Visualizing illuminance levels, generated in *Radiance*, in a Maya environment

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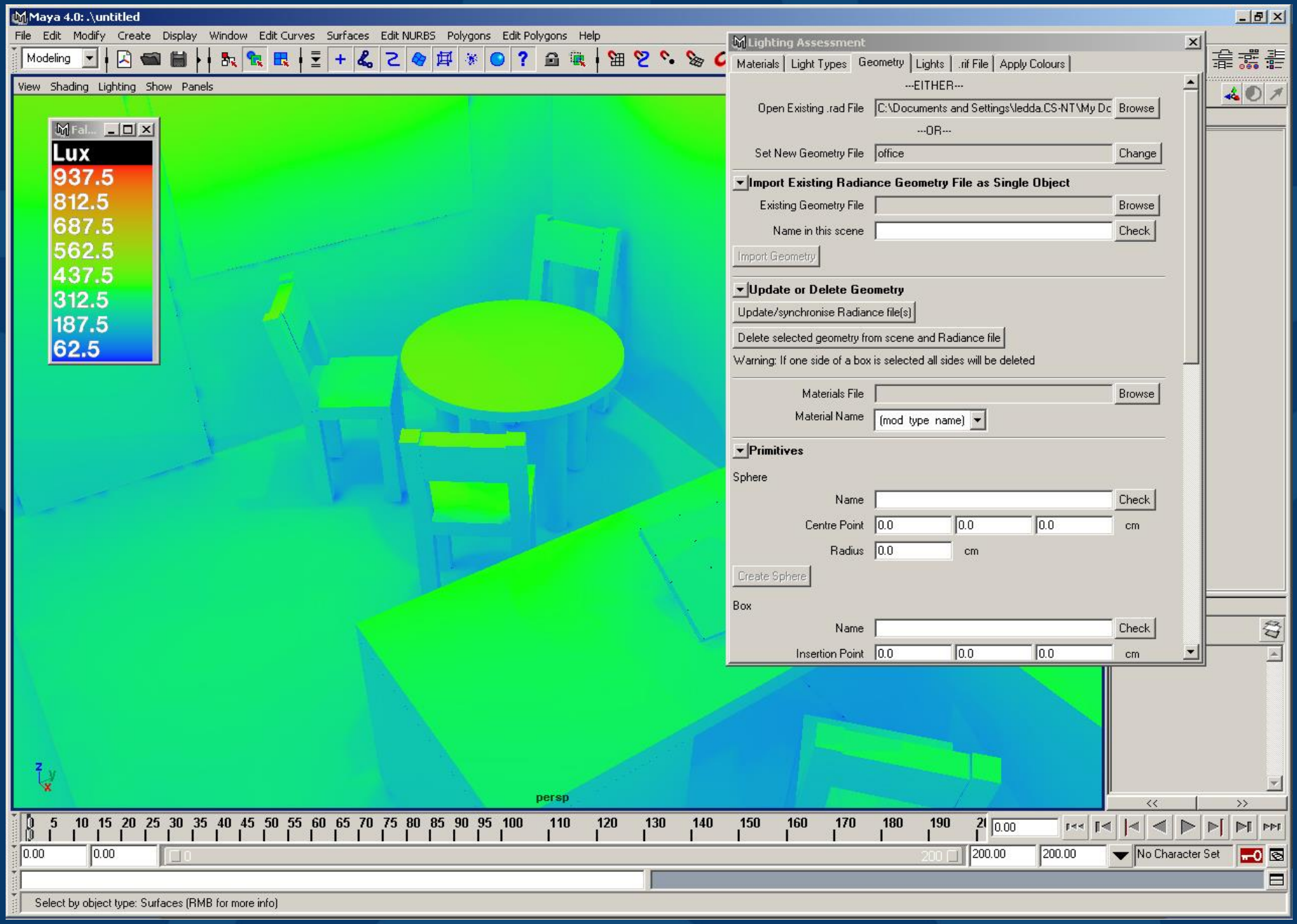
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Lighting Assessment
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---EITHER---
Open Existing .rad File
C:\Documents and Settings\ledda.CS-NT\My Dc
Browse
---OR---
Set New Geometry File
office
Change
Import Existing Radiance Geometry File as Single Object
Existing Geometry File
Browse
Name in this scene
Check
Import Geometry
Update or Delete Geometry
Update/synchronise Radiance file(s)
Delete selected geometry from scene and Radiance file
Warning: If one side of a box is selected all sides will be deleted
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Select by object type: Surfaces (RMB for more info)

