

TURNTOOL

TurnToolBox for 3D Studio Max and Autodesk Viz

Manual

Version 2008

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1. Bringing 3D to the Internet

TurnTool is a real time 3D graphics solution targeted at the growing market for 3D on the Internet.

Integrate your 3D visualizations in web pages and other applications for interactive viewing and manipulation - responding to user input from mouse and keyboard. Knock your audience off their feet in amazement!

The TurnToolBox, the part of TurnTool needed to create TurnTool content is a plugin for 3D Studio Max (a 3D modeling application from discreet). If you are familiar with 3D Studio Max or Autodesk Viz makes it very easy for you to create breathtaking interactive 3D visualizations. The TurnToolBox exists for other 3D applications, but this manual will concentrate on the plugin for 3D Studio Max and Autodesk Viz.

For our customers' target audience, we make the viewing of this amazing 3D content as easy as pumpkin pie. The TurnTool Viewer is freely available for download from TurnTool's website and supports automatic installation when viewing TurnTool content. The compact size of TNT-files makes the download of each 3D visualization painless.

TurnTool takes the lead in online 3D visualization by allowing ultra fast downloads and still preserving a high quality of graphics and functionality.

1.1. The TurnToolBox and the TurnTool Viewer

The TurnTool technology consists of two main components: The TurnToolBox and the TurnTool Viewer. The TurnToolBox generates TNT-files. The TurnTool Viewer enables the user to view the TNT-files directly in their browser.

TurnTool has been developed by experienced game programmers and is likely to be nothing less than a revolutionary contender for the Web3D market. With competing products focusing on either file download sizes or quality of 3D content, TurnTool sets a new standard in both areas for an unsurpassed experience.

TurnTool presents itself as a convenient solution to all potential web3D content providers - big or small. Both buying it and selling it is easy. There are no difficult pricing policies to understand. We do not want any money from your customers (unless they insist).

With TurnTool, you just pay for the software. Finally, you can devote your attention to what is important: creating great 3D models and worlds for online display.

1.2. Quality and Speed

The TurnTool plug-in and 3D content download sizes are confined to a minimum while preserving a high quality of 3D display. The TurnTool file (TNT file) can be implemented as an integrated part of an overall graphics design by means of background image files - or by means of a transparent background.

1.2.1. Easily Integrated

As an ActiveX control, the TurnTool Viewer can be integrated with an endless list of applications. To name but a few: Microsoft Internet Explorer, Microsoft PowerPoint and Macromedia Director are examples of these. (See chapter 1 in TurnToolBox Scripting Manual: "Integrating TurnTool")

1.2.2. Easy To Use

TurnTool is easy to use and you do not have to learn an external editor. All editing is done from within the 3D Studio Max interface and TurnTool does the hard work of translating data to the TNT file.

1.2.3. Flexible

TurnTool has been designed with a maximum focus on flexibility. The engine is divided into components, each residing in respective libraries. The hardware abstraction layer provides TurnTool with the capability to support many APIs and driver systems such as DirectX and OpenGL. It also enables special attention and continuous development of each component for efficient updating of the TurnTool software.

1.2.4. Outstanding Quality

TurnTool delivers an outstanding quality of graphics with state-of-the-art antialiasing of objects and a crystal clear display of textures. Using very flexible scripting options, virtually any scene and/or functionality imaginable can be accomplished - ranging from simple product visualizations to full-blown 3D architectural visualizations and even large landscapes.

2. System Requirements

TurnToolBox is compatible with the following applications:

3D Studio Max 6.x, 7.x, 8.x, 9.x or 2008 (32 and 64 bit)
Autodesk Viz 5.x, 2005, 2006, 2007 or 2008 (32 and 64 bit)
ArchiCAD 9.x, 10.x and 11.x
Cinema4D 8.x, 9.x and 10.x

TurnTool Viewer minimum requirements:

- Windows 95, 98, Me, NT4, 2000, XP or Vista.
- DirectX 7.0 or later or OpenGL 1.1 or later
- 32 MB system memory or more
- Pentium 133 processor or greater

Recommended configuration:

- Pentium II processor or greater
- OpenGL or DirectX compliant 3D graphics hardware

Browsers supported by the TurnTool Viewer:

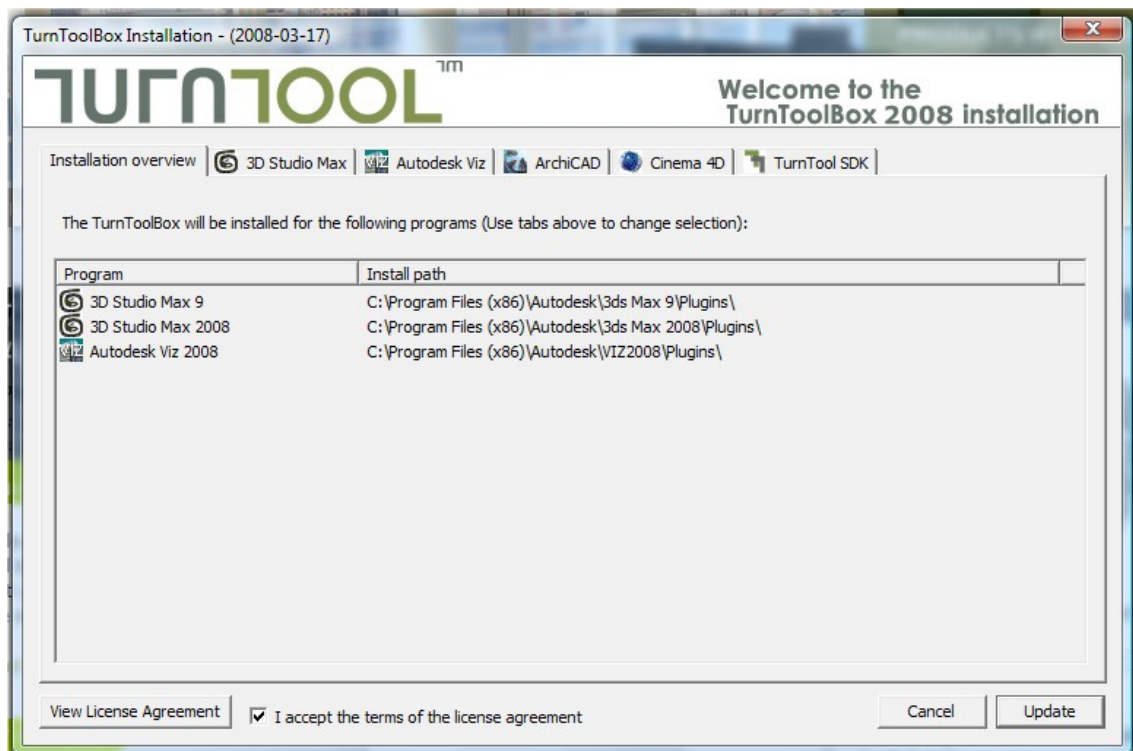
- Microsoft Internet Explorer 4.0 or later
- Mozilla Firefox 1.5 or later
- SeaMonkey Browser 1.0.6 or later
- Ace Explorer Version: 3.0 or later

3. Installation

To install the TurnTool software, please go to the TurnTool website and download it from there or use the link below. That way you make sure you have the latest version.

