

Clouds and Mountains Screensaver Data Dictionary

Terrain.vb - Language VB.NET

Variable	Data Type	Definition
ridgedMultiFractal	RidgedMulti	Base terrain heightmap noise generator.
amplitudeAdjustedRidgedMulti	Multiply	Multiplies base terrain heightmap by the amplitude of the terrain.
terrainNoise	NoiseMap	Where terrain heightmap is stored
terrainNoiseBuilder	PlaneNoiseMapBuilder	Builds terrain using noise generator and stores it in terrainNoise
terrainNoiseWidth	Integer	Width of terrain noise heightmap
terrainNoiseLength	Integer	Length of terrain noise heightmap
terrainAmpl	Single	Amplitude of terrain heightmap
terrainSmplDist	Single	Distance between each vertex sampled from the heightmap. Determines size of each terrain polygon.
terrainPosition	Vector3	Position of terrain model in world space.
terrainModel	RawModel	Stores the IDs of the VBOs and VAOs of the stored terrain vertex/polygon data in OpenGL for easy drawing.
loader	Loader	Wrapper class to abstract creation of some OpenGL objects.
terrainObjectComponent	TerrainObjectComponent	Handles drawing of terrain objects (trees).
heightMapMask	Bitmap	Image which masks the generated terrain heightmap to ensure some patterns always appear.

TerrainComponent.vb - Language VB.NET

Variable	Data Type	Definition
camera	Camera	Stores the camera's position and orientation as well as its view and projection matrices.
loader	Loader	Abstracts creation of OpenGL objects
terrain	Terrain	The terrain
earth	EarthManager	Stores properties of earth like radius.
sun	SunManager	Stores properties of sun like light direction and position of sun
model	RawModel	Stores terrain model
objectComponent	TerrainObjectComponent	Manages placement of terrain trees
terrainFramebufferComponent	TerrainFramebufferComponent	Manages capturing of drawn terrain to a texture so that post processing may be applied to this texture.
shader	Shader	The terrain shader
shadowShader	Shader	The shader used to draw the shadow map for shadow mapping.
shadowBox	ShadowBox	Manages creation of shadow mapping projection and view matrices so that they may cover the camera view frustum.
amplitude	Single	Terrain amplitude
healthyGrassTexture	Integer	ID of healthy grass OpenGL texture
healthyGrassNormalTexture	Integer	Normal map of healthy grass
grassTexture	Integer	ID of grass OpenGL texture
grassNormalTexture	Integer	Normal map of grass
patchyGrassTexture	Integer	ID of patchy grass OpenGL texture

patchyGrassNormalTexture	Integer	Normal map of patchy grass
rockTexture	Integer	ID of rock OpenGL texture
rnormalTexture	Integer	Normal map of rock
snowTexture	Integer	ID of snow OpenGL texture
snowNormalTexture	Integer	Normal map of snow
depthMapFBO	Integer	ID of shadow mapping frame buffer object
depthMap	Integer	ID of shadow mapping texture
lightProjection	Matrix4	Orthographic projection matrix from sun
lightView	Matrix4	View matrix from sun
terrainModel	Matrix4	Terrain model matrix
quadRenderer	ScreenQuadRenderer	Draws quad enveloping screen. Used to blit/draw the terrain texture to the screen.
textureBlitterShader	Shader	Shader used to blit the terrain texture to the screen
terrainResolutionWidth	Integer	Width in pixels of the terrain texture.
terrainResolutionHeight	Integer	Height in pixels of the terrain texture.
fogFalloff	Single	Value used to determine how far until fog begins to set in.
SHADOW_WIDTH	Integer	10000
SHADOW_HEIGHT	Integer	10000

TerrainFrameBufferComponent.vb - Language VB.NET

Variable	Data Type	Definition
currentFrameTex	Integer	Texture holding the current frame
occlusionTex	Integer	Texture storing whether the terrain occludes the view or not

TerrainObjectComponent.vb - Language VB.NET

Variable	Data Type	Definition
objectShader	Shader	Shader for drawing objects
loader	Loader	Encapsulates creation of OpenGL objects
objects	List	List of the objects to be drawn
models	Model	List of possible models to draw
terrAmplitude	Single	Terrain amplitude
terrModelMatrix	Matrix4	Model matrix of terrain
sun	SunManager	Stores sun properties
random	Random	Random number generator
camera	Camera	Stores camera properties
sortedObjectsByDistanceFromCam	Boolean	States if all the objects had been sorted by distance from camera to prevent drawing from overlapping. Set to false when a new object is added to the list, as the list must be resorted. Once sorted set to true.
modelScaleFactors	Double	Size multipliers for each model