Introduction

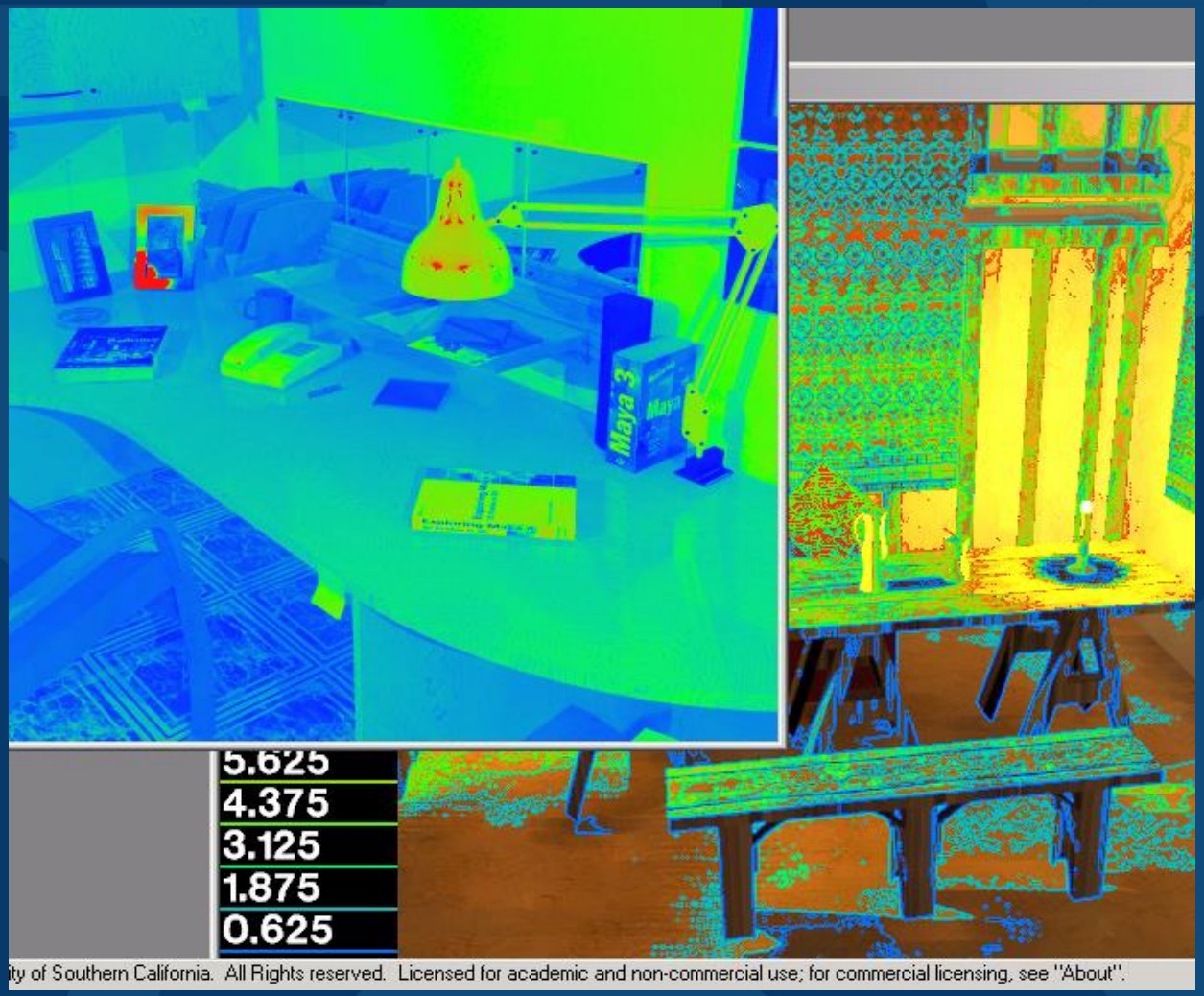
- The real world can presents luminance levels ranging from 10^{-4} cd/m^2 (starlit) to 10^{6} cd/m^2 (sunlight).
- Knowing the luminance levels in an environment can be very useful in light design.

Illuminance standards

- National standards proscribe minimum illuminance levels for a variety of tasks and situations.
- From these standards it is then possible to determine suitable lighting conditions.
- These standards (at least UK ones) take into account only *illuminance* and therefore are not view dependent.