<http://www.turntool.com/ToolboxInstall.exe>

Download and launch the file above. Follow the on-screen instructions to install the plug-in for your 3D applications.



After installation, start up 3D Studio Max or Autodesk Viz. You can now export your file as a TNT file by selecting export from the file menu and selecting TurnTool Export from the File Type drop down menu. Exporting can also be facilitated through the TurnToolBox interface. Description follows:

TurnTool properties are manipulated through a set of panels that are located in the utility page of the command panel (see the picture below). You open the TurnTool panels by clicking the button labeled TurnToolBox or by selecting it through the list that appears when clicking the "more" button. If there is no TurnToolBox button in your panel, add the button to the current button set by clicking the "configure button sets" button and drag the TurnToolBox label onto the set. By making this button, you will always have easy access to TurnToolBox.

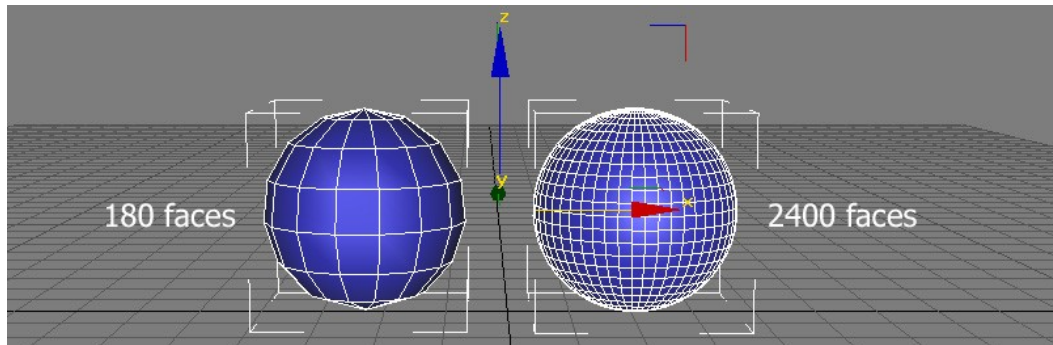


When exporting, TurnTool generates a TNT file and an html document containing an object of the TNT file. Click on either the html file or the TNT file to view the scene. Clicking the View button in the utility panel will view the HTML document by default.

4. Creating TurnTool Content

Modeling a 3D scene for real time display with TurnTool is quite similar to using other tools for real time 3D. Follow a few rules of thumb and you are ready to create fantastic real time TurnTool content of your 3D artistry.

Building geometry for real time output requires an attention to mesh resolution. For most scenes, a compromise between mesh detail and file output size must be determined to ensure a good balance of quality versus speed.



A good rule of thumb, when building a 3D Studio Max scene for TurnTool export, is: the more faces and textures in a scene, the slower the rendering speed. A scene with 90.000 faces or less, and with less than about 25 MB of texture images (uncompressed) will perform well even on systems just barely meeting the minimum system requirements.

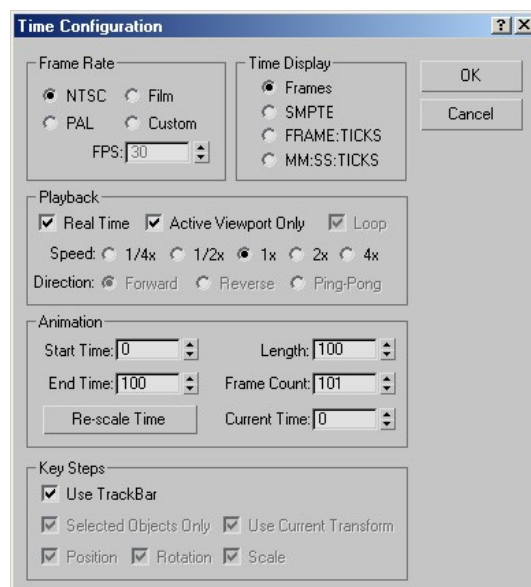
This is just a rule of thumb, as you will also have to take into account the number and size of texture maps, and lights used in the scene, as well as the target system. High-end systems will be able to show much more detailed scenes perfectly fluent (200.000 + faces and 60-120 MB of textures).

TurnTool presents one of the fastest rendering engines ever created and you will find the performance very good with even large scenes.

4.1. Global Configuration

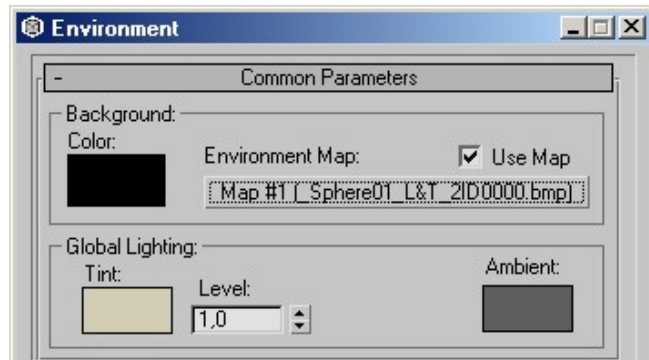
In the "Time Configuration" menu in 3DS Max, the exporter uses the Start Time and the Length in the animation section to determine the amount of frames in the animation. The exporter also reads the frame rate. Use this to create animations that are more fluent.

If there is no animation in the scene, set Length to one.



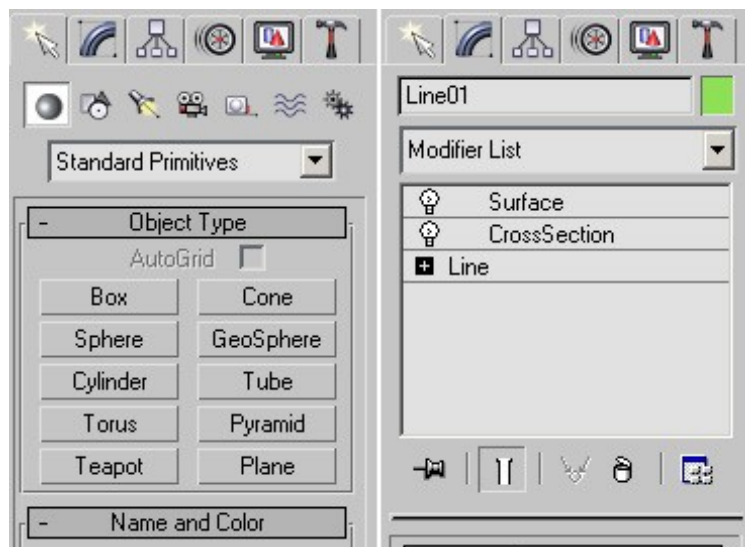
4.2. The Viewport

Exporting with TurnTool considers the Max's "Environment" menu. A background image is exported as it is - in any resolution. Background color is also supported. In the Global Lighting section, you will find the ambient color. This color is used for determining the lowest amount of light in your scene. The Tint color is also supported.



4.3. Meshes

TurnTool supports all polygonal objects within 3DS Studio Max. Keep in mind, that most objects qualify as polygonal meshes during export; regardless of the 3D Studio Max labeled "modeling class". To illustrate this, patch objects created with the spline and surface modifiers, will export as polygonal meshes.



