Animator Shapes and Groups

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VehicleSim products include VS Visualizer, a tool for viewing animations from a virtual video camera that operates in a simulated 3D world. The 3D world is defined by descriptions of 3D shapes and objects, along with descriptions of motions of the shapes and objects. VS Visualizer supports shapes from three sources:

1. OSG file format (files named `*.osg`). This format is defined by the OpenSceneGraph Project. This format supports advanced rendering features such as multi-texturing and normal maps and custom fragment shaders. For detailed information on this format, visit the OpenSceneGraph Project web site at http://www.openscenegraph.org.
2. OBJ file format (`*.obj`). This format is the standard Wavefront file format. OBJ files can be generated with many 3D modeling programs. This format supports defining object color and applying texture maps to objects.
3. STL file format (`*.stl`). This is the standard StereoLithography format. STL files can also be generated with many 3D modeling programs.

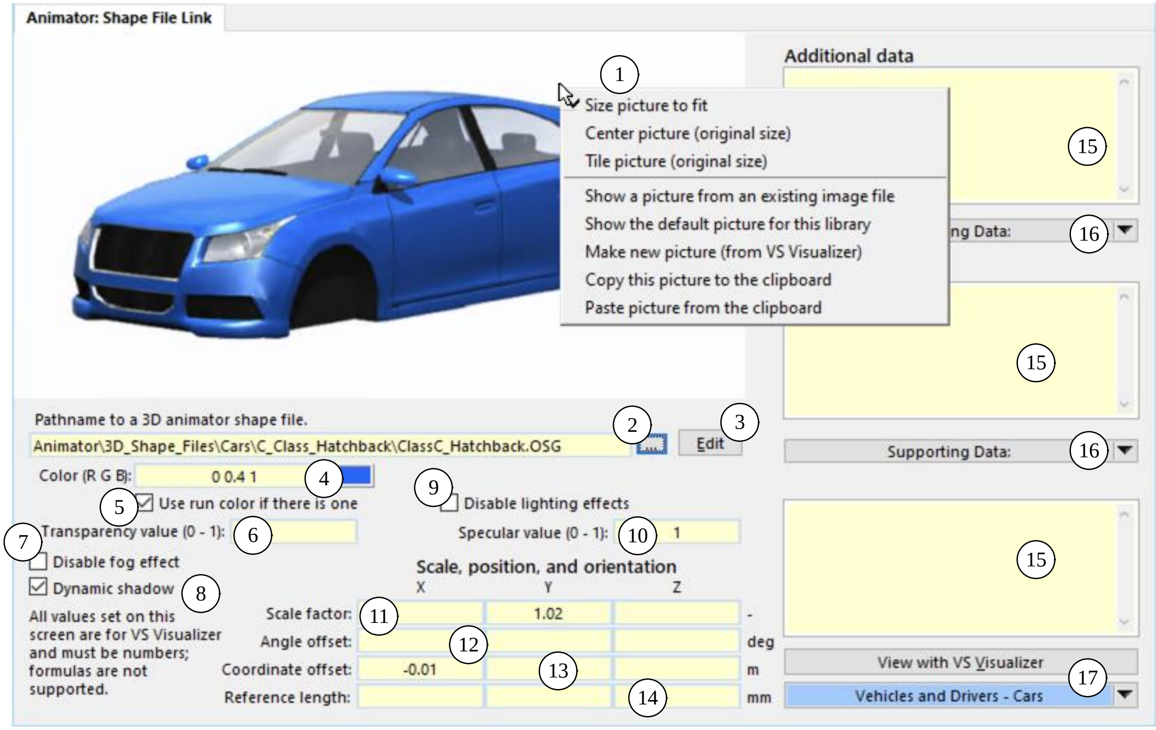
Of the three formats, the OSG is the most modern and provides the best visualization. It also supports data compressions, such that OSG files can be much smaller than equivalent OBJ files.

The screen **Animator: Shape File Link** provides access to OSG, OBJ, and STL files. The screen **Animator: Shape File Assembly** assembles objects and provides options for setting properties for the entire assembly such as scaling and lighting properties. Two other screens, **Animator: Group** and **Animator: Group (More)**, can be used to assemble arbitrary groups with custom reference frames to go along with assemblies of objects.

Alert Most screens in the VS Browser are used to provide data to VS Math Models that performs the vehicle simulation. Parameters for a VS Math Model can be specified with numbers or formulas. However, the **Animator Shape** screens exist to provide data to VS Visualizer. Formulas are not supported; all values must be numerical or have specific text values such as `on` and `off`. Numerical values for angles must be in degrees, and dimensions and coordinates must all have the same units (typically meters).

