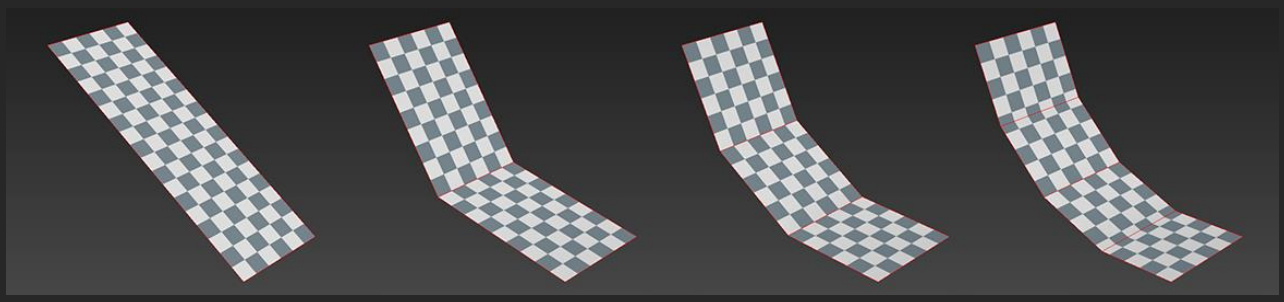
Introduction

Welcome to the Curved World and thanks a lot for purchasing this package.

What is Curved World?

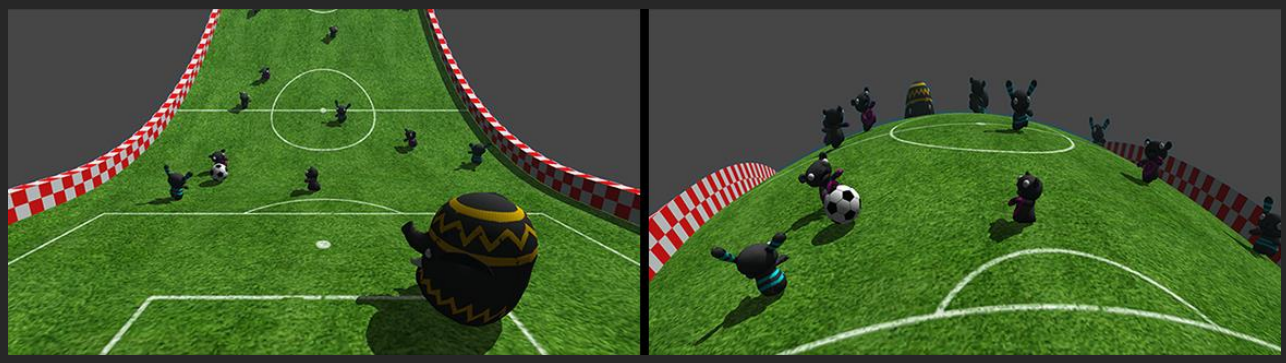
Curved World is a per mesh screen space curvature shader. It is not image effect and does not require Unity Pro. For all platforms and devices.

Shader bends mesh in screen space using only its vertexes. Quality and smoothness of the curve depends on meshes vertex count along bend axis.