Mesh animations are exported as sequences of single frame meshes. Particle animations are supported as mesh animations as well. Character Studio objects are exported as hierarchical polygonal 3D characters referring to the biped. The biped is a node-hierarchy, which contains the skeletal animation. Hidden meshes will not be exported. Finally, Frozen meshes are exported without animation.

4.4. Light Sources

The light sources illuminate and shade the meshes. TurnTool supports multiple light sources with different colors, however the only type of light source currently supported is an omni light. It is possible to animate the position of the omni, and thereby creating real time shading effects.

TurnTool exports the light multiplier setting as well as color.

The light intensity will affect all vertices within the range of the light source. If the light does not use attenuation, this range will be infinite. On the other hand, if the light uses attenuation the intensity of the light will decrease over distance. To control this TurnTool supports far attenuation.

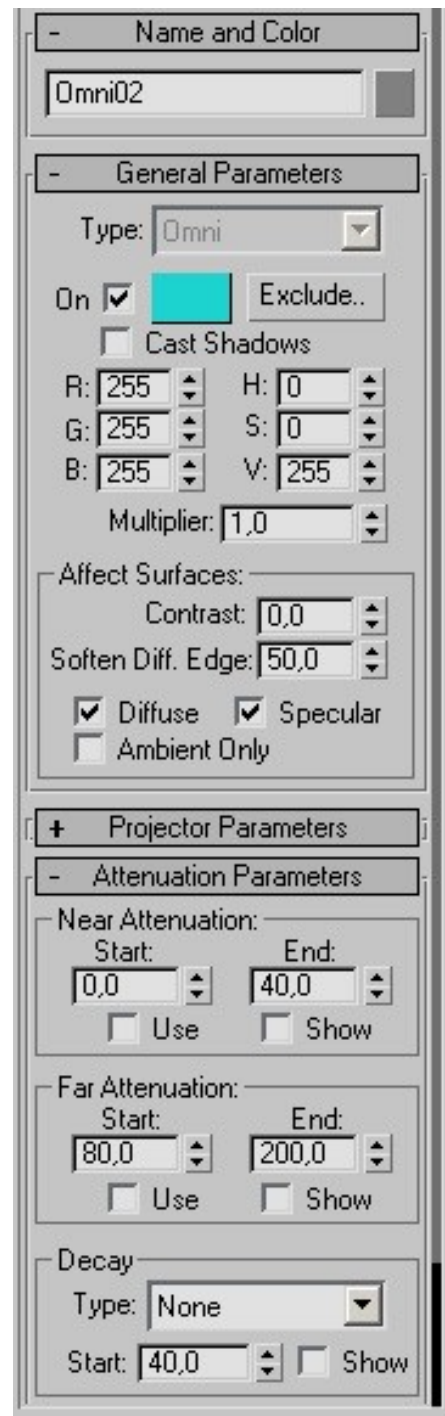
At the "Far Attenuation Start" distance to the light the intensity of the light will be the Multiplier value.

At the "Far Attenuation End" distance to the light the intensity of the light will be zero.

For each vertex, the amount of light will be calculated using both light & material colors, distances and angles. This means that light "resolution" will increase with the number of vertices/faces on the surface.

It is possible to export a scene without any light sources. It is recommended that you use at least one light source, because it would be hard to perceive depth without lights.

The Color, Multiplier and Attenuation parameters can all be animated over time. Finally, Frozen light sources are exported without animation.



4.5. Cameras

The cameras are the elements in the scene through which you can see your virtual world. TurnTool supports Free & Target cameras.

Each camera has a FOV, short for "Field Of View".

TurnTool supports a pixel perfect conversion of the FOV parameter. Two kinds of projection are supported: Perspective & Orthographic. In short, the Orthographic is a coordinate system without depth.

The Orthographic uses the Target Distance parameter to calculate its Viewing Frustum.

For further information, use the 3D Studio Max Reference Manuals.

TurnTool automatically fits clipping planes to the scene in real time. This behavior may be overridden by setting the near and far clipping planes manually, but this is an advanced optimization feature best left to experts.

The first camera the exporter encounters will work as default camera inside the viewer. It is not possible to View a scene using TurnTool without having a camera present.

Camera position, rotation and the FOV, Far Clip, Near Clip and Target Distance parameters can all be animated over time. Finally, Frozen cameras are exported without animation.

4.5.1. Understanding Camera Control

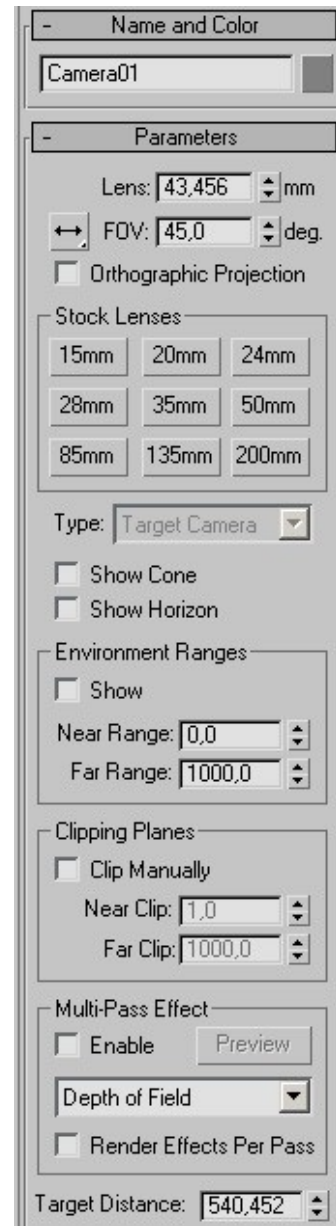
There are two types of cameras in TurnTool, target and free cameras, each useful for different purposes. The difference between the two is in the way it is controlled by the user. It can be summarized like this:

A target camera orbits around a target point in space and is controlled like this:

- Left mouse button & drag: Orbits the camera around the target.
- Right mouse button & drag: Alters the distance from the camera to the target (zooms).
- Both mouse buttons & drag: Moves both the camera and the camera target up, down, left & right.

The free camera is moved freely and is controlled like this:

- Left mouse button & drag: Changes the facing of the camera (like looking around).
- Right mouse button & drag: Moves the camera back & forward.
- Both mouse buttons & drag: Moves camera up, down, left & right.