Animator: Shape File Link Screen

Each dataset in this library links to a single OSG, OBJ, or STL shape file. The screen also has controls to customize properties of the shape such as color and transparency (Figure 1).


Animator: Shape File Link
Additional data
Size picture to fit
Center picture (original size)
Tile picture (original size)
Show a picture from an existing image file
Show the default picture for this library
Make new picture (from VS Visualizer)
Copy this picture to the clipboard
Paste picture from the clipboard
ng Data:
Supporting Data:
Edit
View with VS Visualizer
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
15
15
16
16
17

Pathname to a 3D animator shape file.
Animator\3D_Shape_Files\Cars\C_Class_Hatchback\ClassC_Hatchback.OSG

Color (R G B): 0 0.4 1

☑ Use run color if there is one

☐ Disable lighting effects

Transparency value (0 - 1):

Specular value (0 - 1): 1

☐ Disable fog effect

☑ Dynamic shadow

All values set on this screen are for VS Visualizer and must be numbers; formulas are not supported.

Scale, position, and orientation

	X	Y	Z	
Scale factor:		1.02		-
Angle offset:				deg
Coordinate offset:	-0.01			m
Reference length:				mm

Vehicles and Drivers - Cars

Figure 1. Animator: Shape File Link screen.

① **2D image**. This image provides a visual indicator of how the object will appear in VS Visualizer.

The image can be created or copied by clicking on it to obtain the pop-up menu shown in the figure. It is typically created by choosing the option **Make new picture (from VS Visualizer)**. This launches VS Visualizer with the proper window size. You can adjust the view (zoom, rotated, pan, etc.). When the view looks OK, copy it to the Windows clipboard (e.g., type Ctrl+C). Then click on the image ① again and choose **Paste picture from the clipboard**. For more information about generating 2D images, see the document *VS Browser Reference Manual*.

② Pathname for a shape file. You can type the name in directly or use the adjacent browser button to select the file. Depending on the type of file, the keyword associated with the pathname is either `ADD_STL` or `ADD_OBJ` (used for both OSG and OBJ file types).

③ **Edit** button. Click this button to load the OSG or OBJ or STL file into a text editor where it may be viewed fully and possibly modified.

④ Color of object (keyword = `SET_COLOR`). The color can be specified with RGB numbers separated by space or with the adjacent color control that displays the current color. If the shape file is an OBJ or OSG with multiple objects, then this color applies only to the last object defined in the file.

When textures are applied to a surface defined in an OBJ or OSG file, the information from the 2D image is combined with the lighting effects defined in this screen. If the picture has only gray scale values, then this setting can define its color. This means a single gray-scale texture can be used to add detail to surfaces of many color (grass, dirt, pavement, etc.). However, if the picture has color information and this field specifies color information, then the effect is as if the picture were painted on the surface and illuminated using colored lighting. The effect is usually that the surface appears darker than in the original image. For the colors in the original 2D image to remain relatively intact, any lighting specified here for a textured surface should be white or gray.

⑤ **Use run color if there is one** checkbox (keyword = `USE_RUN_COLOR`). Several screens in the browser have options to specify a “run color” that can override the color of an object specified here ④. For example, this option is provided on the **Run Control** screen and the **Animator: Wheel Arrows and Other Indicators**. If a run color is specified and then this dataset is sent to VS Visualizer, the run color will override the color specified here if this box is checked. If this box is not checked, then the run color is ignored.

⑥ Transparency value (keyword = `SET_TRANSPARENCY`). Use this control to specify that an object should be translucent. The value should between 0 (invisible) and 1 (fully opaque). If not specified, the default value of 1.0 is used.

⑦ **Disable fog effect** checkbox (keyword = `SET_FOGGING ON / OFF`). When not checked, the colors are subdued when the object is far away, accounting for atmospheric “fogging.” When checked, this effect is turned off and the color and/or texture do not change due to lighting or distance. This box is normally not checked, except for special shapes such as images of the sky or objects that are intended to stand out for special effects (e.g., tire force arrows).

⑧ **Dynamic Shadow** checkbox. When checked, a realistic shadow is cast onto the area surrounding the object based on the lighting in the scene, using the VS Visualizer lighting rules.