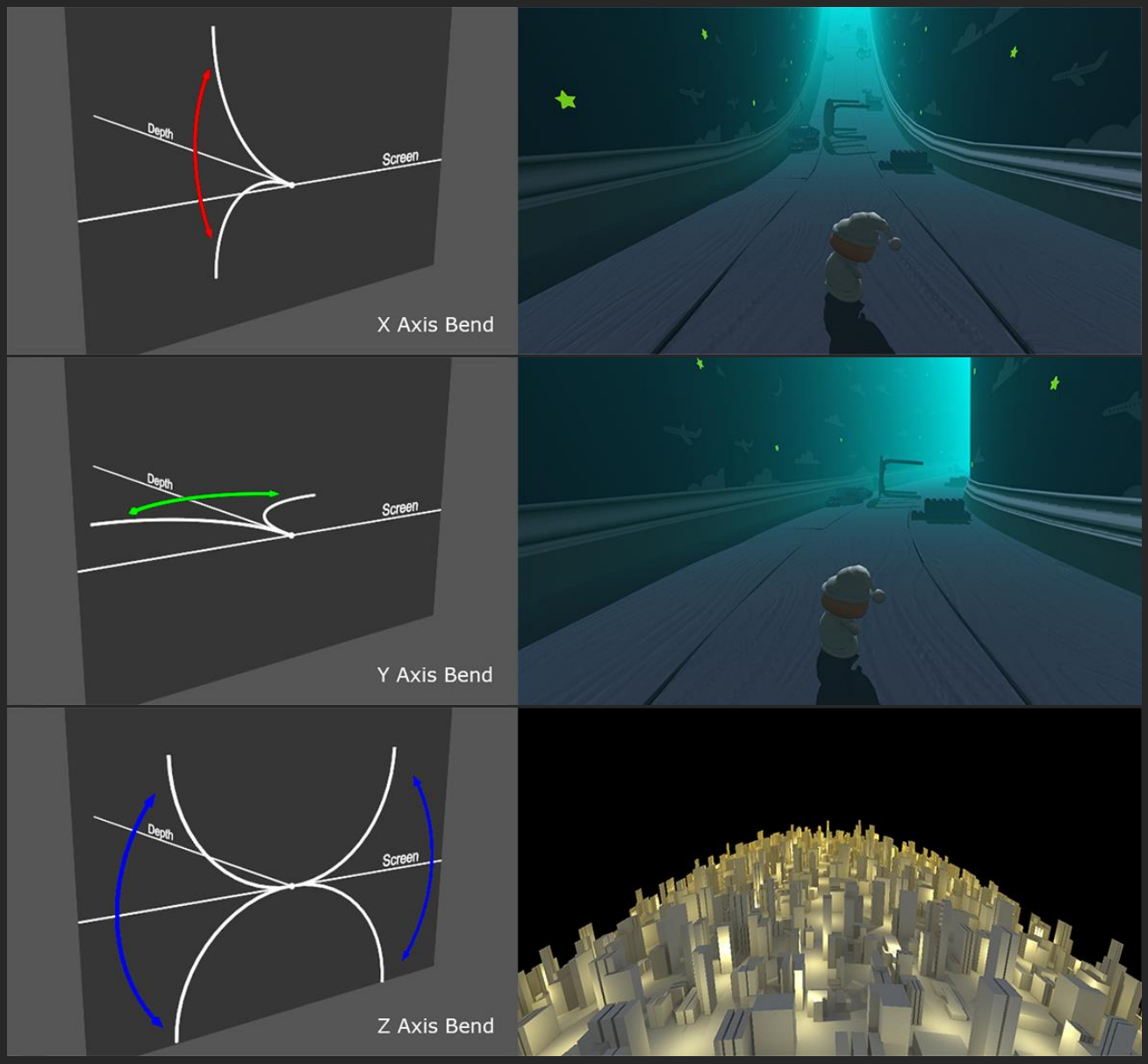


Shader does not disturb any of the world space game features like physics, animations, path finding. Nothing!

…it just renders differently

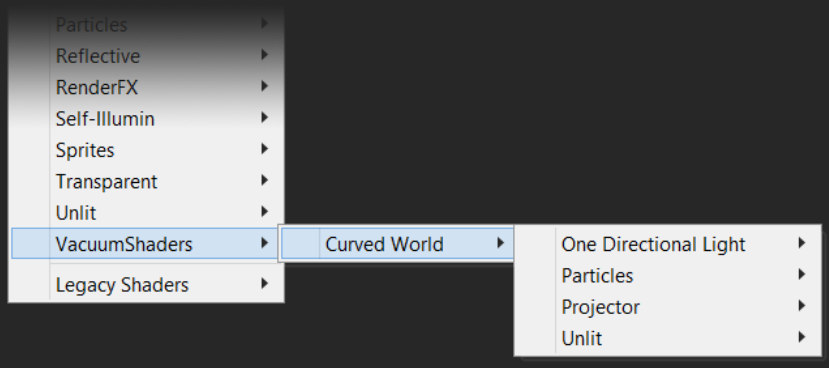


Shader has all three(X, Y and Z) axis bending control. They can be used together or separately.