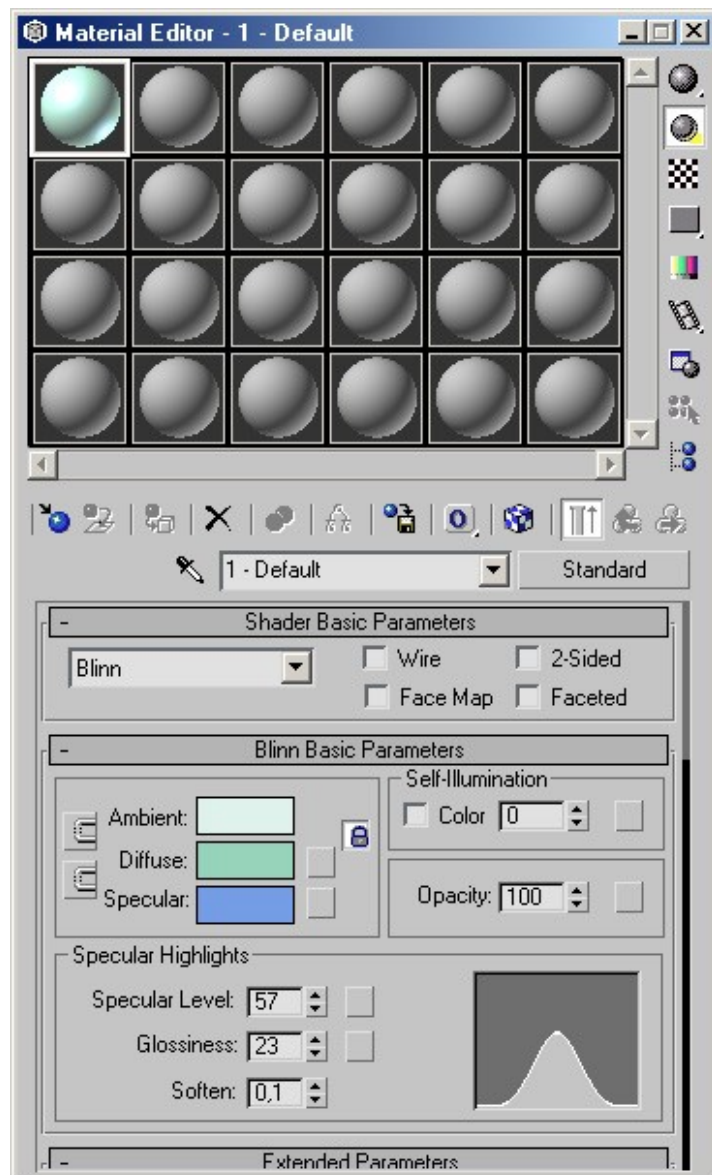
- Arrow keys: Moves camera back, forward, left & right
- Arrow keys + left mouse button: Moves camera up, down, left & right

In scenes with physics, it is probably more desirable to set up a physics controller. In that case, the camera should be linked to the physics object, which in turn is controlled by the user. See the section on physics for more details on setting this up.

4.6. Materials

The materials are information about the colors and texture maps of surfaces. Materials are attached to meshes and are illuminated by light sources. TurnTool supports the Ambient, Diffuse and Specular colors. TurnTool also converts the Self-Illumination value and color from the Max material. Associated with the Specular color is Specular Level and Glossiness. If Specular Level is zero the Specular Lighting will be disabled for this material. If specularity is not used, it is recommended to set the Specular Level to zero, as you will save time rendering the scene in real time.

TurnTool supports the opacity as both value (spinner) and Map. The Opacity Map needs to exist in the alpha channel of the Diffuse Map, - otherwise the Exporter will be unable to convert the material. In the "Advanced Transparency" menu TurnTool supports the "Additive" option. This is used for enabling Additive Blending. TurnTool also supports reflection mapping.



4.7. Texture Maps

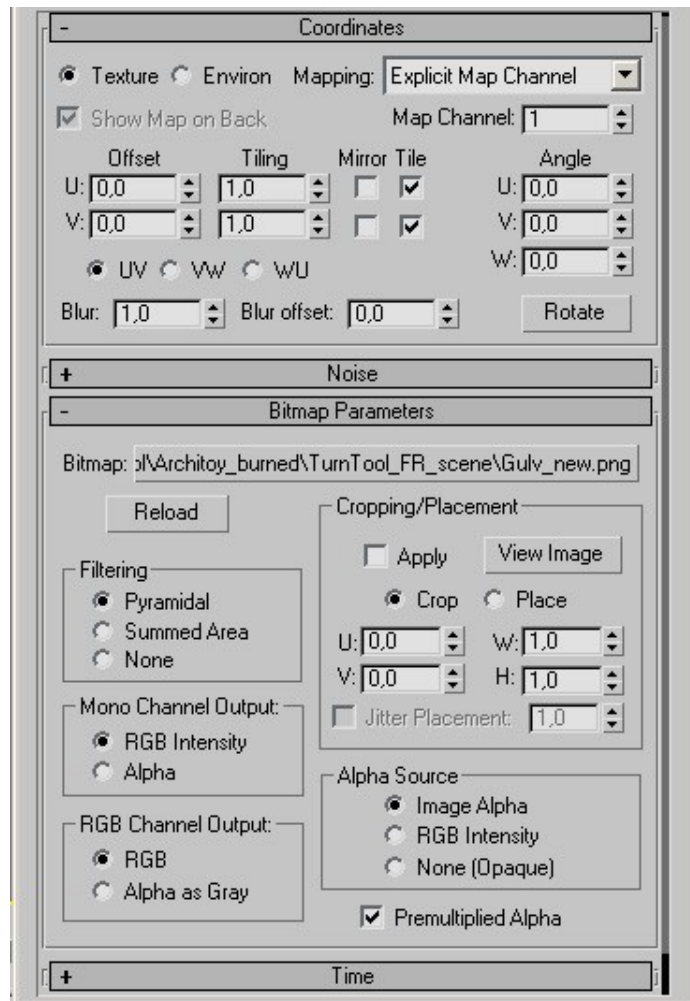
Texture maps are associated with Materials and bring definition and detail to objects by mapping either photos or "handmade" image files to 3D surfaces.

The UV Coordinates are indices into the texture. TurnTool supports a range of parameters to control and modify the UV. TurnTool converts the U and V offset, the U and V tiling and the U, V, W angles. These values are converted into UVW transformation matrix; so animating these values have little impact on real time performance. TurnTool also supports the U&V tiling flags & the Map Channel parameter. In the "Filtering" menu, there are three options: "Pyramidal", "Summed" and "None". Which are translated into "Trilinear", "Bilinear" and "None". Most image formats are supported by 3D Studio Max; BMP, PNG, TGA, AVI, IFL, GIF, JPEG, etc. though it is not recommended to use lossy compressed images (such as jpeg) for texture mapping. TurnTool uses its own method of compression, and better results will be obtained if you leave this procedure to TurnTool.

Most 3D hardware is incapable of handling textures with side lengths that are not a power of 2 (2^n , where n is a positive whole number). Resizing this in advance in your favorite paint program will usually result in better results and performance.

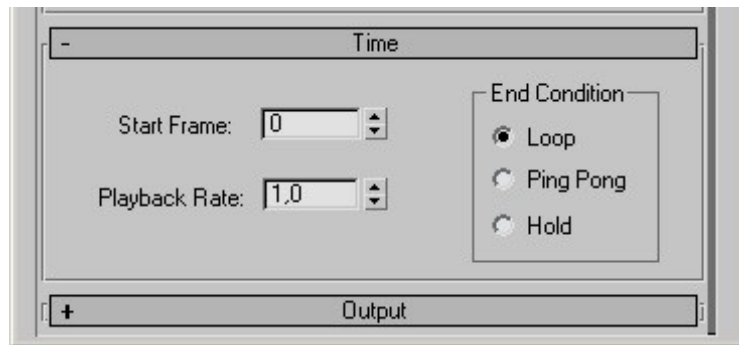
TurnTool supports multi sub materials. A maximum of 64 sub materials can be defined. TurnTool read information from Diffuse, Opacity, Self-Illumination and Reflection map-channels in Max. In addition, the opacity map if used, must reside in the alpha channel of the bitmap. It is not possible to use RGB pixels as Alpha pixels in the opacity channel. The Self-Illumination map channel is used as a light-map. The Self-Illumination should only be used as a second layer of texture where the diffuse map is the first layer.