- **Probably the easiest way to visualize luminance levels in an environment is to generate a false color version of the scene.**
- **This can be easily done in *Radiance*.**
- **Depending on rendering options we can create luminance or illuminance false colored images.**

False-coloring…

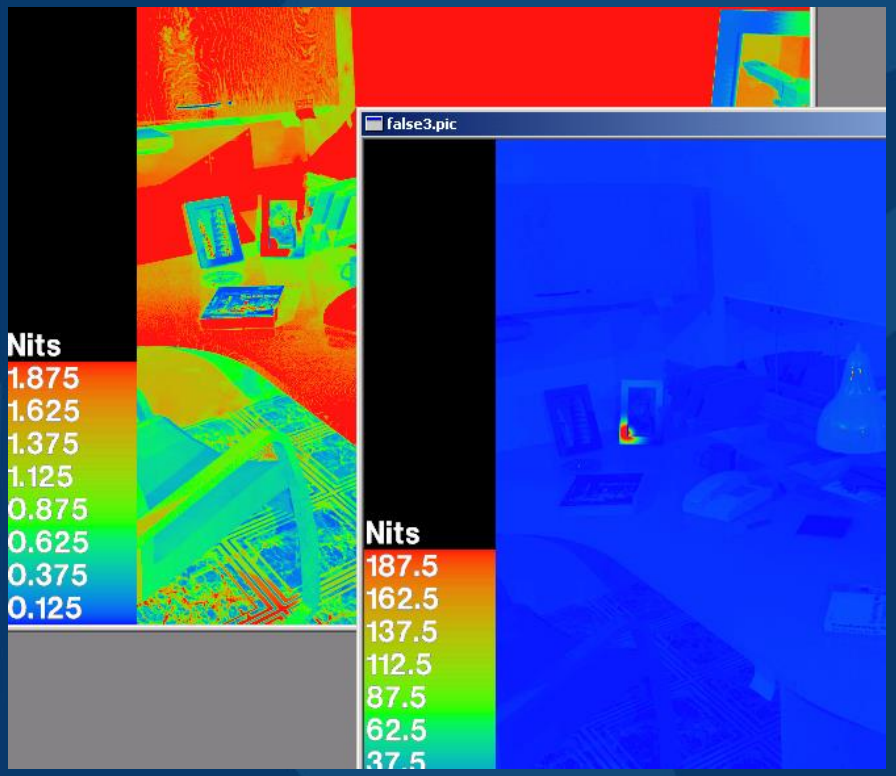


Radiance – *falsecolor* program

- ***Radiance* produces false color images based on irradiance/radiance data.**
- **This is achieved by:**
  - Reading radiance/irradiance values from a .pic image
  - Calculating luminance/illuminance
  - Re-displaying or compositing based on a color scheme.

Setting the correct scaling

- The scale used is very important because it can affect the visualisation and understanding of the scene.

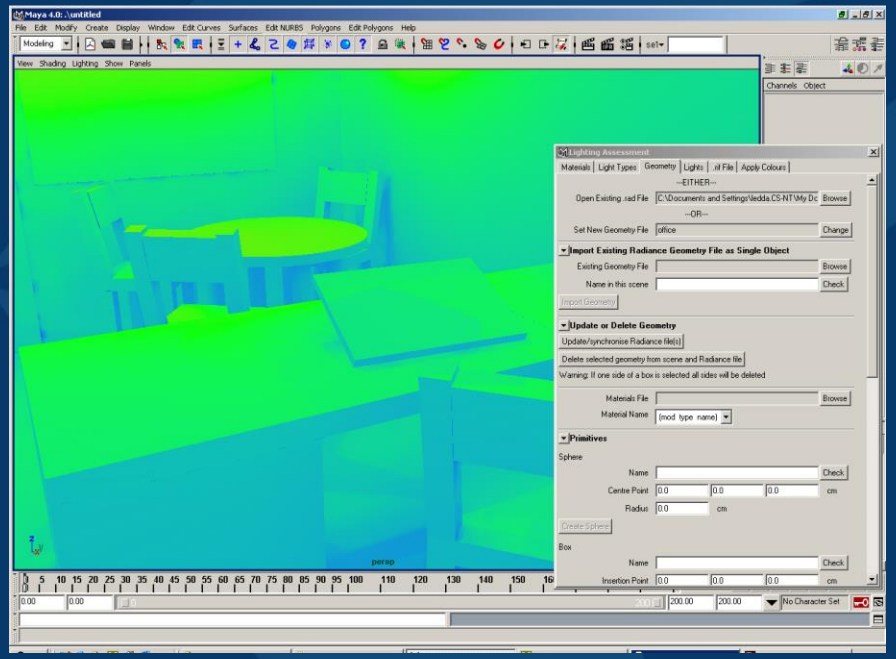


A problem…

- Because *Radiance* takes data from a .pic file, it can only generate false color images from the same view point.
- It would be nice if we could know the illuminance in a particular area of a scene even if it has not been rendered.