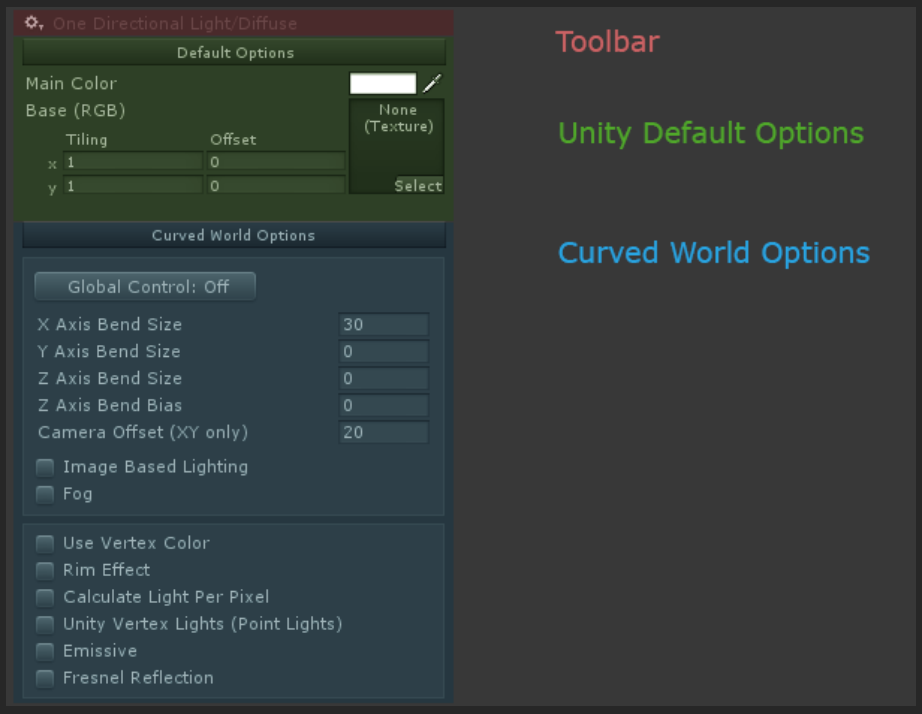


How to use

Assign any of Curved World shaders to the mesh.



Curved World material inspector is divided into three parts:



Toolbar - Contains some useful features explained later in this doc.

Unity Default Options – Gives control to the default visual elements like: Base Texture, Color, Specular, Reflection and Alpha Cutout.

Curved World Options – All control elements for the Curved World are here.

- Global Control On/Off – Curved World shaders can be controlled separately per material or from Global Controller. This parameter shows if the current material is under Global Control. Parameters that are under global control become hidden inside material editor.
  Global Controller is a script that can be attached to any scene game objects. It takes care of all materials that are under its control. Scene may have only one Global Controller.
- X, Y, Z Axis Bend Size – Defines bend size of an axis.
  Note: These are axis in screen space, not world space.
- Z Axis Bend Bias – Bias of Z axis bend.

- Camera Offset (XY only) – Distance from camera where bending of X and Y axis begin.
- Image Based Lighting – (Optional parameter) Enables IBL.
- Fog – (Optional parameter) Enables Fog. For mobile shaders fog is calculated per vertex.

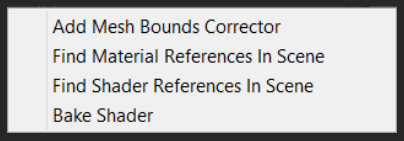
All these above options can be controlled from Global Controller.

- Use Vertex Color – (Optional parameter) Enables meshes vertex color usage.
- Rim Effect – (Optional parameter) Enables Rim effect. For mobile shaders rim effect is calculated per vertex.
- Calculate Light Per Pixel – (Optional parameter) Lit mobile shaders calculate light (and specular) per vertex. This option enables there calculations per pixel.
- Unity Vertex Lights – (Optional parameter) Lit mobile shaders have only one pass (Forward Base pass) for light calculation. This option enables calculation point lights in the same pass, but only per vertex.
- Emissive – (Optional parameter) Makes material emissive. Main Texture alpha defines emission strength.
- Fresnel Reflection – (Optional parameter) Enables Fresnel effect for reflective materials. For mobile shaders effect is calculated per vertex.

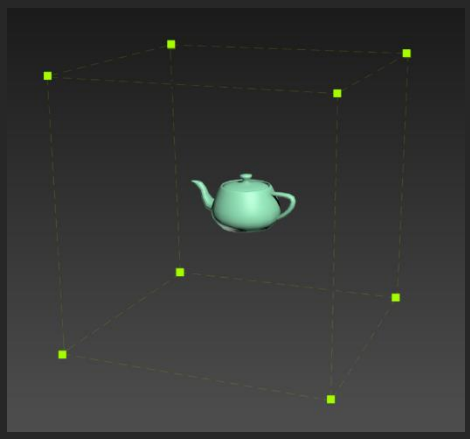
Note:
If optional parameter is disabled then it is also excluded from shader calculation.
Mobile shaders calculate specular using lookup texture, without using heavy formulas. Specular texture wrap mode should be – Clamp, inside Unity Texture Import Settings.