Keep in mind that textures are a big part of the scene size-wise. Using smaller textures can save a lot of download time and make the scene perform better.



4.8. Animated Textures

If a Texture Map uses an animated format such as AVI or ILF, it is possible to animate the texture map over time. To control the texture map animation TurnTool supports the Ping Pong, Looped, Hold, Start Frame and Playback Rate. These parameters work just as they do inside Max.



5. TurnTool Properties

TurnTool exposes a number of properties related to different export, rendering and controlling aspects of the scene. These properties are manipulated through a set of panels that are located in the utility page of the command panel.

You open the TurnTool panel by clicking the button labeled TurnToolBox or by selecting it through the list that appears when clicking the "more" button. If there is no TurnToolBox button in your panel, add the button to the current button set by clicking the "configure button sets" button and drag the TurnToolBox label onto the set. By making this button, you will always have easy access to the TurnToolBox.

Which objects are affected?

The current selection of objects in max determines which panels are visible, and properties will affect applicable objects of the current selection. E.g. the camera panel will be visible if at least one object of the current selection is a camera object. Changes to camera properties only affect cameras in the current selection.

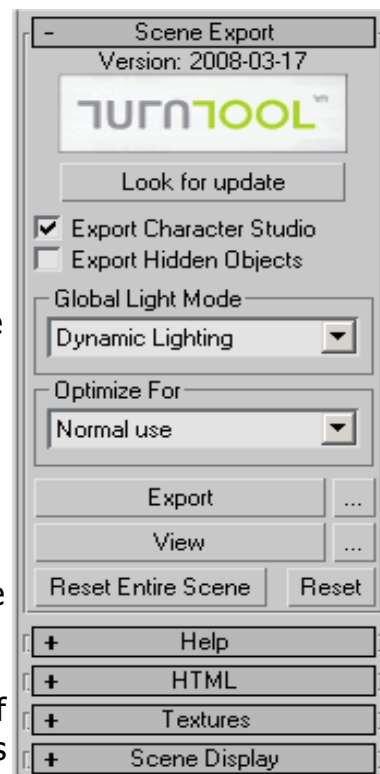
5.1. Scene Export Panel

The scene export panel contains export parameters and buttons to actually export and view the result. This panel is always available.

Export Character Studio: Determines whether to use the Physique plugin for Character Studio. When using the physique plugin, TurnTool will export your character once and deform the character in real time using the node animation. Disabling this feature while using animated characters will produce very large files. This can be used for trouble-shooting scenes that do not behave right.

Export Hidden Objects: When this option is selected, hidden objects are exported as if they were not hidden.

Global Light Mode: Sets the global default value of the property "Light Mode" found in the Miscellaneous Panel.



Optimize For: This combo box allows you to select how you want TurnTool to optimize the scene when exporting. Possible selections are:

- *Normal Use:* Gives a good all-round optimization of the exported file.
- *Fast Export Time:* Gives a faster export times at the cost of larger file sizes. This is useful when viewing work in progress, but is not recommended for final exports.
- *Extra Small File Size:* Like "Normal Use", but optimizes the file size even more and gives better performance. Exports take longer time though.

Export: This buttons exports a TNT file. The default filename is identical to the name of the max file (except for the extension), but you can change this by clicking the "..." button right next to it.

View: With the default settings, this button launches the html document with the same name as the TNT file exported (except for the extension). You can change this to any file you want, by clicking the "..." button next to it.

Reset Entire Scene: This button will reset all TurnTool settings in the entire scene to their default values. Use with caution.

Reset: This button will reset the values of this panel to their default values.

5.2.HTML Panel

The HTML Panel is used for configuring the characteristics of the HTML file generated along with the TNT file. This panel is always available.

Generate HTML: If this is not checked, no HTML file will be generated

Transparent: If checked, the TurnTool control will be transparent so that any web page content underneath it, will be visible through it.

Width: This sets the width in pixels of the TurnTool control.

Height: This sets the height in pixels of the TurnTool control.

Color: If the control is not transparent, this is used for setting the color of the control before the scene is loaded.

Template: This sets the template that is used for generating the html. It is possible to choose from the following:

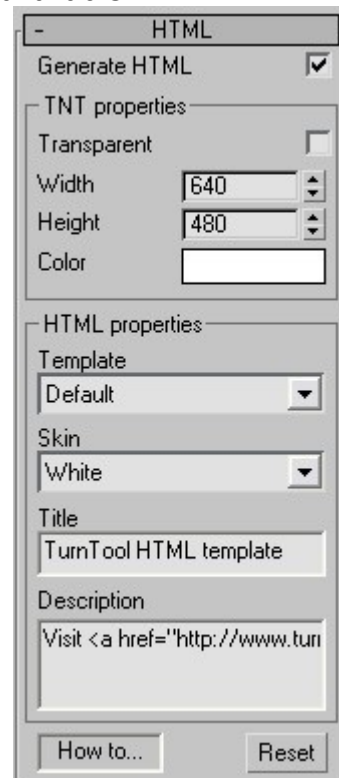
- CollectorGame: Simple Game to collect objects.
- Default: Standard layout.
- Move: Where it is possible to move around the objects.
- PhysicsAdjuster: Where it's possible to adjust the scene physics.
- Simple: Simple, clean layout.
- SimpleArchitect: Where it is possible to change between cameras.

Skin: This sets the color theme for the html.

Title: This sets the title of the html document.

Description: This sets the description/title of the TNT scene.

How to...: This will show the online templates help page.



5.3. Texture Panel

The texture panel is used for configuring TurnTool related properties of textures. The textures appearing in the list are the textures of the selected objects. The Global Default entry is special, and represents the settings for all textures with no settings of their own. This panel is always available.

Use Global Default: When this is checked, the selected textures use the settings set for the "Global Default" entry in the list.

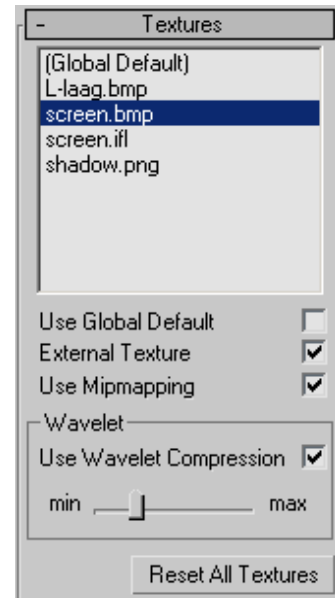
External Texture: When this is checked, the selected textures are not included in the TNT file. This can be useful for textures meant to be loaded at runtime by the script.

