TurboCAd

Visualize

V1.0 (draft version)

This guide is mainly a copy of the TC help file. (Reds text). With some added notes derived from testing various elements of Visualize (Black text).

It is not a training guide.

It is simply meant as a reference for myself, to save hunting through multiple sections of the TC help file. And add images to further demonstrate the effect of a setting.

Although mainly done for myself. It is made available for anyone to have a look at, in case they may find it useful.

Andy H

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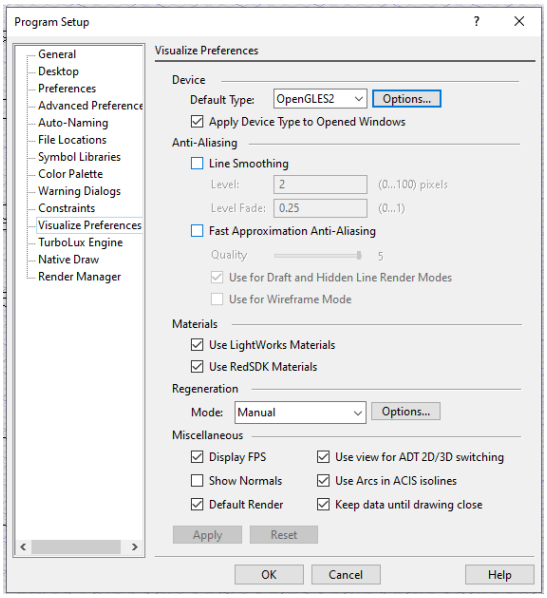
TurboCAD Visualize 2022

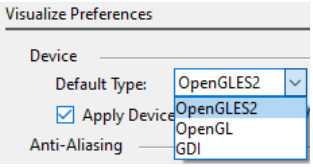
Visualize is an SDK from the Open design alliance. It was brought into TC in 2021. Alongside Lightworks rendering engine. In 2022 Lightworks was replaced by Turbolux (Luxcore). And visualize was then made the main draft render engine In my personal opinion, it was too slow on large drawings to be really useful.

2023 saw some changes to visualize with the use of materials from all other rendering engines, However as of 20-05-2023, IMSI won't sell TC to Europe resellers. So This document cannot be altered for 2023.

Visualize preferences. Program setup



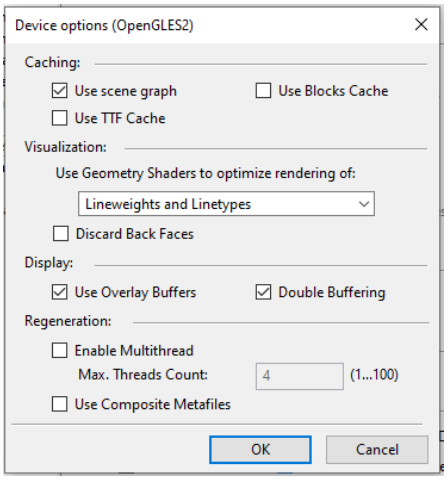
Device.



From the help files. ''OpenGLES2 is most advanced and most productive device mode. OpenGL, GDI device modes can be used for virtual machines and low (embedded) video cards''.

For simple renders, there may not be much difference between the settings.

Some properties may not be available. For example, if set to GDI, show normals is not available.



Device Setup
Caching.

Use scene graph

Enables usage of the optimized Scene Graphics Manager, which is an additional render layer that builds its own internal hierarchy of scene graphic objects and optimizes them in the background of multiple threads to provide better rendering performance. This option can increase memory usage up to two times but rendering performance increases up to 10-30 times.

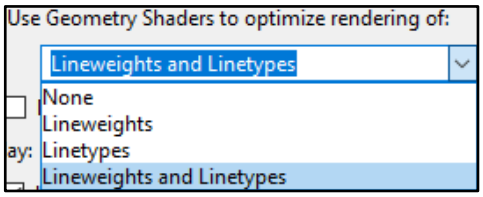
Use Blocks Cache

Enables caching of a hierarchical block structure.

Use TTF Cache

Enables usage of the TrueType font cache. It is useful for rendering drawings that contain a lot of text. If TrueType font cache is enabled, each font character used inside the drawing is cached as a separate metafile.

Use Geometry Shaders to optimize rendering of



Sets bit flags that instruct the vectorization device to use Geometry Shaders (if this feature is available for the GPU) to optimize rendering performance for specific geometry features. Values:

• **None**: Geometry Shader is not used.

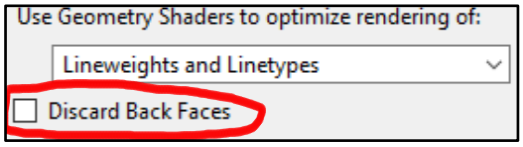
• **Lineweights**: The renderer invokes Geometry Shader to optimize rendering of lineweights.

• **Linetypes**: The renderer invokes Geometry Shader to optimize rendering of linetypes (includes plot style related linetypes and highlighting by dashed patterns).

• **Lineweights and Linetypes**: The renderer invokes Geometry Shader to optimize rendering of lineweights and linetypes.

I have no idea which graphic cards support this feature.

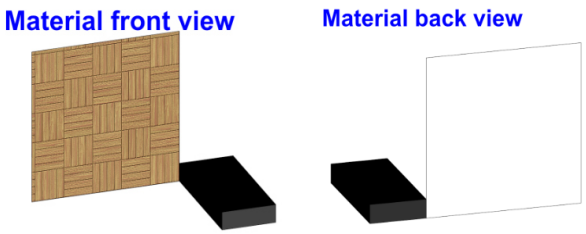
Discard Back Faces



Description: Enables back-face culling.

Back faces are the opposite face to the normal face a material is applied to. Anyone who has used RedSDK, will know the setting as 'Double Sided'. Except ticking the box tells the program not to render the back face. Whereas RedSDK tells the program to render back faces.

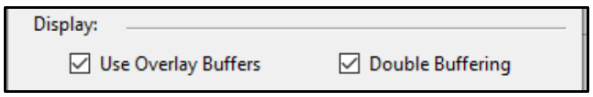
For 3d objects this normally won't make any difference. One difference it will make, is with surface (sheet) object.



Example. Discard back face ticked, using sheet object, with the material attached to the object. In this example, the view was rotated to show the back face, and as can be seen the material is only applied to one side of the sheet.

It is possibly (in theory), that stl imports could be affected, if they have mixed facing normal's. But I have no evidence of that. Easy solution, do not tick this setting, unless for specific reason.