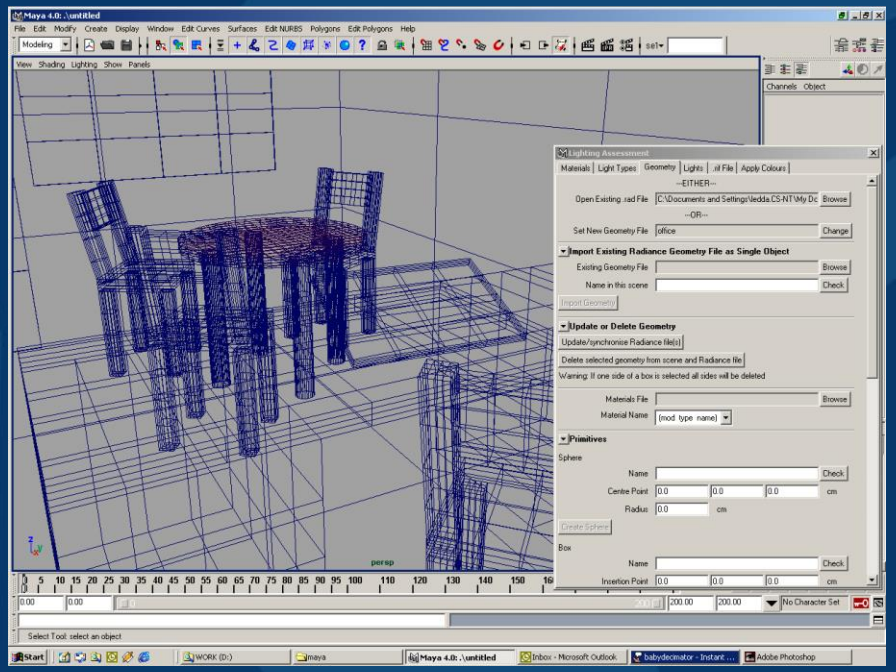
Our approach

- Visualise the lighting levels of an environment in 3D.
- This is possible because illuminance is inherently view independent.



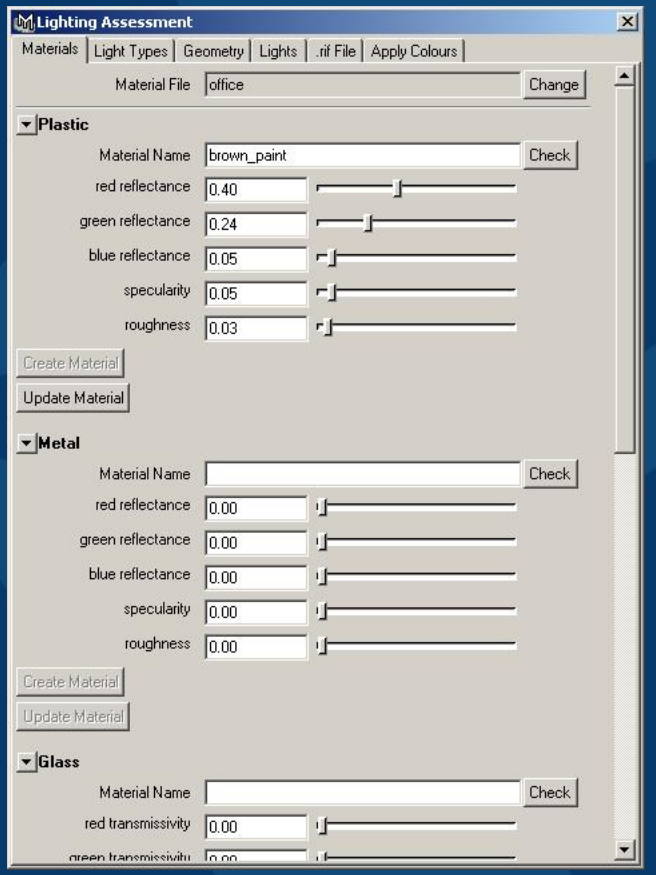
How does it work?