Use Mipmapping: When this is checked, the selected textures will use an advanced rendering technique called mipmapping. Briefly explained, this means that textures use multiple levels of detail. This can improve both performance and rendering quality, the expense being an increase in the usage of video memory (33% increase). Best used with high detail textures that are seen from both near and far distances.

Use Wavelet Compression: When this is checked, the selected textures are compressed using a wavelet algorithm (very small size, lower quality). Use the slider to set the level of compression. The higher the compression, the smaller the file size and the lower the quality and vice versa.

NOTE: The level of compression does not change the amount of video memory consumed by a texture. The dimensions of the image alone determine this.

Reset All Textures: This button will clear all texture properties in the scene to their default values.

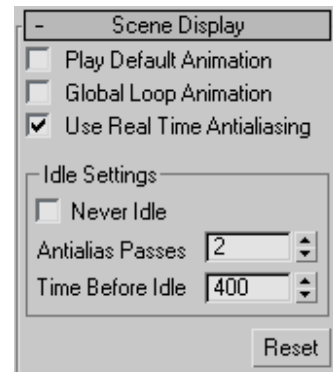


5.4. Scene Display Panel

The scene display panel contains control buttons that affect the display of the scene. This panel is always available.

Play Default Animation: If checked, TurnTool will automatically play animations in the scene.

Global Loop Animation: Sets the global default value of the property "Loop" found in the Miscellaneous Panel.



Use Real Time Antialiasing: If checked, the scene will be rendered using the real time antialiasing capabilities of the video hardware. This is not supported by all graphics cards.

Never Idle: If checked, the scene will be rendered with the highest possible frame count at all times. Never entering idle mode where antialiasing takes place.

Antialias Passes: This spinner sets the number of Antialias passes to perform. The higher this is, the better the quality of the antialiased result will be.

Time Before Idle: This is the number of milliseconds to pass since the last activity in the scene, before antialiasing begins and idle mode is entered.

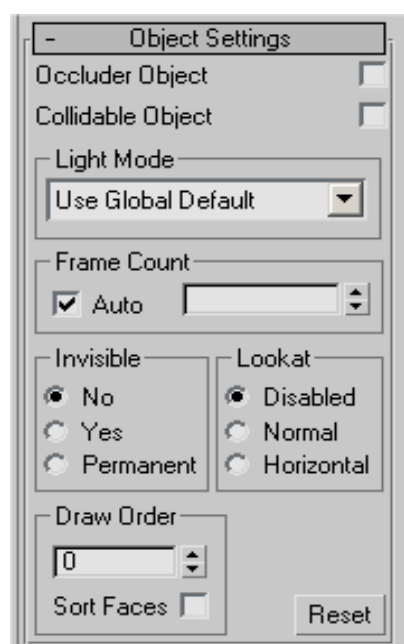
Reset: This button will reset the values of this panel to their default values.

5.5. Object Settings Panel

The control buttons of this panel are used for setting various general properties for the current selection of objects. This panel is available when at least one object is selected.

Occluder Object: If checked, the selected objects will be occluded. Objects of this type will cover objects with mouse interactivity from the mouse cursor.

Collidable Object: If checked, the selected objects are objects, with which physics objects should interact. The ground and walls are good examples of objects, which should have this



property checked. This setting will not function properly with objects that have multi sub materials.

Light Mode: Determines how lighting calculations for the object should be performed. Possible selections are:

- *Use Global Default:* Uses the settings of "Global Light Mode". This is the default value.
- *Dynamic Lighting:* Lighting is calculated dynamically when viewing the scene. This allows lights and objects to move relative to each other.
- *Static Lighting:* Lighting is calculated once when the scene loads. This has the benefit of much better performance. Drawbacks are slightly longer loading time and lighting may look wrong if an object is moved. It is ideal for large static scenes. No vertex colors are exported because the calculated light would replace them.
- *Vertex Colors:* TurnTool performs no lighting calculations but exports a color for each vertex instead. This can be used for pre-generating more advanced static lighting using built-in functions of max or third party plugins (vertex color "baking").
- *Baked Textures (No Lighting):* TurnTool performs no lighting calculations. This is useful when using textures "baked" with pre-calculated lighting.

Frame Count: This number specifies how many frames of animation the object has. If set to a lower number than the actual number of frames, only the specified number of frames will be exported.

TIP: Sometimes, Max reports an incorrect number of animated frames for an object, which can cause long export times. This can be prevented by setting frame count to the known number of frames or to 1, if the object isn't animated. This causes TurnTool to ignore remaining frames.

TIP: This can also be set to 0 if you want to exclude an object from export, but don't want to remove it from the max file.

Invisible: If this is set to permanent, the object cannot be made visible at runtime (through scripting). This is desirable for objects which were never meant to be rendered, such as physics objects, interaction objects, invisible collision geometry and so forth. If set to Yes or No, the property can be changed at runtime through scripting (see the SetVisible function).

Lookat: When set to normal, this causes the object to be rendered as always facing the viewer, very useful for billboard vegetation and tool tips. The "Horizontal" value makes this work in the horizontal direction only.

Draw Order: The number indicates in which order objects should be rendered. A lower numbered object is rendered before a higher numbered one.

Sort Faces: When rendering, objects with transparency are sorted by their pivot points and rendered back to front. For objects with a lot of overlapping transparent faces, this may not look right. This can be corrected by checking off this property. This means the object's faces are also sorted by depth and rendered back to front.

Reset: This button will reset the values of this panel to their default values.

5.6. Camera Panel

The properties in this panel are used for controlling the behavior of the selected cameras. This panel is available when at least one camera is selected. The properties in this panel affect only cameras.

Camera Movable: When set to Auto, animated cameras will not be movable by user input while non-animated cameras will. Values of Yes and No, forces one of these conditions regardless of animation.

Move Speed: Number describing the move speed of free cameras and the panning speed of target cameras. Negative values reverse the direction of movement as well.

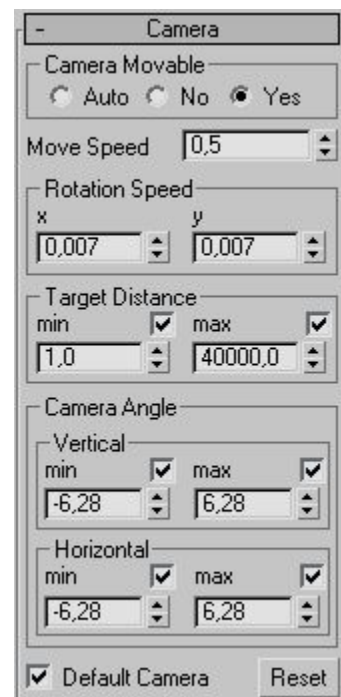
Rotation Speed: Number describing the speed with which the camera rotates when moving the mouse pointer. Negative values reverse the direction of movement as well.

Target Distance: These values can be used for restricting the distance from the camera to its target point, by setting a minimum and/or maximum distance.

Camera Angle: These values can be used for restricting the angle of rotation a camera can attain in the four directions respectively, measured in radians.

Default Camera: When checked, the selected camera becomes the default camera of the scene. The scene is initially viewed from this camera. Only one camera in the scene can have this property checked.