ShadowBox.vb - Language VB.NET

Variable	Data Type	Definition
OFFSET	Single	Offset value used in shadow box calculation
UP	Vector4	Vector which denotes which direction is up
FORWARD	Vector4	Vector which denotes which direction is forward

SHADOW_DISTANCE	Single	Distance where shadows are calculated
mixX	Single	Minimum frustum vertex X pos
maxX	Single	Maximum frustum vertex X pos
minY	Single	Minimum frustum vertex Y pos
maxY	Single	Maximum frustum vertex Y pos
minZ	Single	Minimum frustum vertex Z pos
maxZ	Single	Maximum frustum vertex Z pos
lightViewMatrix	Matrix4	View matrix of light from which shadows are casted
cam	Camera	The scene camera
nearWidth	Single	Width of the near plane of the camera perspective frustum
nearHeight	Single	Height of the near plane of the camera perspective frustum
farWidth	Single	Width of the far plane of the camera perspective frustum
farHeight	Single	Height of the far plane of the camera perspective frustum

VolumetricCloudsFramebuffer.vb - Language VB.NET

Variable	Data Type	Definition
currentFrameTex	Integer	Texture to current drawn frame to be post processed.
lastFrameTex	Integer	Texture to last drawn frame without post processing. Used in temporal reprojection as an optimization.
alphanessTex	Integer	An occlusion texture for the clouds. Shows where the background is occluded by the clouds for screen space god rays to be applied.

VolumetricComponent.vb - Language VB.NET

Variable	Data Type	Definition
volumetricShader	Shader	Shader for drawing of volumetric clouds
postProcessClouds	Shader	Shader to post process clouds
quadRenderer	ScreenQuadRenderer	Draws quad to screen
camera	Camera	Stores camera info
earth	EarthManager	Stores earth parameters
sun	SunManager	Stores sun parameters
temporalProjection	VolumetricCloudsFrameBuffer	Stores lastFrameTex and other relevant info used to undertake the temporal reprojection optimization.
oldViewProjection	Matrix4	Stores previous view projection matrix to be used for temporal reprojection
frameIter	Integer	Current frame index, used to sample the bayer matrix for temporal reprojection.
perlinWorleyNoiseGen	NoiseGenerator3D	Generates perlin worley noise for cloud volumetric raymarching
worleyNoiseGen	NoiseGenerator3D	Generates worley noise for cloud volumetric raymarching
weatherNoiseGen	NoiseGenerator2D	Generates the weather map, which defines where clouds appear
curlNoiseGen	NoiseGenerator2D	Generates curl noise for adding wisps in the clouds
perlinWorleyNoise	Integer	The perlin worley noise texture
worleyNoise	Integer	The worley noise texture
weatherNoise	Integer	The weather map/noise
curlNoise	Integer	The curl noise
cloudsResolutionWidth	Integer	Width of resolution clouds are drawn to the screen at

cloudsResolutionHeight	Integer	Height of resolution clouds are drawn to the screen at
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GodRaysComponent.vb - Language VB.NET

Variable	Data Type	Definition
godRaysWidth	Integer	Width of resolution God rays are drawn at
godRaysHeight	Integer	Height of resolution God rays are drawn at
quadRenderer	ScreenQuadRenderer	Draws quad to screen
godRaysShader	Shader	Shader to draw screen space God rays
sun	SunManager	Holds parameters of sun
godRaysFramebufferComponent	GodRaysFramebufferComponent	Framebuffer to which God rays are drawn to.
camera	Camera	Stores parameters of camera

FramebufferComponentBase.vb - Language VB.NET

Variable	Data Type	Definition
resWidth	Integer	Width in pixels of texture to which framebuffer draws to
resHeight	Integer	Height in pixels of texture to which framebuffer draws to
prevViewportDimensions	Integer(4)	Stores the results of an opengl query for what the previous dimensions of the viewport were, before the viewport dimensions are changed for the framebuffer. Used to revert changes to the viewport.

Mesh.vb - Language VB.NET

Variable	Data Type	Definition
vertices	List(Of Vertex)	List of vertices of mesh
indices	List(Of Integer)	Indices to the vertex buffer storing which vertex is drawn when. Used to save space on memory used for vertex data, so that vertices for each polygon do not need to be repeated.
textures	List(Of Texture)	List of mesh textures
VBO	Integer	OpenGL vertex buffer object of mesh.
EBO	Integer	OpenGL element buffer object of mesh.