Toolbar - Contains some useful features.

- Title – Shows current shader type.
-  - Activates menu



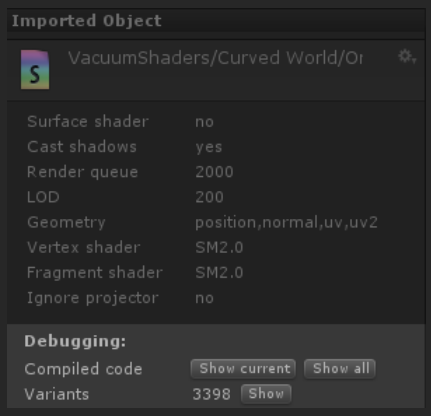
- Add Mesh Bounds Corrector – Curved World bends mesh only if it is visible to the camera. If mesh goes beyond camera view frustum, it will be culled and not rendered. To force mesh visibility to the camera it is necessary to change/scale mesh bounds.
  This menu item will add Mesh Bounds Corrector script to the mesh that helps scaling its bounds. Script only works with non-Static objects and skinned meshes.
  For static objects it is necessary to add 8 "dead" vertexes to the mesh manually using any of 3D modeling software.



Scaling mesh's bounding box in 3Ds Max.
8 vertices will be added to the mesh.
After importing mesh to Unity disable Optimize Mesh inside Import Settings.
8 vertex adds only 64 bytes to the mesh and doesn't participate into mesh rendering, as they does not have triangles attached.

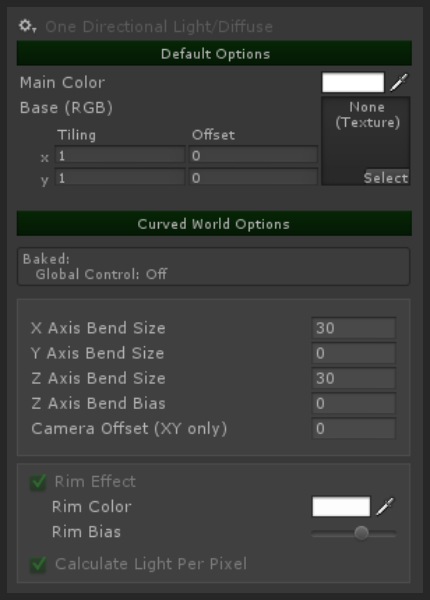
Note:
Try to keep bounds scale as low as possible.

- Find Material/Shader References In Scene – Quick view of scene objects that are using current material or shader.
- Bake Shader – Most of the Curved World shader files contain lots of variants inside. Using these variants gives possibility to have many shaders and effects inside one file (instead of writing hundreds of shader files). Turning on/off optional parameters automatically switches shaders inside material editor and users even doesn't notice that.
  Backside of these variants is that they increase shader file size (that goes into build) and compilation time. Some of mobile devices may even crash because of huge memory required for shader compilation.



For example: One Directional Light / Diffuse.shader uses 1222 variants and is 10MB in size.

Before building project or testing on mobile device it is required to bake Curved World shaders. Baking removes all variants from shader and generates one shader file with all used optional parameters as one effect.
Baked shaders go to Baked submenu inside Curved World shaders choosing menu and is automatically assigned to the material.
After baking it is not possible to turn on/off optional parameters.



For example: This is baked One Directional Light / Diffuse.shader. All unused optional parameters are removed.
Optional parameters that were turned on before baking cannot be turned off, but their values can be changed.

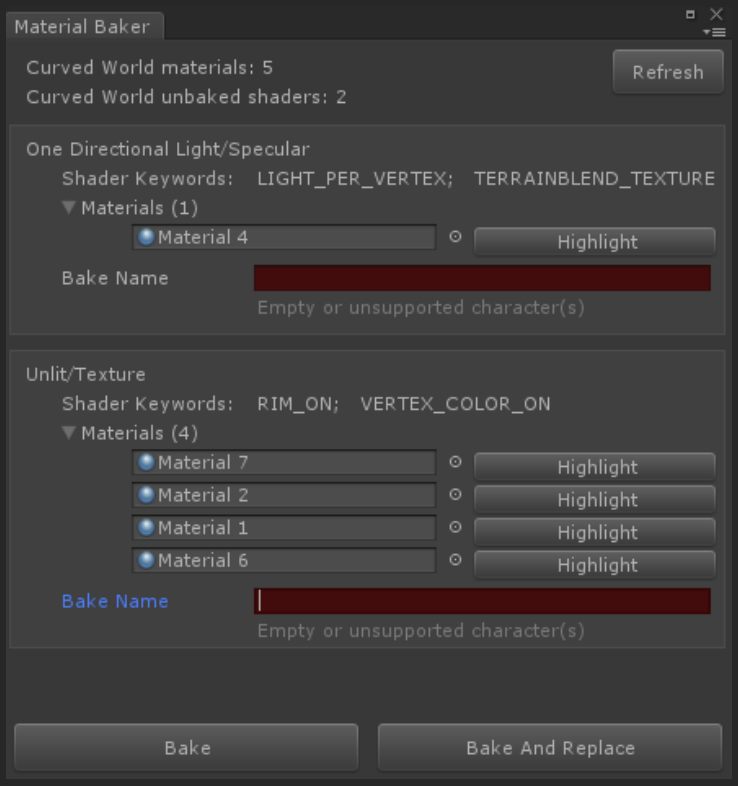
Now it contains only 17 variants (Unity system variants) and is 70KB after compilation.