Display:



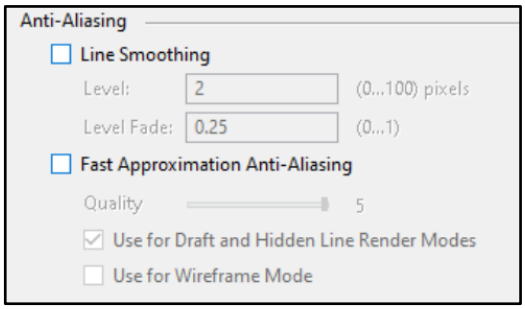
Use Overlay Buffers

Enables the usage of overlay buffers during rendering processes.

Double Buffering

Enables an additional intermediate off-screen buffer to avoid a blinking effect during on-screen rendering.

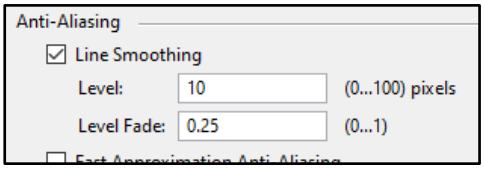
Anti-Aliasing:

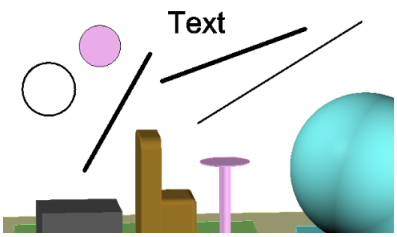


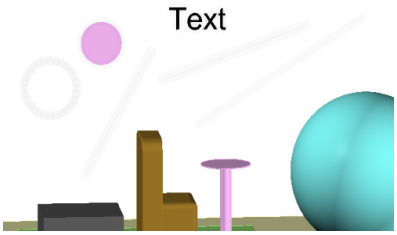
Visualize supports two types of Anti-Aliasing: Line Smoothing and Fast Approximation Anti-Aliasing (FXAA) Anti-Aliasing is available for device type OpenGLES2.

Anti-aliasing is similar to a paint program, in that it creates a 'fuzzy' edge to 2d items.

As can be seen in the far right image below, going too far with the settings can look a bit odd.



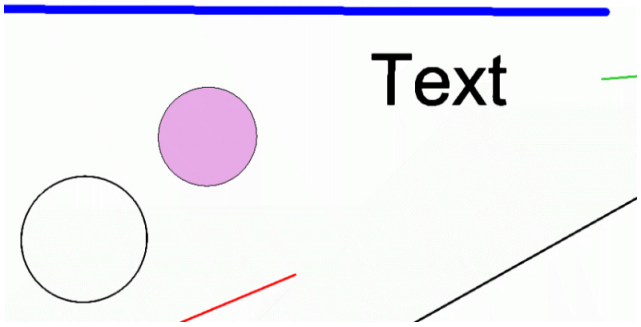




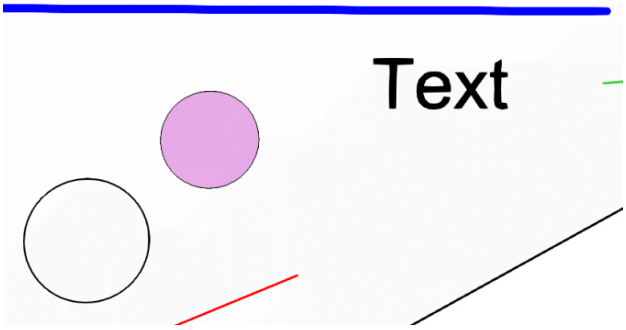
Fast approximation.

This is more subtle than the above. It simply has a slider for adjusting the anti-alias, from 1 to 5.

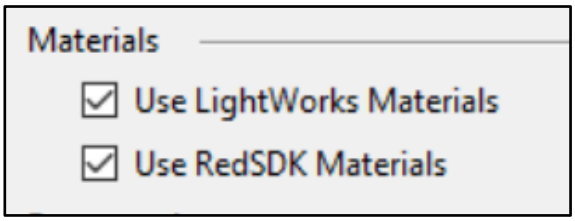
Fast approximation = 1



Fast approximation = 5



Materials:



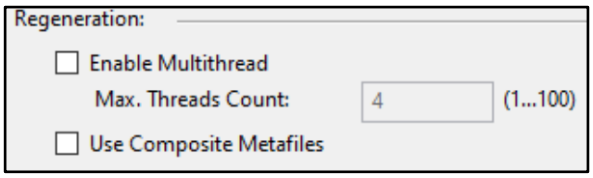
TC 2022. ODA Visualize SDK render does not yet have its own materials in TurboCAD as Lightwork or RedSDK.

The structure of ODA materials is very similar to the materials of other render engines, therefore added the ability to import materials from Lightwork or RedSDK. Currently ODA render supports color, texture, transparency map, bump map, these parameters can be imported from Lightwork or RedSDK materials.

If the options 'Lightwork' and 'RedSDK' (from Program Setup\ODA Visualize page) are not set, then the default material (with graphic's color) will be used. If the options are set, then the material that has the texture will be used.

Note: RedSDK materials can be used even if the plugin is not installed, but editing of these materials is available only if the Native Draw mode is RedSDK.

These are simple tick boxes, If a previous drawing has Lightworks or RedSDK materials attached, TC will attempt to use them. If the material cannot be used with Visualize, TC will apply the pen colour.



Regeneration:

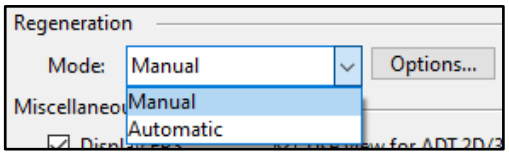
Enable Multithread

Enables multi-threading, and allows one to set the maximum number of threads to use. Whether this makes any difference, may depend on ones computer system. On my machine, in a test drawing, it makes no difference if it is set to 4 or 12.

Use Composite metafiles

Not a clue what this is.

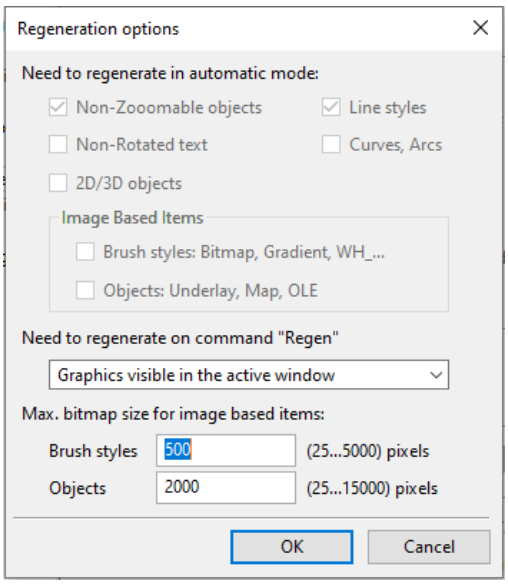
Regeneration:



When changing the view (zoom, rotation), primitives can change automatically or by pressing a key F5 (Menu View\Redraw or View\Regen) Drawing speed may slow down when auto-regenerate is enabled.