⑨ **Disable Lighting Effect** checkbox (keyword = `SET_LIGHTING ON / OFF`). When not checked, the object is shaded using the normal VS Visualizer lighting rules. When checked, the lighting is turned off and the color and/or texture do not change with respect to orientation towards the light or the camera point of view. This box is normally not checked, except for special shapes such as photographs of the sky, heads-up displays (HUD), and force vector arrows.

⑩ Specular (mirror-like reflectivity) value of object (0-1). Shiny surfaces reflect light in a specific direction, while dull surfaces reflect the light equally in all directions. The specular value for a surface determines how directionally light is reflected, relative to a viewing angle. A value of 1 means the surface is very shiny, like a mirror. A value of 0 means the surface is dull.

This information may or may not be needed, depending on the details of the linked shape file. If the file is OBJ or OSG, the object might have internal specular information. With newer OSG files that ship with CarSim, TruckSim, and BikeSim, the shapes nearly always have secularity set internally. In these cases, the value from this field indicates how much of the available range should be used: 1 means use all, 0 means use none. If the field is blank, the result is the same as if a value of 1 is specified.

If the file uses the old STL format, there is no internal specular information, and this field provides the only specular information.

Note VS Visualizer looks for three values of specular, corresponding to red, green, and blue (RGB). The single value from this field is written three times in the parsfile with the keyword `SET_SPECULAR`.

⑪ Scale factors (keywords = `SET_SCALE_X`, `SET_SCALE_Y`, `SET_SCALE_Z`). The X, Y, and Z coordinates in the shape file are not necessarily in meters. Use these three fields to convert from the scale of the shape file to meters. These scale factors are applied before any rotations ⑫ or coordinate offsets ⑬.

⑫ Angle offsets (keywords = `SET_ANGLE_X`, `SET_ANGLE_Y`, `SET_ANGLE_Z`). The shape defined in the shape file might not be oriented in reference frames associated with the objects being viewed. Use these three rotation angles to adjust the orientation of the shape. These rotations are applied after the scale factors are applied ⑪, but before coordinate offsets are applied ⑬.

⑬ Coordinate offsets (keywords = `SET_OFFSET_X`, `SET_OFFSET_Y`, `SET_OFFSET_Z`). The X, Y, and Z coordinates in the shape file are not necessarily based on the same origin as used in the coordinate system associated with the reference frame used by VS Visualizer for this dataset. Use these three fields to set offsets that are added to all coordinates in the shape file. The offsets are applied after scaling ⑪ and rotations ⑫ are applied.

⑭ Reference dimensions used to support resizable shapes (keywords = `X_REF_LENGTH`, `Y_REF_LENGTH`, `Z_REF_LENGTH`).

Coordinates in shapes associated with a reference frame can be re-scaled in the X, Y, and Z directions by these ratios:

- X coordinates are multiplied by the ratio: `x_length/x_ref_length`
- Y coordinates are multiplied by the ratio: `y_length/y_ref_length`
- Z coordinates are multiplied by the ratio: `z_length/z_ref_length`

The scaling is applied to everything in a reference frame, so values for the last shape dataset read for a given reference frame will override those associated with other shape files.

Note The label indicates the units for the reference length are mm. This is true for many vehicle shapes and components, but not always. For example, when setting up arrows to show force, the reference length would typically be in Newtons.