Model.vb - Language VB.NET

Variable	Data Type	Definition
texturesLoader	List(Of Texture)	List of the model textures loaded
meshes	List(Of Mesh)	List of the model meshes
directory	String	File path to model
gammaCorrection	Boolean	Is gamma correction enabled
loader	Loader	Abstraction for loading OpenGL objects

ModelInstance.vb - Language VB.NET

Variable	Data Type	Definition
model	Model	Model used to draw the instance
modelMatrix	Matrix4	The model matrix of the model
position	Vector3	Position of the model

NoiseGeneratorBase.vb - Language VB.NET

Variable	Data Type	Definition
shader	ComputeShader	Shader used to generate the noise on the GPU

RandomFloatGenerator.vb - Language VB.NET

Variable	Data Type	Definition
inst	RandomFloatGenerator	Singular static instance of the random float generator. Implements the singleton design pattern.
random	Random	Random number generator

RawModel.vb - Language VB.NET

Variable	Data Type	Definition
vertexArrayObject	Integer	OpenGL vertex array object of the model
vertexCount	Integer	Number of vertices in the raw model

Shader.vb - Language VB.NET

Variable	Data Type	Definition
vertexShader	Integer	The vertex shader of the shader program
fragmentShader	Integer	The fragment shader of the shader program

ShaderBase.vb - Language VB.NET

Variable	Data Type	Definition
ID	Integer	ID of the shader program

Camera.vb - Language VB.NET

Variable	Data Type	Definition
pos	Vector3	Position of camera
lookAt	Vector3	Position camera looks at
view	Matrix4	Camera view matrix
projection	Matrix4	Camera projection matrix
fieldOfView	Single	Camera field of view
NEAR_PLANE	Single	Distance near plane of camera view frustum is from the camera
scrWidth	Single	Width of screen camera draws to
scrHeight	Single	Height of screen camera draws to

EarthManager.vb - Language VB.NET

Variable	Data Type	Definition
earthRadius	Single	Stores the radius of the earth

HDRComponent.vb - Language VB.NET

Variable	Data Type	Definition
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hdrFBO	Integer	OpenGL ID of high dynamic range FBO
rboDepth	Integer	OpenGL ID of RBO
colorBuffer	Integer	OpenGL ID of texture which stores post-processed HDR texture
hdrShader	Shader	The HDR shader
quadRenderer	ScreenQuadRenderer	Renders quad to screen

ScreenQuadRenderer.vb - Language VB.NET

Variable	Data Type	Definition
vao	Integer	OpenGL id of vertex attribute object
quadVbo	Integer	OpenGL id of the vertex buffer object which stores the quad vertex data
loader	Loader	Abstraction for loading / creating OpenGL objects

Screensaver.vb - Language VB.NET

Variable	Data Type	Definition
loader	Loader	Abstraction for loading / creating OpenGL objects
screenQuadRenderer	ScreenQuadRenderer	Used by the entirely shader dependent components. Draws a screen covering quad.
scatteringComponent	ScatteringComponent	Atmospheric scattering
volumetricComponent	VolumetricComponent	Volumetric cloud raymarching
terrainComponent	TerrainComponent	Rasterized randomly generated terrain
godRaysComponent	GodRaysComponent	God / crepuscular rays
hdrComponent	HDRComponent	High dynamic range

postProcessClouds	Shader	Shader which applies post processing to the clouds
camera	Camera	Stores camera properties
sun	SunManager	Stores sun properties
earth	EarthManager	Stores earth properties
time	Double	Internal system clock time.

SunManager.vb - Language VB.NET

Variable	Data Type	Definition
sunPos	Vector3	Position of the sun in the sky

ScatteringComponent.vb - Language VB.NET

Variable	Data Type	Definition
scatteringShader	Shader	Shader for atmospheric scattering
scatteringFrameBufferComponent	ScatteringFrameBufferComponent	Frame buffer for scattering
textureBlitterShader	Shader	Shader for drawing the texture from the FBO to the screen
quadRenderer	ScreenQuadRenderer	Draws quad to screen
camera	Camera	Stores camera properties
earth	EarthManager	Stores earth properties
sun	SunManager	Stores sun properties
scatteringResWidth	Integer	Width of resolution scattering is drawn to the screen at
scatteringResHeight	Integer	Height of resolution scattering is drawn to screen at

BlitTextureToScreen.frag - Language GLSL

Uniform Variable	Data Type	Definition
textureToDraw	sampler2D	Texture to be drawn / blitted to screen

DepthShader.frag - Language GLSL

Uniform Variable	Data Type	Definition
texture_diffuse1	sampler2D	Diffuse texture of model being drawn
texture_emmissive1	sampler2D	Emission texture of model being drawn