- We developed a tool for Maya that directly generates *Radiance* files.
- Using the GUI, materials, geometry and lights can be created and easily modified…



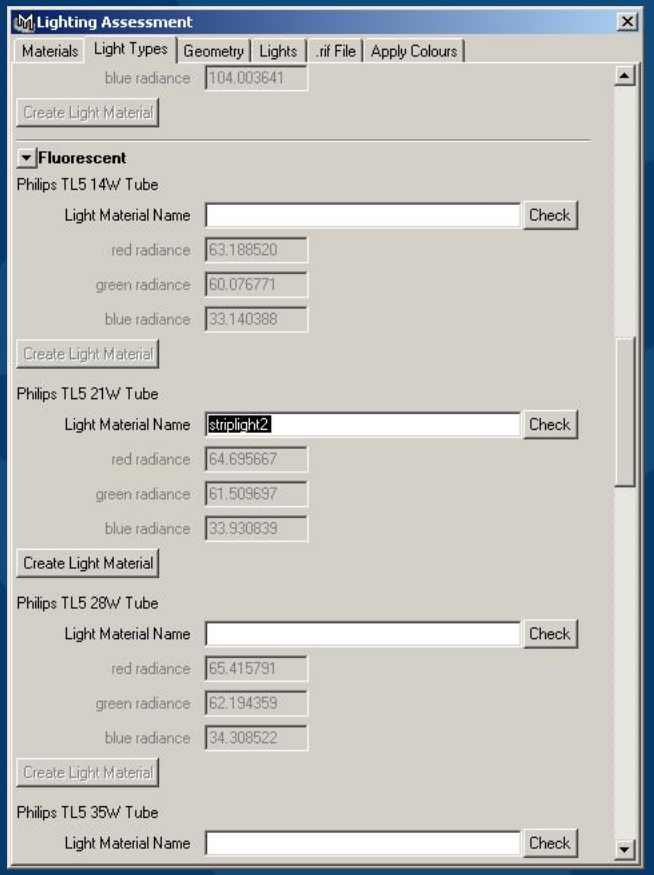
Our approach (2)

- The GUI allows us to simultaneously generate geometry in *Radiance* (.rad file) and in Maya (on screen)
- In Maya the position of the geometry can be easily modified. The new position is the re-written to the *Radiance* file.