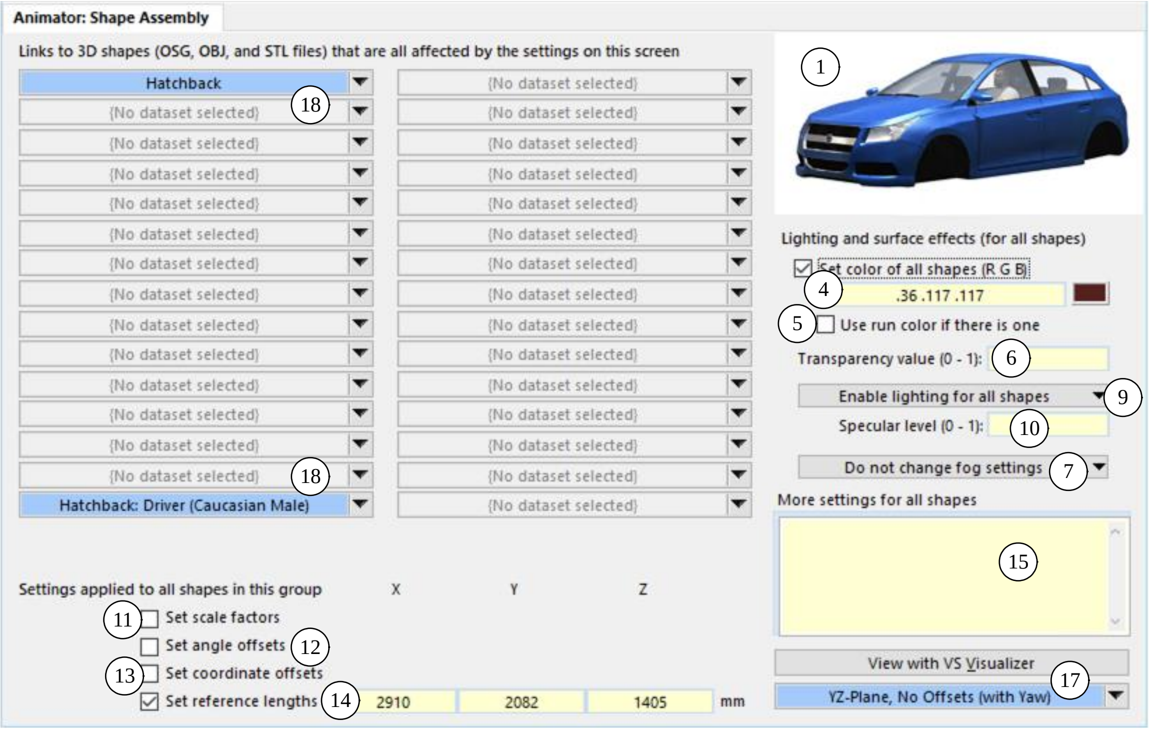
⑮ Miscellaneous fields. Use these to associate additional information with the shape.

⑯ Miscellaneous links. Use these to associate additional information with the shape.

⑰ **View** button and camera data link. Besides clicking on the 2D image and using the pop-up menu, you can also preview the animated 3D object using this button using VS Visualizer with the specified custom camera setting ①.

Animator: Shape Assembly Screen

Use this screen to assemble a group of shapes, and to set properties of every shape in the group such as color and transparency. Instead of linking to a single file, this screen provides links to multiple **Animator: Shape File Link** datasets ⑱ (Figure 2).



Animator: Shape Assembly

Links to 3D shapes (OSG, OBJ, and STL files) that are all affected by the settings on this screen

Hatchback	{No dataset selected}
{No dataset selected}	{No dataset selected}
{No dataset selected}	{No dataset selected}
{No dataset selected}	{No dataset selected}
{No dataset selected}	{No dataset selected}
{No dataset selected}	{No dataset selected}
{No dataset selected}	{No dataset selected}
{No dataset selected}	{No dataset selected}
{No dataset selected}	{No dataset selected}
{No dataset selected}	{No dataset selected}
{No dataset selected}	{No dataset selected}
{No dataset selected}	{No dataset selected}
{No dataset selected}	{No dataset selected}
{No dataset selected}	{No dataset selected}
Hatchback: Driver (Caucasian Male)	{No dataset selected}

Settings applied to all shapes in this group

	X	Y	Z	
□ Set scale factors				
□ Set angle offsets				
□ Set coordinate offsets				
☑ Set reference lengths	2910	2082	1405	mm

Lighting and surface effects (for all shapes)

☑ Set color of all shapes (R G B)

.36 .117 .117

□ Use run color if there is one

Transparency value (0 - 1):

Enable lighting for all shapes

Specular level (0 - 1):

Do not change fog settings

More settings for all shapes

View with VS Visualizer

YZ-Plane, No Offsets (with Yaw)

Figure 2. Animator: Shape Assembly screen.

Nearly all controls that exist on the **Animator**: **Shape File Link** screen (Figure 1) also exist here. However, on this screen, controls that were checkboxes (to enable or disable a feature for a single shape) might instead be drop-down list controls, with options to enable the feature on all shapes in the assembly, disable the feature on all shapes in the assembly, or do not modify the feature.

Some of the settings and controls on this screen have the same function as on the single shape screen, such as the 2D image ①, VS Visualizer preview button and camera data link ⑰, and the yellow fields (⑥, ⑩, etc.).

This section describes only user controls that are extended or modified relative to the descriptions in the previous section for **Animator: Shape File Link** screen.

④ **Set color of all shapes** checkbox. If this box is not checked, then the colors specified in the individual file links are used. If this is checked, then a data field and color selector are displayed. A checkbox **Use run color if there is one** is also displayed ⑤.