The user can specify which types of primitives will be updated automatically when the view changes.

Note… at the time of writing. These don't work on my computer (using TC 2022). So below is just what the help files say.



Regeneration Options:

The dialog allows you to setup regeneration options.

Non-Zooomable objects

Non-zooomable objects (camera, light, blockmark, unscaled text) keep their size when zooming.

Non-Rotated text

Non-Rotated text objects keep their orientation automatically.

2D/3D objects

Turn on/off automatic regeneration of 2D/3D object (ADT objects, Landscapes) switching when changing camera orientation.

Line styles

Objects with some line styles will be updated automatically (as in GDI mode when zooming and camera rotating).

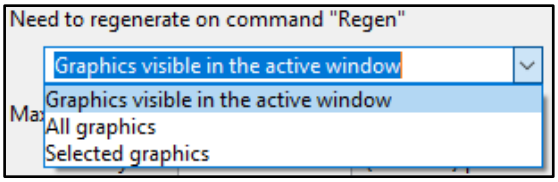
Curves, Arcs

Curves and arcs keeps their smoothness when zooming.

Enabled: If Device Type is OpenGLES2 or OpenGL

Image base Items

Not listed in the help file



Brush styles. Bitmap. Gradient WH..

Not listed in the help file

Objects. Underlay. Map. OLE.

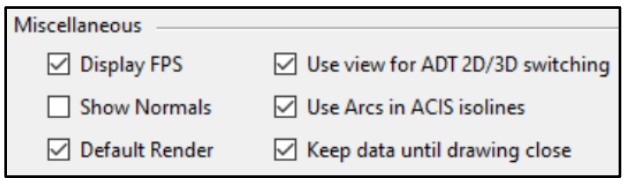
Not listed in the help file

Need to regenerate on command Regen.

Not listed in the help file

Miscellaneous:

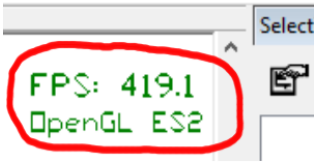
These are general operation and display options.



Display FPS:

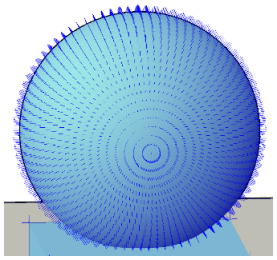
If this option is on, a display appears in the upper right corner of the drawing space. This display track the Frame Per Second to indicate the speed of the Visualize drawing engine and Device Type.

There are probably few reasons to keep this active. Unless one suspects a problem with Visualize slowing things down.



Show Normals:

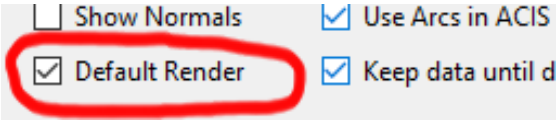
The visualization of the normals make it easier to estimate the smoothness and orientation of the 3D objects, and to find artifacts/ defects on those objects. Supported in Hidden Line and Draft renderings. This option is Off by default.



Basically, every facet that represents a surface facet emits a line, that shows the direction of a normal (essentially the +Z direction of the facet).

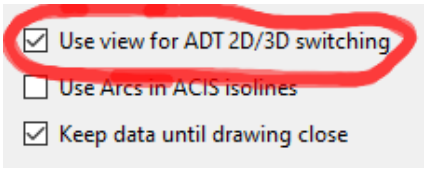
However, one would not want to regularly work with the setting turned on. As the drawing will soon look really messy.

Default Render:



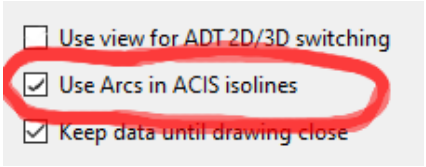
Enables usage of Visualize rendering modes by default in Draft and Hidden Line renders. This option allows the user to switch on Visualize Draft and Hidden Line render in one click.

Use view for ADT 2D/3D switching:



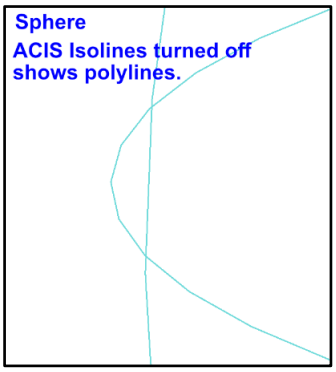
This option allows user to draw object 2D/3D in the same way as GDI (options is off), and draw object 2D/3D the same as in ACAD (options is on).

Use Arcs in ACIS isolines:



Enables usage arcs in ACIS isolines instead of polylines.

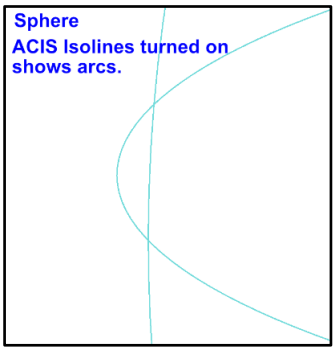
This option allows user to draw contours in the same way as GDI, and use arches to get an accurate representation of the contours.



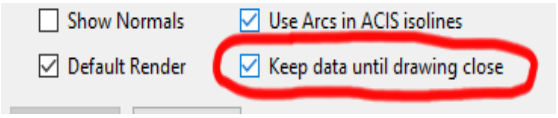
When set to visualize (wireframe etc.), the lines representing an object, can be set to show polylines or show smooth arcs.

At normal zoom levels, one would probably not notice any visible difference.

One difference it can make, is with larger files. Navigation and zooming can be quite a bit slower if ACIS isolines is set to arcs. (option ticked). If navigation is a priority, may be better to have this un-ticked. (Note, standard GDI wireframe uses isoline polyline - on my computer).



Keep data until drawing close:



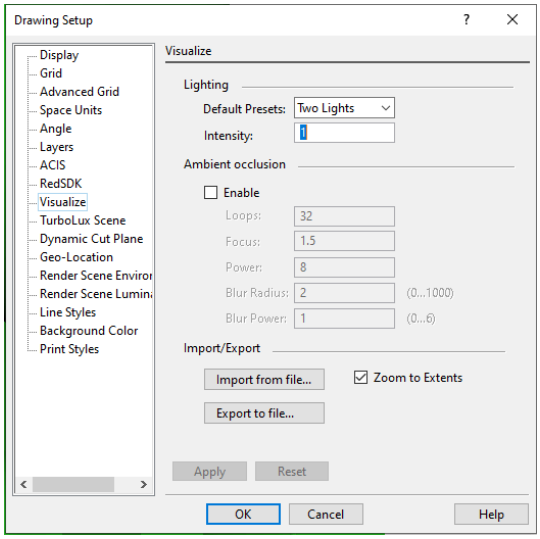
Keep the Visualize contents in cache to optimize switching between paper/model spaces and Visualize/non – Visualize rendering modes.