Reset: This button will reset the values of this panel to their default values.



5.7. Physics Panel

The properties of this panel determine how physics objects interact with their surroundings. As only sphere primitive objects can be physics objects. This panel will only be visible when at least one sphere object is selected and its properties affect only spheres. Experimentation is encouraged with these properties.

Physics Object: If this is checked, the selected spheres will be physics objects.

Gravity Force: Describes how much gravity affects the object. The higher this number is, the higher the gravity.

Mass: Describes how heavy the object is (how hard to move). The higher this number is, the harder the object is to move.

Friction: Describes the object's ability to slide on other surfaces. The higher this value is, the higher the friction.

Angle Friction: Describes how sloped surfaces and walls affect the friction. Setting this value to 0.0 will give you the same friction on all surfaces regardless of the angle to the gravity vector. A value that is higher than 0.0 will make it more difficult to move in any direction on this surface.

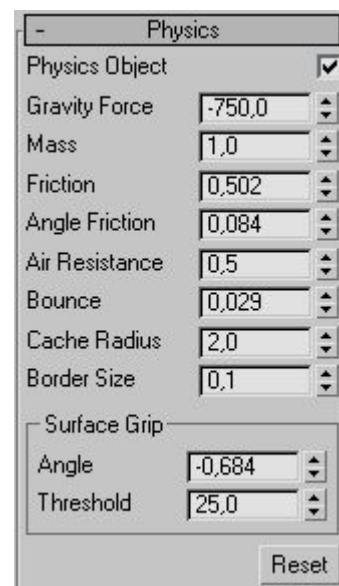
Air Resistance: Describes how much the air will slow the object. The lower this number, the denser the air.

Bounce: Describes how much the object will bounce when hitting a collidable object.

Cache Radius: This is the caching radius for collision geometry. Units are the radius of the physics sphere, considering border size.

Border Size: Describes how near a physics object have to be to collision geometry before "colliding". Setting this too low may cause problems. Too high values look wrong.

Surface Grip Angle: Describes how steep a surface the object can rest on without sliding.



Surface Grip Threshold: Minimum speed before the object is considered stationary and stops moving. A 'Surface Grip Threshold' value at 10% of the 'Move Speed' value will be suitable in most cases.

Reset: This button will reset the values of this panel to their default values.

5.8. Controller Panel

Physics objects are also controller objects and can be controlled by the user. The properties in this panel are used for defining how control of the physics object should work. As with the physics settings, experimentation is encouraged. This panel is only available when at least one physics object is selected and its properties affect only physics objects.

Move Free: Used for switching on vertical turning (looking up/down).

Movement Speed: Specifies how fast the object can move.

Movement Enable Angle: Describes how steep a surface the object can ascend.

Jump Force: Specifies how high the object can jump.

Jump Scalar: Describes how much the movement speed affects the jump of an object.

Jump Delay: This is the minimum time interval between two jumps.

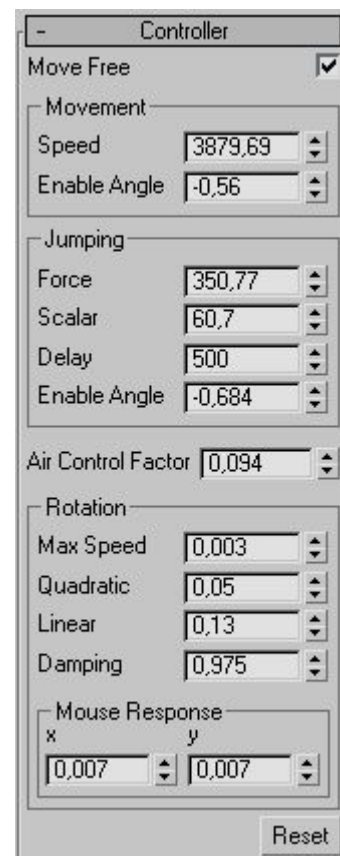
Jump Enable Angle: Describes from how steep a surface the object can jump.

Air Control Factor: describes how much control the object has while in the air. A value of 1 gives the same control as on the ground (it can be higher).

Rotation Max Speed: Describes the maximum rotation speed an object can attain.

Rotation Quadratic & Rotation Linear: These are both numbers and part of the equation, which describes rotation acceleration and deceleration.

Rotation Damping: This describes how fast rotation ceases when input stops.



Mouse Response: Describes how fast the object rotates in response to mouse input (mouse sensitivity).

Reset: This button will reset the values of this panel to their default values.

5.9.Events Panel

The event panel is available when at least one object is selected. Some objects can be configured to trigger events when certain situations occur. These events can be handled by the container or script, and appropriate actions can be taken. In other words when a certain situation occur TurnTool can be configured e.g. to call a



JavaScript function in your HTML file. With this function you can do what ever you want to do when this event occur. These events are what make the 3D scene truly interactive. A description of how to use these events can be found in the TurnToolBox Scripting Manual, chapter 2.2: "Scripting the TurnTool Control - TNT Event".

Mouse Click: If checked, the selected objects will generate "OnClick" events. The cursor will change when pointed at these objects and an "OnClick" event will be generated if the user clicks it. This setting applies to any polygonal object in max, however sphere primitives give a better performance. The "Occluder Object" property is automatic for objects with this property.

Mouse Enter & Exit: If checked, the selected objects will generate "OnMouseEnter" events when the mouse cursor moves over the objects, and "OnMouseExit" events when the cursor moves away again. This setting applies to any polygonal object in max, however sphere primitives give a better performance. The "Occluder Object" property is automatic for objects with this property.

Zone Enter & Exit: If checked, the selected objects will generate "OnZoneEnter" events when the center of a physics object enters within their radius, and "OnZoneExit" events when the physics object completely leaves again. This setting applies to sphere primitive objects only.

6. Getting Physical

In some scenes, it may be desirable to use the physics features of TurnTool to make the experience of viewing the scene more real. Exploring a scene in first person using the mouse and/or keyboard to move around will excite many viewers. In addition to the descriptions below, it is recommended to check out some of the example max files from the TurnTool website. It is sometimes easier to understand something if an example is available. Here are direct links to a few of them:

<http://www.turntool.com/examples/Colliers.zip> (Beginner)

<http://www.turntool.com/examples/Skovbo.zip> (Intermediate)

http://www.turntool.com/examples/Az_huse.zip (Expert)

Common for all these examples are that they use the Physics in TurnTool. What the physics in TurnTool can do is to handle a sphere primitive with any radius and collide it against any object that consists of polygons in a physical correct manner. In doing so the Physics calculations will take parameters like friction, gravity, mass and air resistance into account.

6.1. The Physics Object

Only sphere primitives can be physics objects. For a sphere primitive to be regarded as a physics object it must have the physics object property checked. Once this property is checked the physics object will be affected by gravity and fall downward. Therefore, the next thing we need is something on which the physics object can land. For this reason we have collision objects. A collision object can be any polygonal object in max and they become collision objects once they have the collidable object property checked in the TurnToolBox interface.

Once the physics object has landed on a collidable object, you can move it around with the arrow keys. It can be interesting enough to control a sphere around a scene while looking at it. However, often you will want to use the physics in TurnTool to walk around in first person, like in such games as Quake and Counterstrike. So here is a small tutorial for creating that sort of walk controller with TurnTool in 3DS Studio Max.