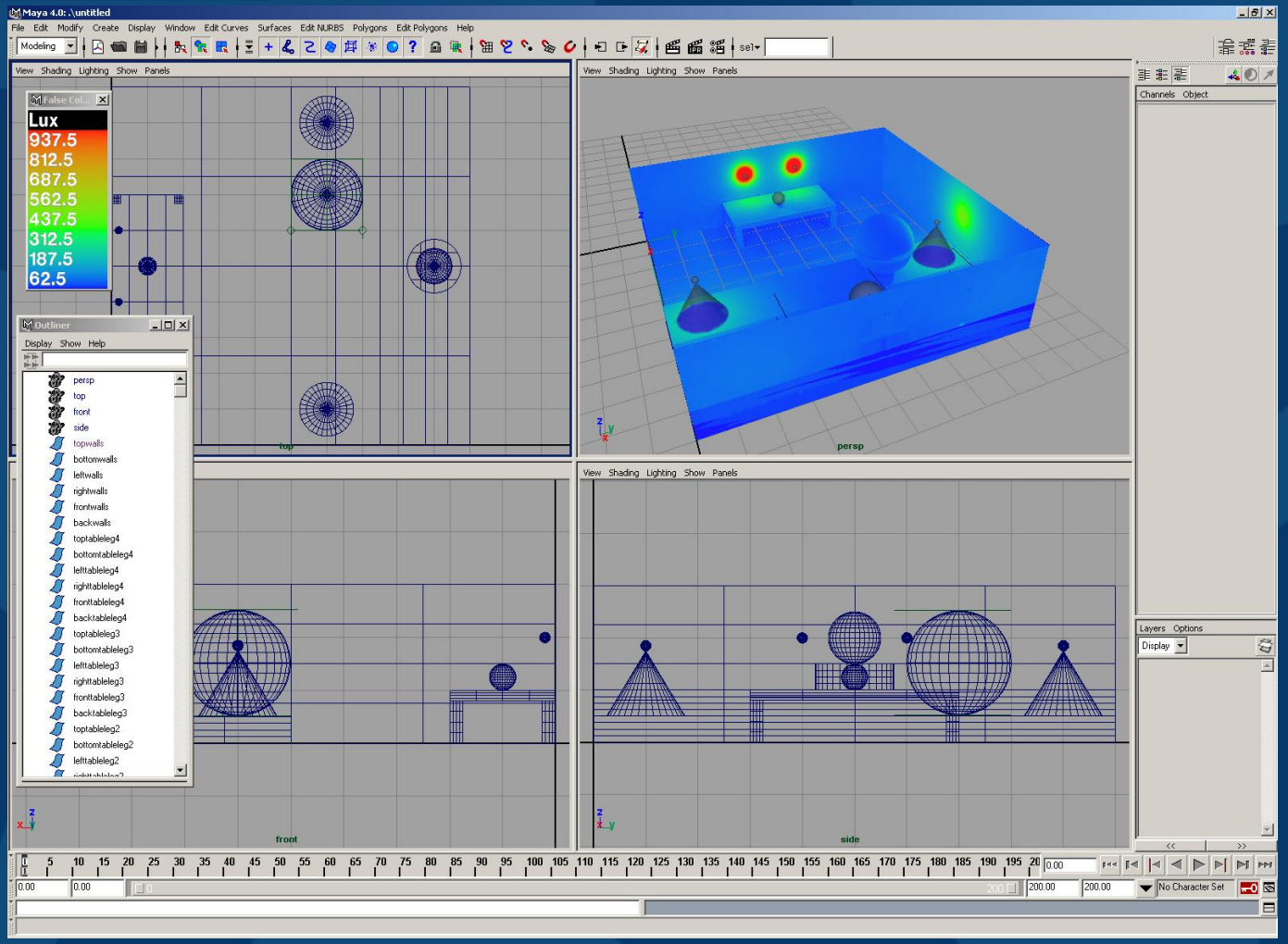


Our approach (3)

- Lights and models can be easily imported into any scene and saved to .rad file.



VIDEO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Channels Object
Layers Options
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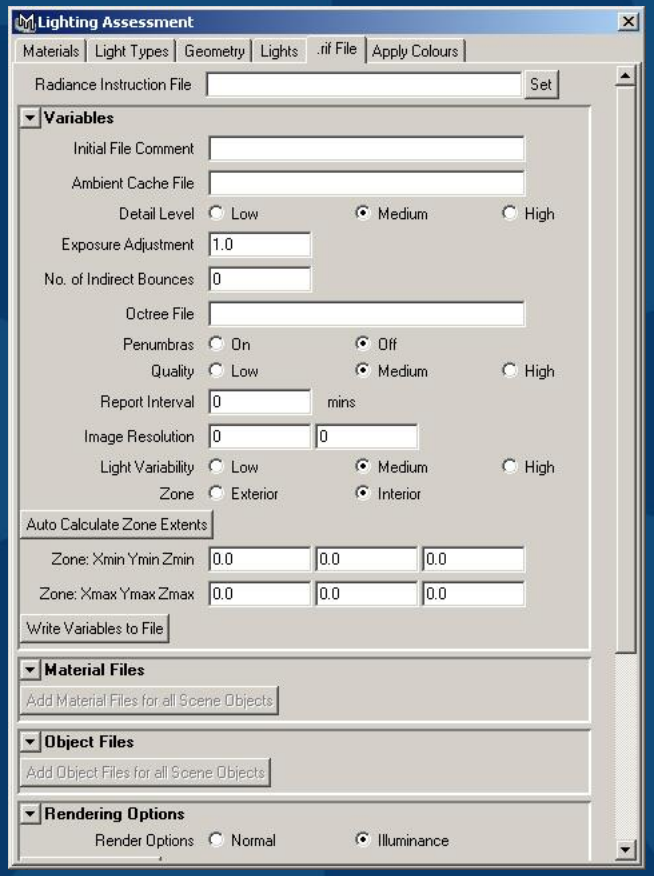
front
side
No Character Set

