



Usage Instructions

Program I/O

The program expects the information describing the scene to be contained in a file named :

“SceneDescription.txt”

This file must be present on the same directory as the executing binary and must be formatted correctly.

The output of the program is a file named :

“Image.ppm”

A PPM image created in the same directory as the executing binary.

These I/O Ports can be changed by modifying the Macro named :
”InputPath” and “OutputPath” in the file “FileManage.cu”.



Program I/O

The size of the output image “Image.ppm” can be changed by modifying the macro named :

“OUT_IMG_XSZ” and “OUT_IMG_YSZ” in file “FileManage.cu”

The Camera must be scaled correctly in “SceneDescription.txt” to get the expected aspect ratio in the output image “Image.ppm”.

Scene Description : Part 1

The file “SceneDescription.txt” must necessarily have the following properties :

1) Keyword “SET_BG”

Followed by 3 floats, representing the RGB colour of the background, with each float being between 0 and 1

Ex :

```
SET_BG  
0.1 0.1 0.9
```

2) Keyword “SET_GI”

Followed by 4 floats

First 3 represent the intensity of the Globally Illuminating Light in R G and B colours. These floats can be any positive number.

The last float lies between 0 and 1, and represents the maximum fraction of a pixels colour which can be contributed to by Global Illumination.

Ex :

```
SET_GI  
25 25 0  
0.05
```

(Recommended value of the last float is between 0 and 0.2)

Scene Description : Part 1

3) Keyword “SET_CAM”

Followed by 9 floats

First 3 represent XYZ Translation Transform of Camera

Next 3 represent XYZ Rotation Transform of Camera

Next 3 represent XYZ Scale Transform of Camera

Ex :

SET_CAM

0 0 5

90 0 0

10 5 1

4) Keyword “END”

Marks the End of File.

Scene Description : Part 2

The properties in “SceneDescription.txt” which describe objects in the scene are :

1) Keyword “SET_MAT”

Followed by 11 floats, Objects will copy the most recent set material before its declared.

First float represents the polish of the surface, lies between 0 and 1.

Next 3 represent Reflectivity of the colours RGB, lie between 0 and 1.

Next 3 represent Transmittivity of the colours RGB, lie between 0 and 1.

For each colour in RGB, the sum of Reflectivity and Transmittivity must be 1.

Next 3 represent Absorptivity of colours RGB, lie between 0 and 1.

Last float represents the Refractive Index of the material.

Ex :

```
SET_MAT
0.9
1 1 0.7
0 0 0.3
0.1 0.1 0.9
1.5
```

Scene Description : Part 2

2) Keyword “OBJ”

Followed by another Keyword ID which identifies the object.

ID must be “PLANE”, “SPHERE”, “CUBOID” or “TETRAHEDRON”.

Then followed by 9 floats.

First 3 represent XYZ Translation Transform of the Object

Next 3 represent XYZ Rotation Transform of the Object

Next 3 represent XYZ Scale Transform of the Object

Ex :

```
OBJ PLANE
5 10 2
90 0 0
4 1 1
```

3) Keyword “LIGHT”

Followed by 6 floats

First 3 represent XYZ Position of Light Source.

Next 3 represents Power in R G and B colour. Intensity falls by inverse square law.