- 1) Create a plane in the top view.
- 2) Check the "Collidable Object" property in the Miscellaneous pane of the TurnToolBox.
- 3) Create a sphere in the top view.
- 4) Check the "Physics Object" property in the Physics pane of the TurnToolBox.
- 5) Move the sphere over the plane and make sure they do not intersect.

- 6) Create a free camera in the front view.
- 7) Align the free camera to the sphere on the X and Z direction.
- 8) Move the free camera to the height of your person in the Y direction.
- 9) Link the free camera to the sphere.
- 10) Add an omni light somewhere in the scene.
- 11) Press 'Export' and then 'View' to see the scene in action.

Once exported, you can walk around using the arrow keys. While the camera is linked to the physics object, it will follow every movement of physics object. Often it will be appropriate to hide the physics object and attach some other visible object to it. If you have followed the above procedure, your camera will initially be looking in the Y-direction. If the camera must face in some other direction to start with, you should rotate the physics object and not the camera. If instead you rotate the camera, you will still be moving in the Y-direction and you would be looking in another direction than you are moving and this is probably not what you wanted.

This way of using physics to make a walk controller works all right, intermediate users can stop here.

You might notice that the center of rotation when looking up and down is located at the position of the sphere. When the virtual person, we are trying to simulate is looking 90 degrees down, he is in fact lying flat on his face having a very close look at the floor. To avoid this effect we need a little more work on our walk controller.

- 12) Select the physics object.
- 13) Set the Y-value of the "Mouse Response" property to "0.0" in the Physics pane.
- 14) Select the camera, which is linked to the physics object.
- 15) Set the "Camera Movable" property in the Camera pane to "Yes".
- 16) Set the "Move Speed" property in the Camera pane to "0.0".
- 17) Set the X-value of the "Rotation Speed" property in the Camera pane to "0.0".

Now you can export and see that the physics object is unable to rotate up and down. Instead, we have configured the camera to be movable, but only in the up and down direction. This is more realistic as the virtual person, mentioned before, now is moving his head up and down instead of his entire body.

6.2. Collision

To make the physics object interact with the scene, all objects which the physics object should not just pass through must have the "Collidable Object" property checked. How the collision objects and the physics object interact is solely dependent on the properties of the physics object.

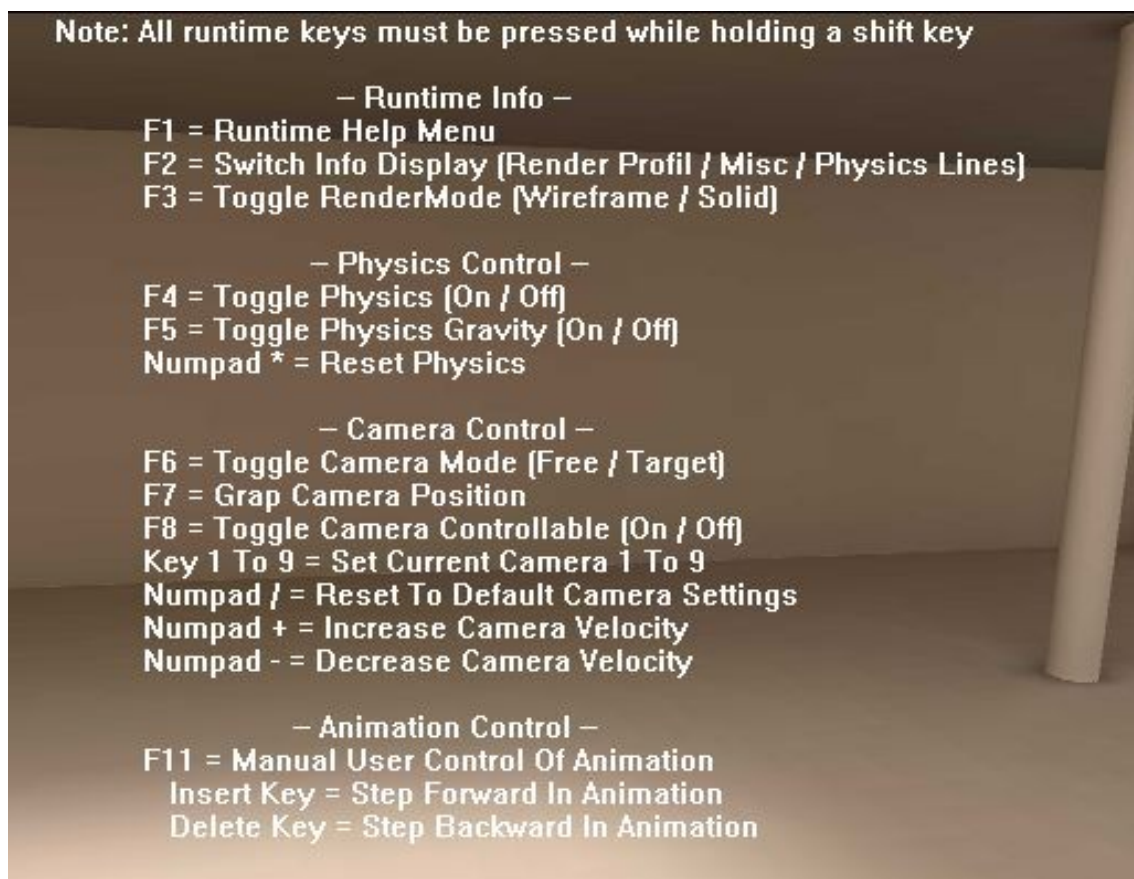
Performance note: A lot of performance can be gained by optimizing the collision objects. Often simple geometric boxes or planes can handle collision for large parts of a scene; this saves many calculations. Complex shapes can be handled easily by surrounding them with a collidable and permanently invisible box.

7. Troubleshooting

When working with complex constructions, scripting and advanced interactivity, it can sometimes be hard to find out why the scene you have put so much work into, doesn't work.

To help you "debug" your scene, you can press "SHIFT + F1" when viewing it. This brings up an overview of hotkeys available for debugging and profiling. Note: Make sure the TurnTool control has the input focus when using the hotkeys.

The text screens are only available when using the DirectX renderer (this is the default). If for some reason you are using the OpenGL renderer, you will not be able to see the text, the other functions are still available though.



Problem: The Scene takes a very long time to export.

Max sometimes mistakenly reports an object to have animation; this causes TurnTool to export the entire object and perform optimizations for every frame

in the max time line. In some cases, this may be very time consuming, especially when the object in question is a complicated mesh. There are a number of different solutions to this problem.

- To test if this really is the problem, you can set the "Optimize For" parameter in the export panel of TurnToolBox to "Fast export time". This disables the time consuming file size optimizations. If this gives remarkably faster export times, it is a hint of the above problem.
- If the scene contains no animation at all, the best solution is to set the number of frames to 1 in the time configuration dialog.
- If the scene contains other animated objects, you can set the number of frames to export for each individual object in the "Miscellaneous" panel of the TurnToolBox. Set the number of frames to 1 for the object in question.