Generating a .rif file

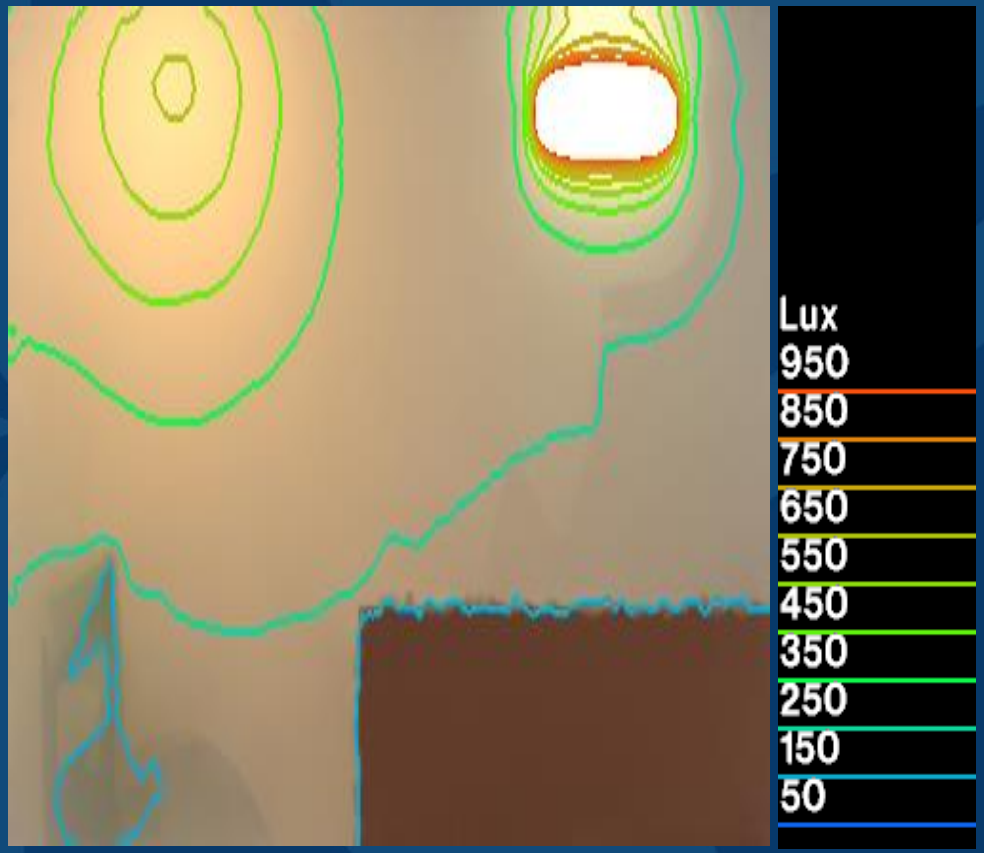
- **The GUI enables us to create a .rif file for the scene**
- **Similar to *trad***
- **However the advantages are that it automatically includes :**
  - geometry
  - Materials
  - View descriptions
  - “ZONE”, “AMB”, “OCT”

Generating a .rif file - GUI



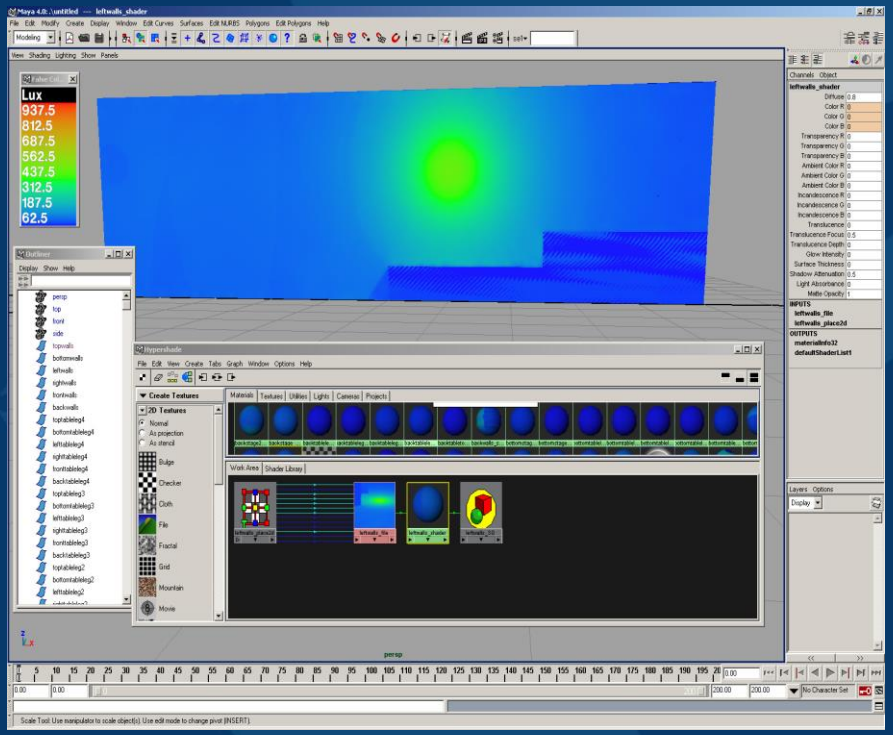
Generation of views

- For every plane, the program generates an individual view.
- Each view is a parallel projection