Keep this turned on for best experience. Turning off on larger drawings can slow things down if one needs to keep switching to draft render, or hidden line..

Example. Turned off. Draft render 10 seconds. Wire frame <1 second. Draft 10 seconds etc. etc.

Turned on. Draft 10 seconds. Wire frame <1 second. Draft 1 second etc. etc.

Drawing setup - Visualize



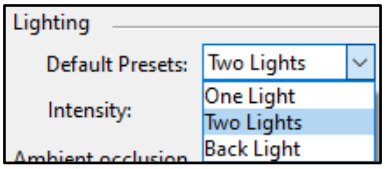
This option lets user set various options for Visualize.

The settings in this dialog, simply set the lighting, and shadow use.

Lighting:

Lighting parameters section allows you to setup ODA Visualize SDK default lighting options.

The section gets enabled if Device Type is OpenGLES2.

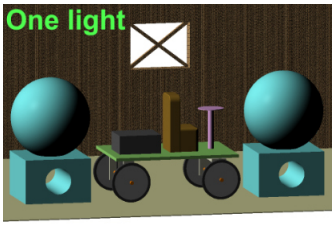


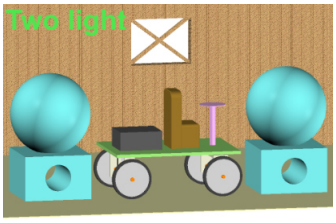
Description: Represents default lighting types:

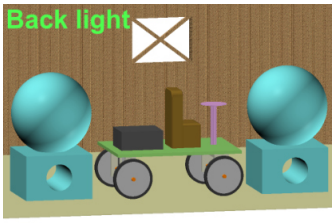
- One light

- Two lights

- Back light



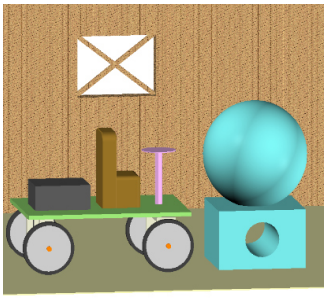


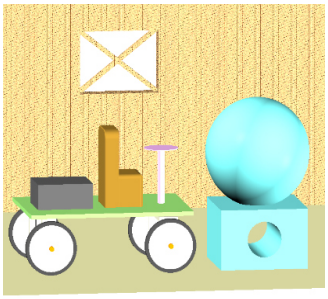


Intensity

Description: A double value that represents the new intensity of the default lights.

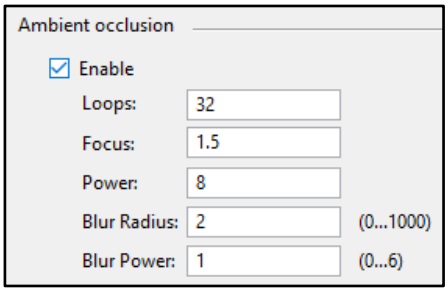
Increases the brightness of the light





Ambient Occlusion:

Ambient Occlusion parameters section allows you to setup Ambient Occlusion options.



The section enabled if Device Type is OpenGLES2.

By default they don't really produce proper shadows, but altering the settings can produce realistic shadow results.

The default is shown right.

Enable

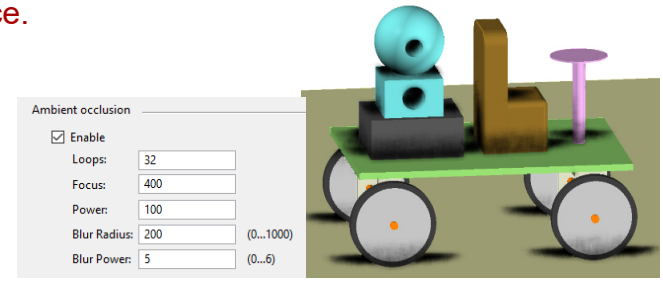
Enables Ambient Occlusion effect.

Loops (default: 32)

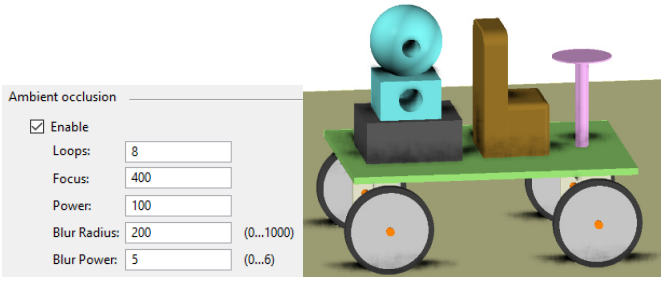
Note. Alter the Focus before or at the same time, as changing this setting,

Specifies number of samples which are computed for each Screen Space Ambient Occlusion fragment. This property directly influences the quality and smoothness of Screen Space Ambient Occlusion effect. It is not recommended to set very large values for this property, because number of sampling operations for each image fragment can seriously downgrade processing performance.

TC 2022. The focus and power were increased in order to get the 'fake' shadows to appear, The shadow effect is a little odd, but at least something is there.



Changing the loops is a bit like applying a soft edge to the shadow effect. If all the other parameters are kept the same, the shadow gets more pixelated around the edge if the value is lower. And more sharp if the value is high.



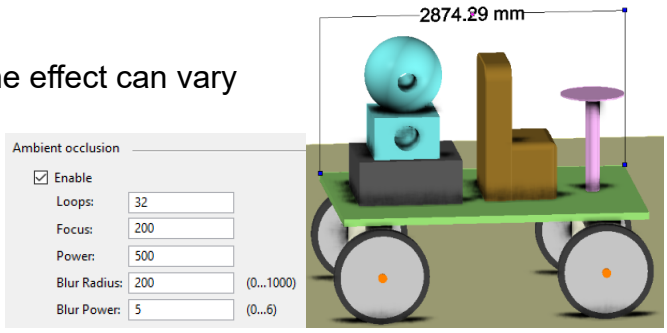
Focus (default: 1.5)

Specifies radius of Screen Space Ambient Occlusion effect sampling area which is represented as hemisphere in World Coordinates Space. Increasing of radius increases the area of Screen Space Ambient Occlusion effect application. Since different drawings may be drawn in different coordinate spaces, units and dimensions, this property is one of the most important for Screen Space Ambient Occlusion effect configuration.