DepthShader.vert - Language GLSL

Uniform Variable	Data Type	Definition
lightSpaceProjection	mat4	Projection matrix from light space
lightSpaceView	mat4	View matrix from light space
model	mat4	Model matrix of drawn object

GodRays.frag - Language GLSL

Uniform Variable	Data Type	Definition
lightPositionOnScreen	vec2	Position of light / sun in screen space
occlusionTex	sampler2D	Shows where the background is obstructed from view by the mountains and/or clouds

hdr.frag - Language GLSL

Uniform Variable	Data Type	Definition
hdrBuffer	sampler2D	Texture to have high dynamic range applied to from the frame buffer
godRaysTex	sampler2D	Texture which displays the produced God rays alpha map for blending with the hdrBuffer
exposure	float	Exposure the scene experiences. Used in HDR calculations.
resolution	vec2	Resolution hdr is being drawn at

ObjectShader.frag - Language GLSL

Uniform Variable	Data Type	Definition
texture_diffuse1	sampler2D	Diffuse texture of model being drawn
texture_emmissive1	sampler2D	Emissive texture of model being drawn
sunColor	vec3	Colour of sun
sunDir	vec3	Direction of light from sun

ObjectShader.vert - Language GLSL

Uniform Variable	Data Type	Definition
model	mat4	Model matrix of object being drawn
view	mat4	Camera view matrix
projection	mat4	Camera projection matrix

PostProcessClouds.frag - Language GLSL

Uniform Variable	Data Type	Definition
textureToDraw	sampler2D	Texture to be drawn / blitted to screen
resolution	vec2	Resolution the clouds have been rendered at

scattering.frag - Language GLSL

Uniform Variable	Data Type	Definition
time	float	System time
resolution	vec2	Resolution atmosphere is rendered at
inverseView	mat4	Inverse camera view matrix
inverseProjection	mat4	Inverse camera projection matrix
sunColor	vec3	Color of sun
sunPos	vec3	Position of sun
EARTH_RADIUS	float	Radius of earth
skyColorTop	vec3	Colour of sky top
skyColorBottom	vec3	Colour of sky bottom

Terrain.frag - Language GLSL

Uniform Variable	Data Type	Definition
sunDir	vec3	Direction of sun's light
sunColor	vec3	Color of sun
healthyGrassTex	sampler2D	Healthy grass texture

grassTex	sampler2D	Regular grass texture
patchyGrassTex	sampler2D	Patchy grass texture
rockTex	sampler2D	Rock texture
snowTex	sampler2D	Snow texture
healthyGrassNormalTex	sampler2D	Bump map of healthy grass
grassNormalTex	sampler2D	Bump map of regular grass
patchyGrassNormalTex	sampler2D	Bump map of patchy grass
snowNormalTex	sampler2D	Bump map of snow
rockNormalMap	sampler2D	Bump map of rock
shadowMap	sampler2D	Shadow map of scene
snowHeight	float	Height at which mountains begin to be snowy
grassCoverage	float	Factor which determines what angle at which grass will cover the mountain, and at which rock will.
fogColor	vec3	Colour of fog
fogFalloff	float	Factor which determines at what distance the fog will begin to onset
cameraPos	vec3	Position of camera

Terrain.vert - Language GLSL

Uniform Variable	Data Type	Definition
model	mat4	Model matrix of terrain
projectionMatrix	mat4	Camera projection matrix
viewMatrix	mat4	Camera view matrix
lightSpaceProjection	mat4	Light projection matrix. Used in shadow mapping for determining the current fragment's position in relation to the

		shadow map.
lightSpaceView	mat4	Light view matrix. Used in shadow mapping for determining the current fragment's position in relation to the shadow map.

volumetric.frag - Language GLSL

Uniform Variable	Data Type	Definition
lightColor	vec3	Sun light's colour
sunDir	vec3	Direction of sunlight
EARTH_RADIUS	float	Radius of earth
time	float	System time
resolution	vec2	Resolution clouds are being rendered at
cameraPos	vec3	Position of camera
inverseView	mat4	Inverse camera view matrix
inverseProjection	mat4	Inverse camera projection matrix
inverseViewProjection	mat4	Inverse camera combined view projection matrix
oldViewProjection	mat4	Last frame's combined view projection matrix
cloudNoise	sampler3D	Perlin-worley noise texture which is raymarched to give the clouds' characteristic fluffy shape
worleyNoise	sampler3D	Worley noise texture is used to create pockets in the clouds
weatherTexture	sampler2D	Texture determines cloud types and positions in the sky
curlNoise	sampler2D	Curl noise texture to give the clouds their characteristic wisps