The view parameters

- For each plane, the view point is determined by finding the center of the plane and its normal.
- The view point (-vp) is then located along the normal at a very short distance from the surface.



The view parameters (2)

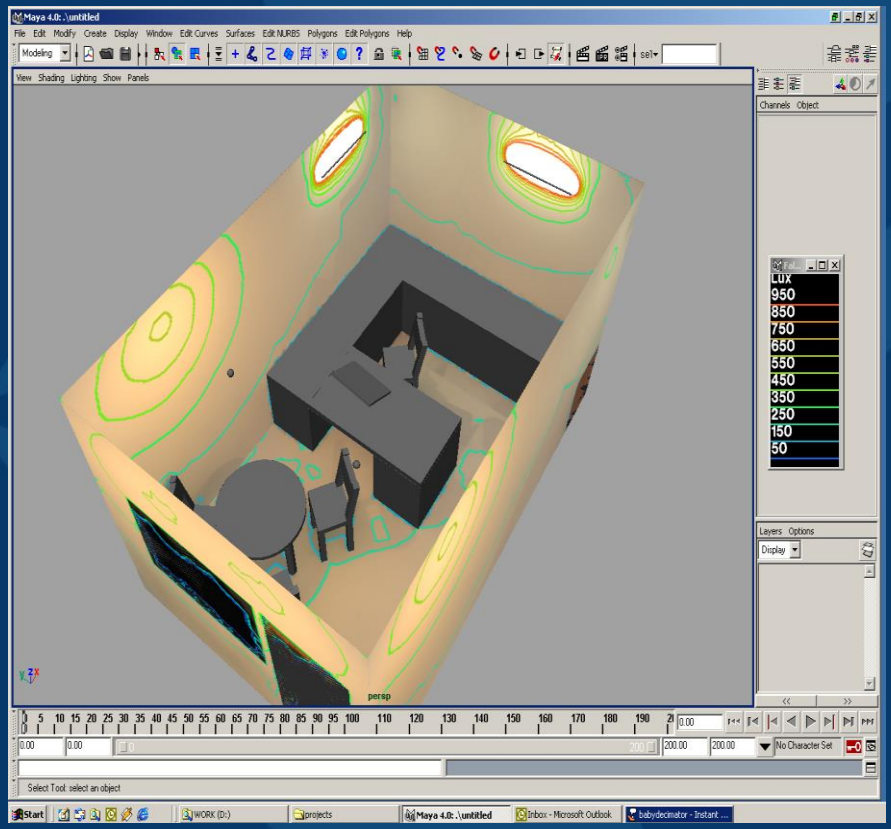
- The view direction (-vd) is simply the vector from the view point previously calculated back to the surface (along the normal).
- The view up (-vu) is determined by interrogating the surface's orientation.
- The width & height (-vh, -vv) are matched to the dimensions of the surface.

Non-planar objects

- We are still working on this feature…
- We can already create luminance data for non planar objects such as spheres, cones and cylinders but it still needs some improvements…

Useful Features

- Automatically both falsecolored and rendered images can be produced separately and as a combined contoured image.



Other features

- Also, the tool automatically generates a *Radiance* view based on the current perspective view.
- Another nice feature is that animation paths can be easily created and written as view files for *Radiance*.

Video

Conclusions

- We have presented a tool that allows the user to model in Maya and then automatically writes *Radiance* files.
- This tools is mainly used to visualize luminances in a true 3D way.
- Normal renderings and other features such as animation are also possible.
- However, much work still needs to be done to make it more useful in light design…

Future work

- Extend the tool to include arbitrary shapes
- Use both NURBS & polygons
- Allow the use of *modifiers* for materials (this has little effect on the illuminance calculation)
- It would be nice to include modifiers for the “light” material.
- So far only plastic, metal, dielectric, trans, glass and light can be used. Other materials just need to be hard-coded in