Baked shader has green title bars.

Note:
Shader baking has no impact on their performance, just removes variants and reduces file size. How much and what optional parameters are used does not matter.

Scene Materials Baking

To review and/or bake all Curved World materials used in scene, open window Menu/Window/VacuumShaders/Curved World/Scene Material Baker

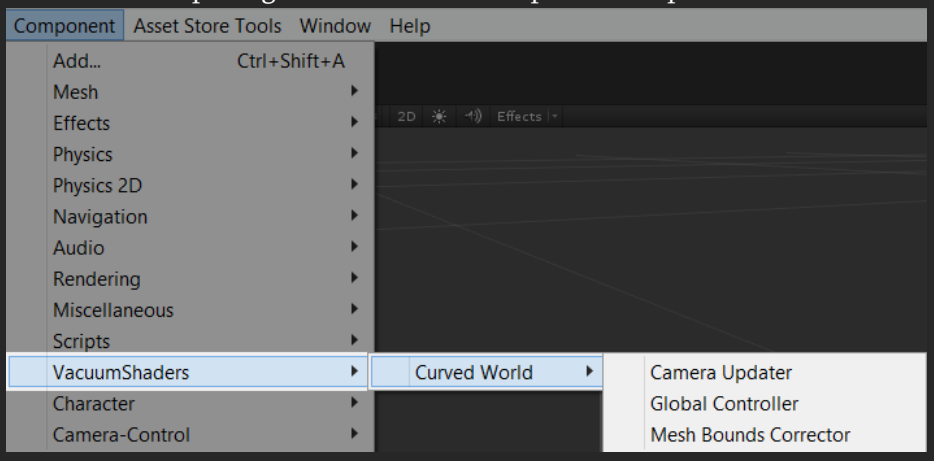


Window displays all unbaked Curved World materials and shaders used in scene.
Note: Several materials may use the same shader.

Window does not update automatically, press **Refresh** button to go through all scene meshes and detect unbaked Curved World materials.

Scripts inside package

Curved World package contains three component scripts that can be used inside project.



- Camera Updater – Assign script to the active camera(s) if you want Global Controller to update camera's Background color with active Fog color.
- Global Controller – Scene should contain only one instance of this script.
- Mesh Bounds Corrector – Adjusts mesh's render bounds.

Current Version Limits

- No Forward Add pass (no point and spot lights per pixel), Deferred rendering and Unity terrain support.

Example Scenes

Begin exploring included example scenes with - Simple Demo.

Note:

Example scenes are not optimized for mobiles, they are just for demonstration of the Curved World effect.

Curved World shader API

Public functions to work with Curved World shaders:

> static public BAKE_INFO Bake(Material _material, string _shaderName, string _fileName, bool _overwrite, bool _replaceAfterBaking)
> Bakes material and saves to VacuumShaders/CurvedWorld/Shaders/Baked folder
>
> _material – Material that should be baked
> _shaderName – Shader display name
> _fileName – Shader file name that will be save on hard disk
> _overwrite – Overwrite existing file or not
> _replaceAfterBaking – Replace material shader with baked one or not

- static public Material[] GetAllUnbaked() – Returns scenes all unbaked Curved World materials
- static public bool IsShaderValid(Material _material) – Is material Curved World type?
- static public bool IsShaderBaked(Material _material) – Is Curved World material baked?
- static public bool IsShaderGlobal(Material _material) – Is Curved World material under global control?

Functions are accessible from `VacuumShaders.CurvedWorld.ShaderBaker`