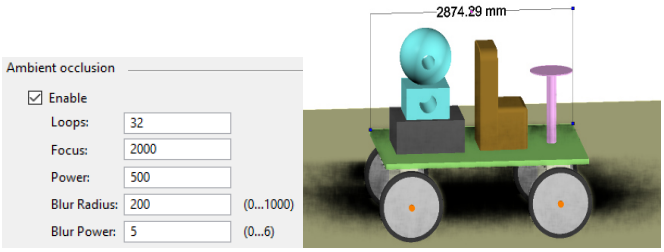
Force will normally be trial and error. And the effect can vary depending on the size of the drawing.

The drawing is quite large so the force may have needed increasing to get full shadow.

The images right, are using a relatively low force of 200

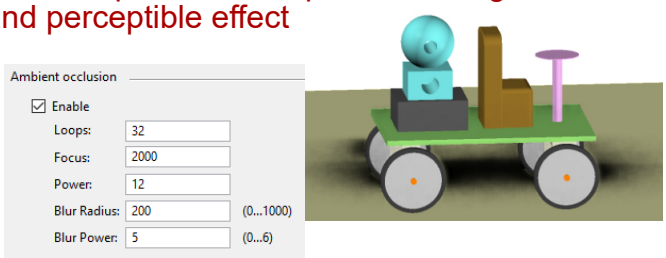


For full shadow in this case, it was necessary to increase the force by a lot to 2000



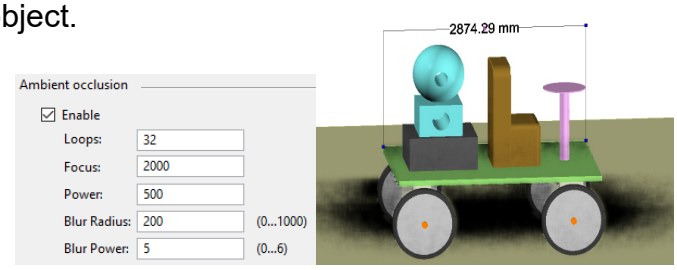
Power (default: 8)

Specifies additional multiplier for resulting colors of the Screen Space Ambient Occlusion effect. The 1.0 value disables additional multiplication, however results produced by the Screen Space Ambient Occlusion effect may be too pale and inexpressive. Larger multiplier values produce more expressive and perceptible effect shades



Like force, power affects the shadow And can be adjusted to get the shadow a bit more realistic.

High force and low power results in some quite good shadow effect, under the main object.



Using a high power may require care, as in some situations, is can make shadows look like a bad smudge.

Blur Radius (default: 2)

Blur radius and blur poser, may be specialised, as they don't make any difference on my computer during tests. Maybe they require a special set of circumstance, that I don't know about.

Sets Screen Space Ambient Occlusion effect blur. Zero value for this property disables blur effect and the resulting image is crisp. Increasing this value increases amount of blur effect and smoothness of final results:

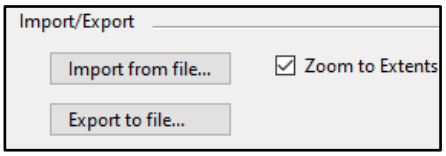
1 — invoke 3x3 Graussian blur kernel
2 — invoke 5x5 Gaussian blur kernel
3 — invoke 7x7 Gaussian blur kernel and etc
Range: [0...1000]

Blur Power (default: 2)

This property can be used to add more expression for Screen Space Ambient Occlusion blur effect results. This multiplier is applied to shading fragments during blur effect computation. You can got more clear blur effect results by increasing power of blur effect.

Range: [0...6]

Import/Export:



Import from File: This button is enabled if the ODA Visualize SDK mode is set in the active window. Formats OBJ and DWG are available for import now. (Set of formats can be significantly expanded if necessary, all formats that are supported by ODA can be added). The imported objects are not added to the drawing.

One must **draft render** the scene before Import becomes available. This works even if the drawing is blank, as long as one is in draft render mode.

The imported objects are held in memory only, like TurboLux, However unlike Turbolux, if one switched back to wire frame, and continues drawing, and then renders again. The imported objects are still there in memory.

This allows one to check how parts of a scene in a different file, will interact with each other. Similar to an X-ref, but the objects imported are not 'real' as 3d editable objects. Unfortunately the objects cannot be snapped to. So alignment can only be done by eye.

OBJ and DWG can also be used. Note, in the case of OBK and DWG the files were removed from memory when switching back to wire frame. I don't know if this is just my computer, or as designed.

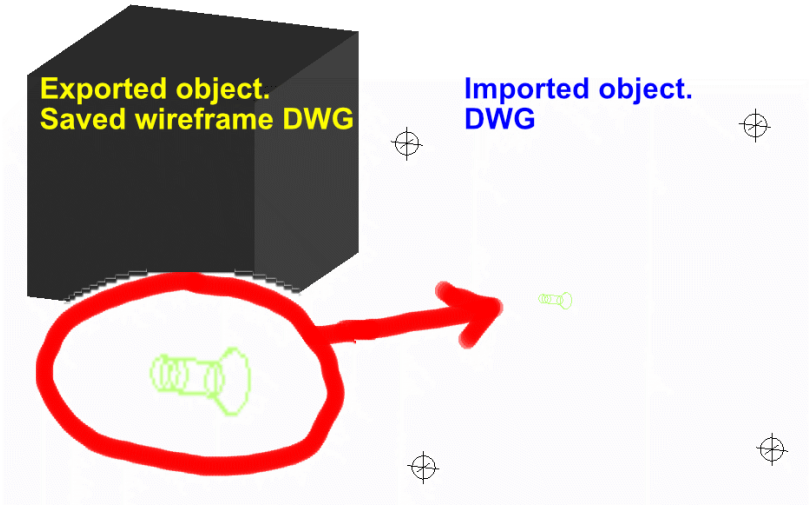
Export to file:

The button is enabled if the ODA Visualize SDK mode is set in the active window. Format VSF (Open Design Visualize Stream) is available for export now. (Set of formats can be significantly expanded if necessary, all formats that are supported by ODA can be added).

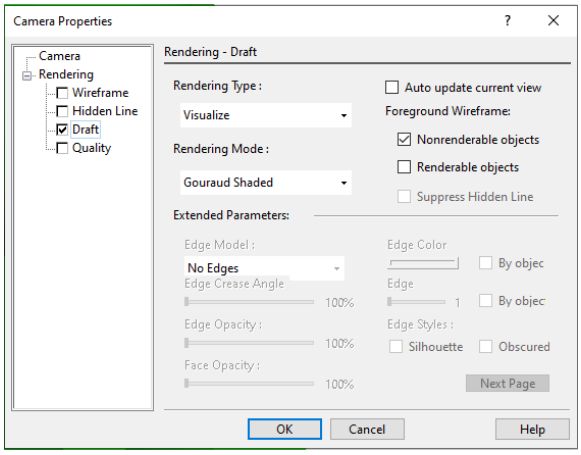
Exports a scene in draft render, into visualize format. This can be imported into another file for viewing.