Ex :

```
LIGHT
0 0 20
6000 6000 1000
```



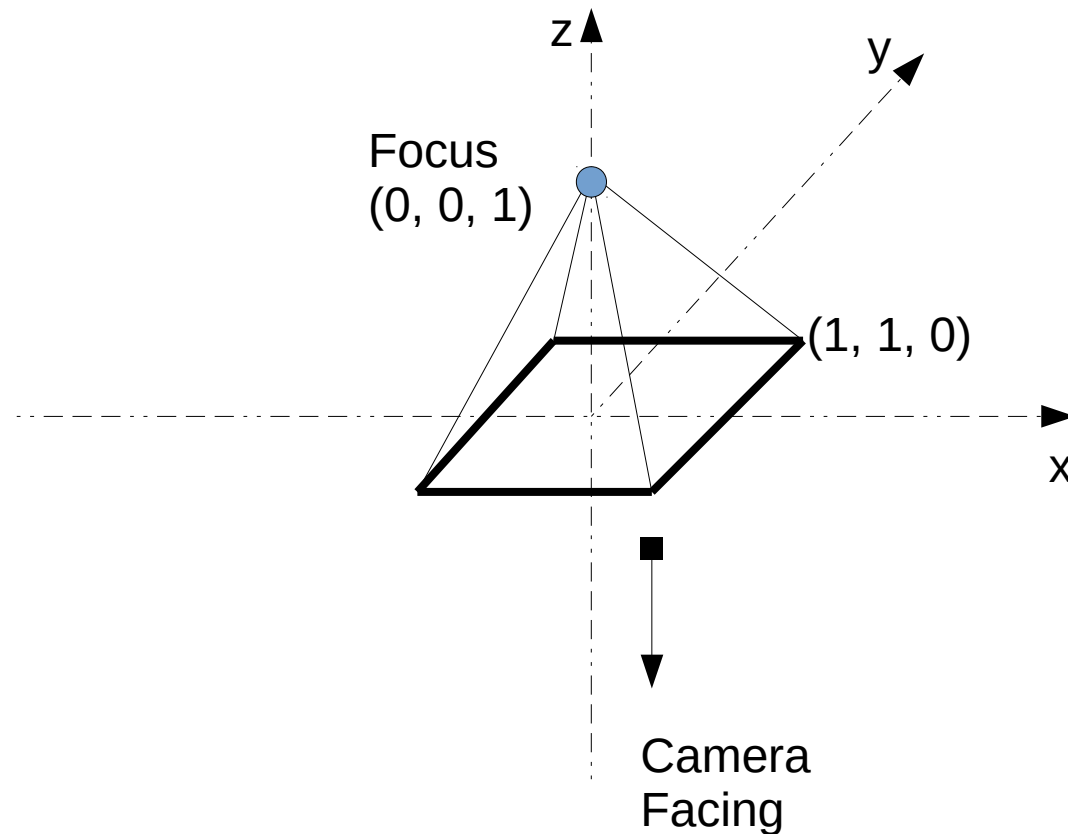
Object Transform

When an Object is subjected to Transform using the “OBJ” Keyword, the following things happen:

- 1) A basic object of the type is loaded
- 2) It is scaled on its local coordinate system
- 3) It is rotated about its local coordinate system, first about X axis, then Y, then Z.
- 4) Its origin is translated.

Camera Transform

When Keyword “SET_CAM” is used, the Camera is transformed in the same way as other objects. But we will first describe the basic model of the camera.





Rendering Settings

The Ray Intersection with Objects is handled in file “Physics.cu”. Here you can change the Clipping Distances used to find intersections by editing Macros named “CLIP_DISTANCE” and “Outer_CLIP_DISTANCE”.

The Maximum Recursive Depth till which we find reflections and transmissions can be changed in file “Render.cu” by editing the Macro “MaxDepth”.

Common Issues

- Command Line :
 - > Warning : 8 bit Overflow
 - This occurs when the intensity of a colour of a pixel is greater than 1.
 - This occurs if your lights are too bright, can be solved by reducing brightness.
- Command Line :
 - > GPU Last Error : an illegal memory access was encountered
 - This occurs when you have large recursive depth for reflected and transmitted rays.
 - Can be fixed by increasing size of Call Stack per thread.
 - Can be done by editing Macro “STACKSIZE” in file “Kernel.cu”.
- Command Line :
 - > GPU Last Error : too many resources requested for launch
 - This occurs when your GPU’s SM does not have enough registers to support a block
 - Can be fixed by reducing block size.
 - Can be done by editing Macro “BLOCKSIZE” in file “Kernel.cu”



Example Scenes

The Folder “Scenes” contains some example scenes for your reference.