```

1.69 History of Changes

```
   HISTORY

version 1.0 (09-July-95)
- first release.
```

1.70 PC-version

```
   PC-VERSION

There is also a PC-version of RayStorm under development, but unfortunately
it's not finished yet.
```

1.71 Future

```
   FUTURE ADDITIONS

- more objects (torus, cylinder, ...)

- real motion blur

- JPEG-saver (use datatypes to load and save pics)

- use Imagine staging files (animation possibility)

- fog
```

- bright flag for objects

- backdrop picture

- global reflection map

- TeX documentation

- animation language

- shadow caching