Sometimes things don't go to plan when using DWG. If the import fails, I'd suggest opening a blank file and trying to import into that, (Obviously remembering to draft render before import.

Example of a failed import



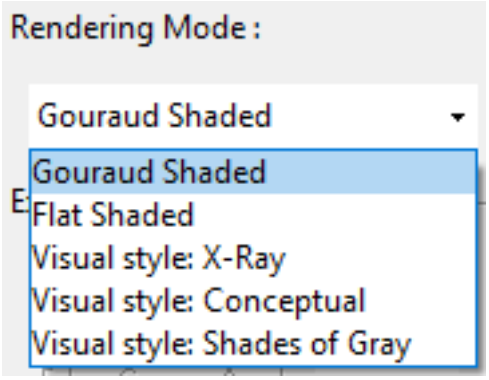
Camera properties.



Rendering Type:

The graphics engine that will be used to create the render. Visualize. TurboLux. Open GL allows quick rendering in order to gauge the shape and placement of objects. Because of its speed, OpenGL is best suited for walk-throughs to quickly review the structure of the drawing, but not to show all details. For example, an object's pen color is used rather than its defined material.

Rendering Mode: The available modes depend on the rendering type:



Gouraud: a method used in graphics to produce continuous shading of surfaces.

Flat Shaded: interpolates surface normals across rasterized polygons.

X-Ray: This mode displays objects with partial transparency.

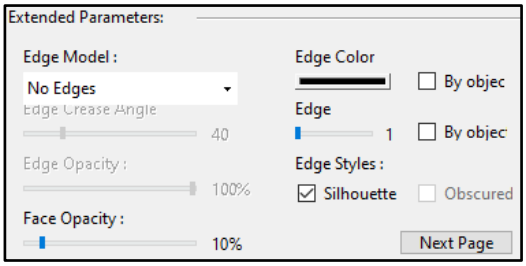
Conceptual: This mode displays objects using smooth shading and the Gooch face lighting model.

Shades of Gray: This mode displays objects using smooth shading and monochromatic shades of gray.Gouraud Shaded - Smooth shaded display. Colors interpolated between vertices. Flat Shaded - Faceted display. One color per face

Gouraud shading and flat shading, do not have any additional settings. However X-ray, Conceptual and Gray open up additional extended settings.

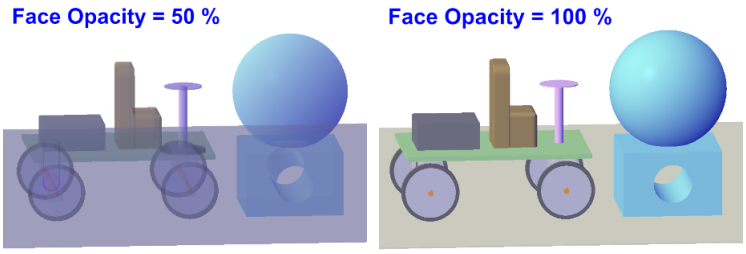
No edges.

Although it says no edges, that applies to



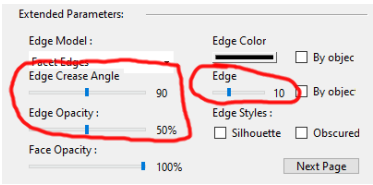
Face opacity.

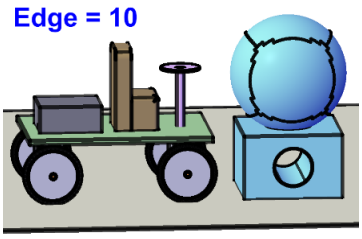
Reducing opacity is like applying transparency to the whole scene, instead of just single objects.

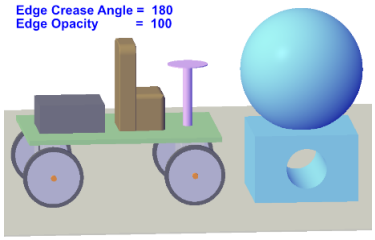


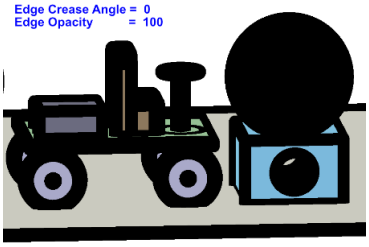
Edge crease angle.
Edge Opacity.

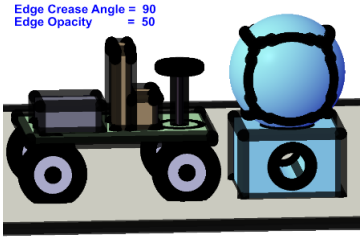
A bit like using camera properties - renderable objects setting. But more dramatic.





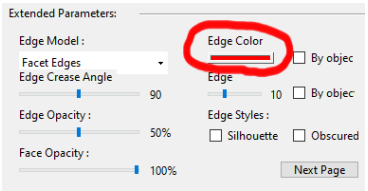


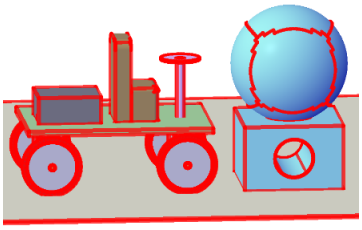




Edge color.

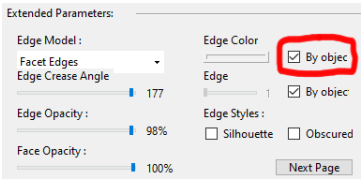
Sets the colour used for the edge effect.

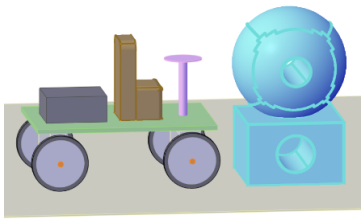




Edge Color By Object.

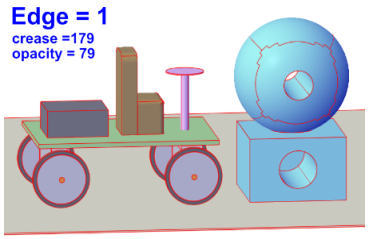
Tells the program to use the line (pen) colour when drawing the edges.

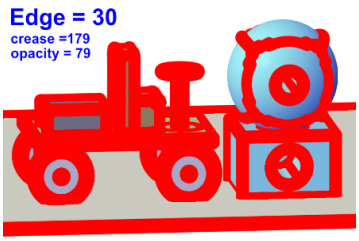




Edge.