lastFrame	sampler2D	Previous frame used for temporal reprojection
lastFrameAlphaness	sampler2D	Previous frame alphaness used for temporal reprojection
terrainOcclusion	sampler2D	Used for excluding fragments which won't be seen from being calculated as an optimization
background	sampler2D	Background texture for blending with clouds
frameIter	int	Frame iteration counter for temporal reprojection
CLOUDS_AMBIENT_COLOR_TOP	vec3	Ambient color of tops of clouds
CLOUDS_AMBIENT_COLOR_BOTTOM	vec3	Ambient color of bottoms of clouds

Mandelbrot Screensaver Data Dictionary

Screensaver.vb - Language VB.NET

Variable	Data Type	Definition
time	Double	System time
mandelbrotShader	Shader	Shader for drawing mandelbrot fractal
screenQuadRenderer	ScreenQuadRenderer	Draws quad to screen
zoomPointSeed	Integer	Randomises the zoom point the screensaver starts on
NUM_FRACTAL_ZOOM_POINTS	Integer	Number of different points on fractal to zoom into

Mandelbrot.frag - Language GLSL

Uniform Variable	Data Type	Definition
iResolution	vec3	Resolution screensaver is rendered at
iTime	float	System time
zoomPointSeed	int	Randomises the zoom point the screensaver starts on
selectedPalette	int	Palette user selected to draw mandelbrot fractal in

Shader.vb - Language VB.NET

Variable	Data Type	Definition
vertexShader	Integer	The vertex shader of the shader program
fragmentShader	Integer	The fragment shader of the shader program

ShaderBase.vb - Language VB.NET

Variable	Data Type	Definition
ID	Integer	ID of the shader program

ScreenQuadRenderer.vb - Language VB.NET

Variable	Data Type	Definition
vao	Integer	OpenGL id of vertex attribute object

quadVbo	Integer	OpenGL id of the vertex buffer object which stores the quad vertex data
loader	Loader	Abstraction for loading / creating OpenGL objects

Note: Shader.vb, ShaderBase.vb & ScreenQuadRenderer.vb are the same as in the clouds screensaver

Metaballs Screensaver Data Dictionary

metaballs.frag - Language GLSL

Uniform Variable	Data Type	Definition
iResolution	vec3	Resolution screensaver is rendered at
iTime	float	System time
waveHeight	float	Amplitude of the waves
dropletCenters	Array of vec3	Stores center of each droplet / metaball which falls down
dropletRadii	Array of float	Stores radius of each droplet / metaball which falls down

Screensaver.vb - Language VB.NET

Variable	Data Type	Definition
time	Double	System time
waveHeight	Single	Height of waves
metaballsShader	Shader	Shader for metaballs
screenQuadRenderer	ScreenQuadRenderer	Draws quad to screen

dropletManager	DropletManager	Stores the details of every droplet and applies physics to them
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DropletManager.vb - Language VB.NET

Variable	Data Type	Definition
droplets	List(Of Droplet)	Stores information about every droplet
GRAVITY	Single	The gravitational acceleration applied to every droplet
prevUpdateTime	Single	System time at previous physics update. Used to determine time difference since previous physics update to perform physics calculations.
numberOfDroplets	Integer	Number of droplets
spawnBoxWidth	Single	Width of the box in which droplets may spawn
spawnBoxLength	Single	Length of the box in which droplets may spawn
spawnBoxHeight	Single	Height of the box in which droplets may spawn
spawnBoxCentre	Vector3	Position of the spawn box

Shader.vb - Language VB.NET

Variable	Data Type	Definition
vertexShader	Integer	The vertex shader of the shader program
fragmentShader	Integer	The fragment shader of the shader program

ShaderBase.vb - Language VB.NET

Variable	Data Type	Definition
ID	Integer	ID of the shader program

ScreenQuadRenderer.vb - Language VB.NET

Variable	Data Type	Definition
vao	Integer	OpenGL id of vertex attribute object
quadVbo	Integer	OpenGL id of the vertex buffer object which stores the quad vertex data
loader	Loader	Abstraction for loading / creating OpenGL objects

RandomFloatGenerator.vb - Language VB.NET

Variable	Data Type	Definition
inst	RandomFloatGenerator	Singular static instance of the random float generator. Implements the singleton design pattern.
random	Random	Random number generator

Note: RandomFloatGenerator.vb, ScreenQuadRenderer.vb, Shader.vb & ShaderBase.vb are the same as in the clouds screensaver