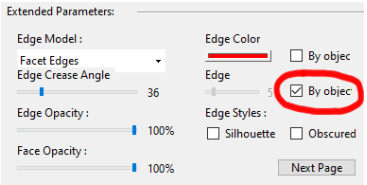
Sets the thickness of the edge lines.

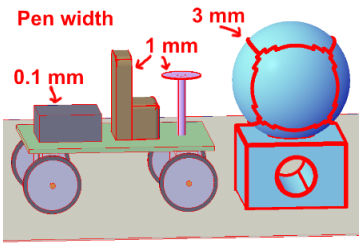




Edge, By Object.

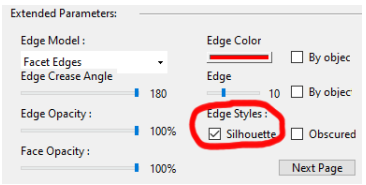
By object uses the object line thickness (in pen properties) to determine the thickness of the lines.

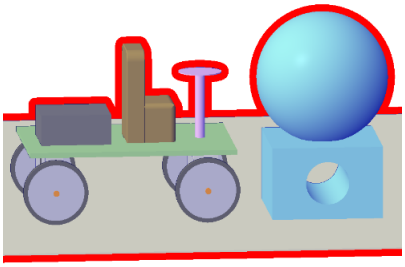




Edge styles.

Silhouette.



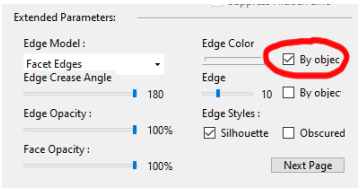


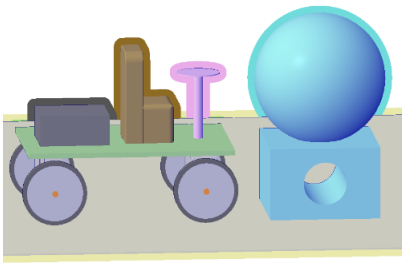
Silhouette creates a line around the scene.

Note. At the time of writing, This sometimes does not work around the scene, but draws a line around all objects.

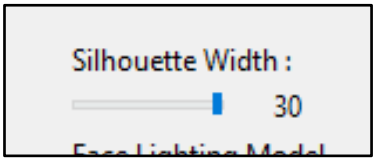
By using silhouette and by object, the line will appear in the objects own colour

I have no idea how useful this feature is.



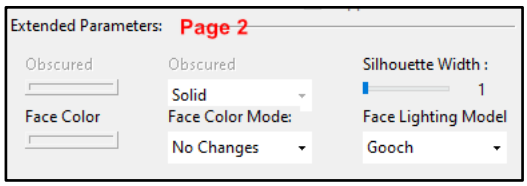


Switching to next page, allows access to the sillhouette width setting.



Extended parameters page 2.

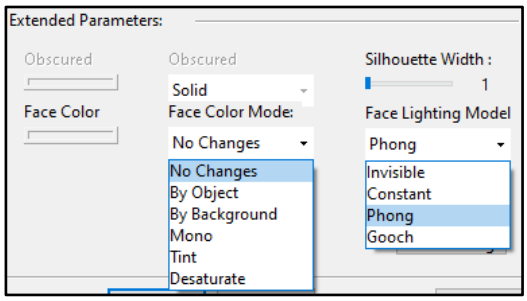
Clicking the next page button, takes one to more settings. Including how the lighting affects the model.



Invisible.

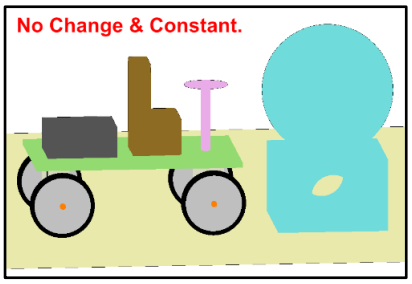
If one has 2d, rendered with 'non-renderable objects' ticked. Invisible will hide all the 3d models, leaving just the 2d rendered.

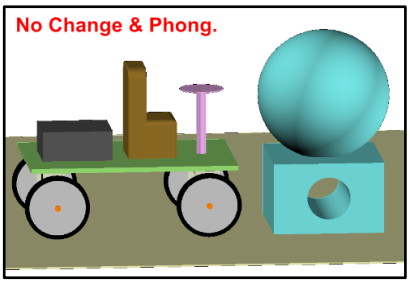
If 'renderable objects' is also ticked, it will render the 2d and 3d edges, similar to what wireframe is.

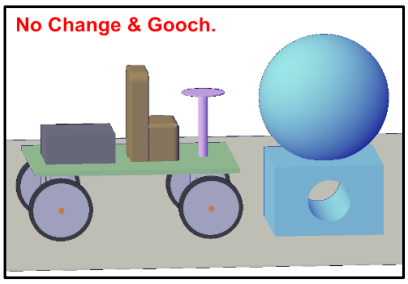


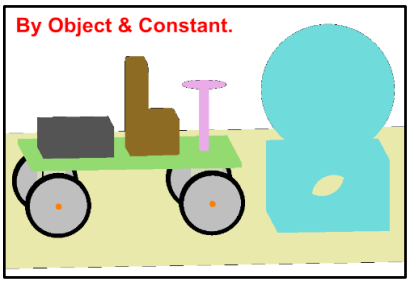
Face and Lighting

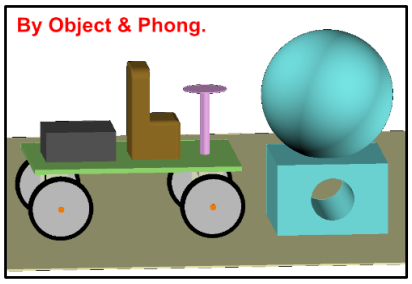
The following example were all rendered using the same edge settings. And are simply an example of the different modes, Using different edge settings on the first page of extended properties, allows for a huge number of alternatives, way too many to show here.

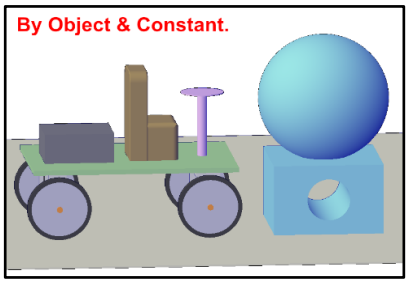


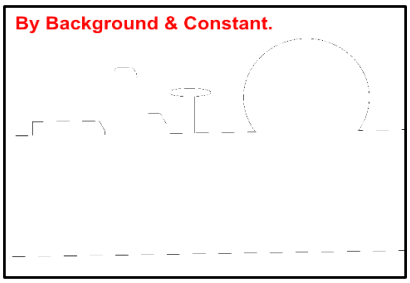


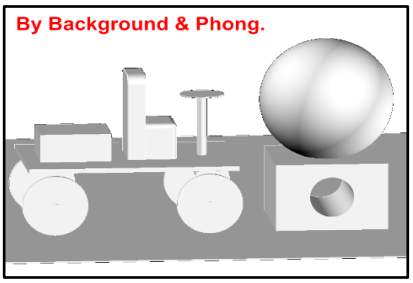


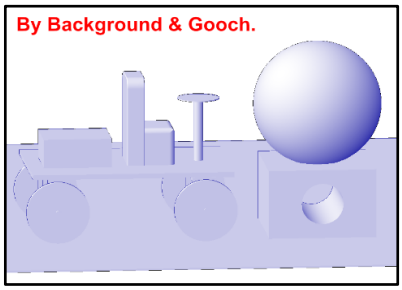

By Object & Constant.

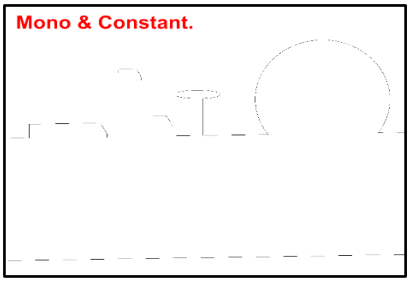

By Object & Phong.

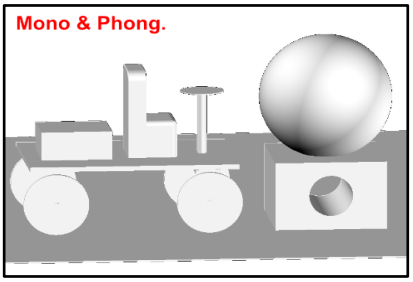

By Object & Constant.

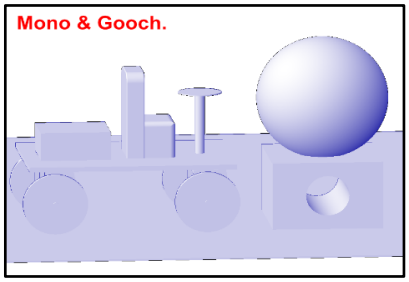

By Background & Constant.

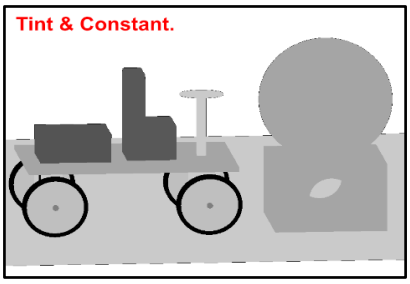

By Background & Phong.

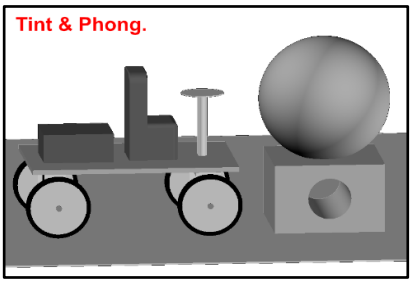

By Background & Gooch.

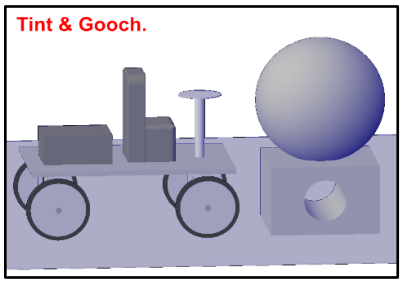

Mono & Constant.

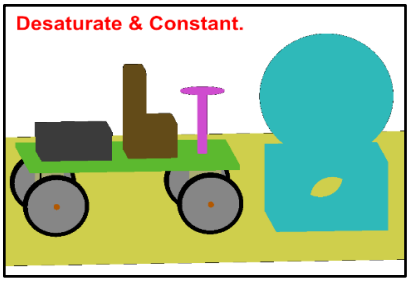

Mono & Phong.

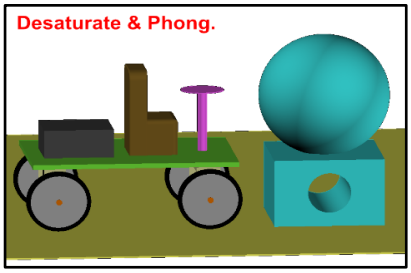

Mono & Gooch.

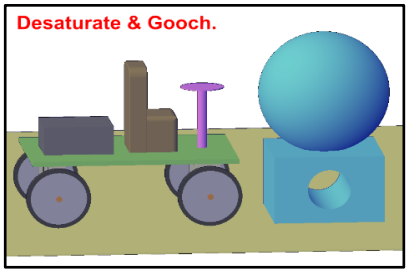

Tint & Constant.


Tint & Phong.


Tint & Gooch.


Desaturate & Constant.

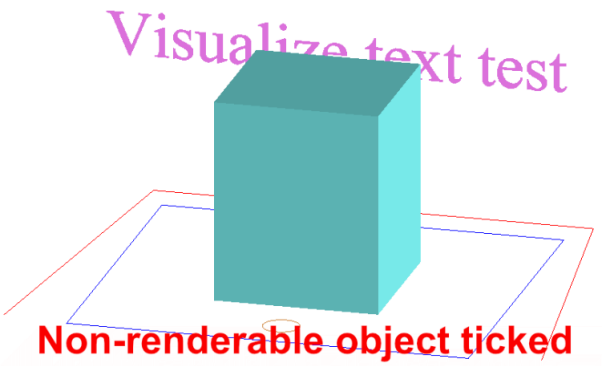

Desaturate & Phong.

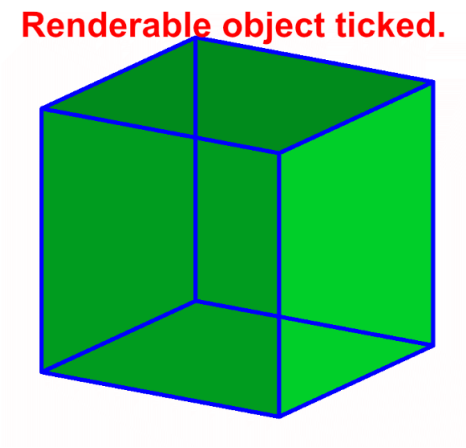

Desaturate & Gooch.

Using non-renderable, and renderable objects setting.

Unlike Turbolux, when camera properties Non-renderable is ticked, the 2d appears like a layered drawing.

Which is a lot better that Turbolux, which applies the 2d after the render is complete, and the 2d is shown in front of any 3d.



Renderable objects also works with Visualize.

The image right has a RedSDK plain material applied to it. With renderable objects ticked the wireframe edges show up, as the wireframe colour was set to blue.