⑦ **Drop-down list for disabling fog**. This list has three options (Figure 3).

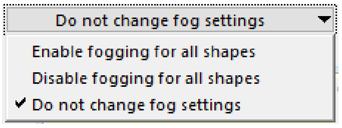

Do not change fog settings
Enable fogging for all shapes
Disable fogging for all shapes
✓ Do not change fog settings

Figure 3. Drop-down list of options regarding fog settings.

⑨ **Drop-down list for controlling lighting properties.** This list has three options (Figure 4).

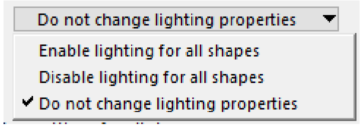

Do not change lighting properties
Enable lighting for all shapes
Disable lighting for all shapes
✓ Do not change lighting properties

Figure 4. Drop-down list of options regarding lighting properties.

Unless the option is to disable lighting for all shapes, two data fields are shown for specifying the specular level ⑩.

⑪ - ⑭ Data fields for specifying scale factors, angle offsets, coordinate offsets, and reference lengths that exist on **Animator**: **Shape File Link** screen are also available here. However, each set of three data fields has an associated checkbox. If the box is checked, then any specified values are applied to every shape that is included on the screen. If the box is not checked, the fields are not displayed.

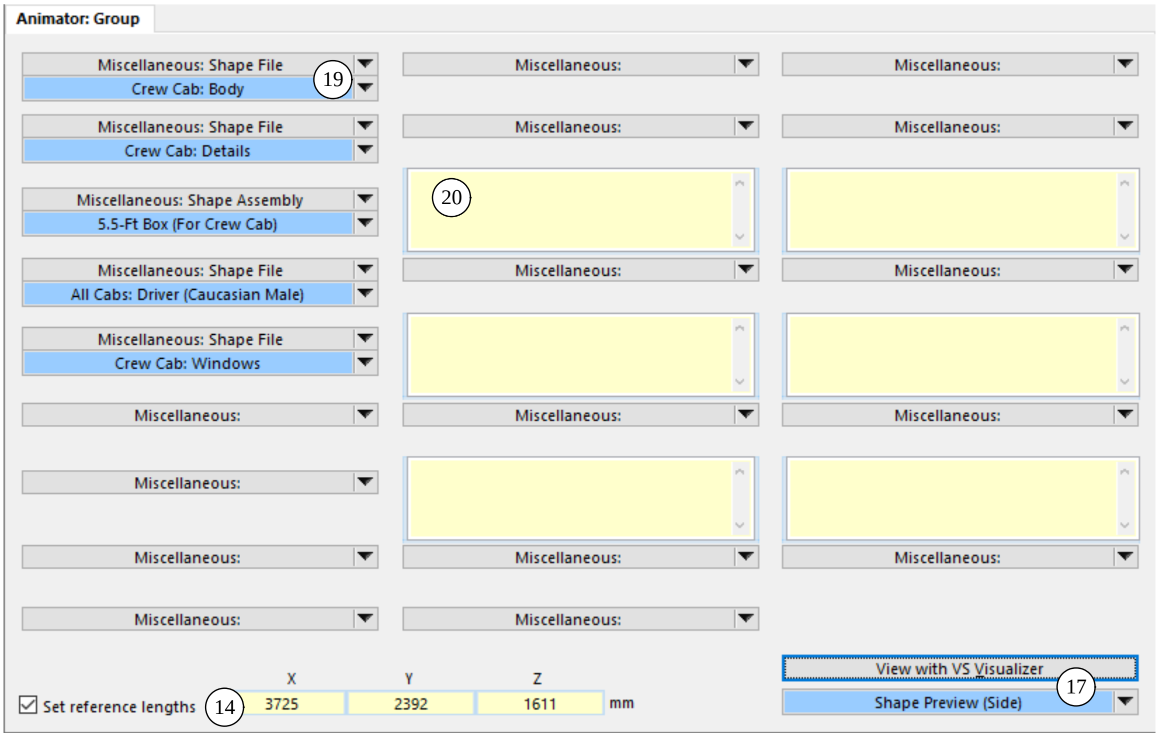
The scale factors, angle offsets, and coordinate offsets are applied to all shapes. Similar settings on the individual shapes may have already been applied. These transformations are cumulative. On the other hand, the reference lengths apply to the reference frame. If reference lengths were applied for individual shape datasets, they are overridden by settings made here.

When this screen is used to assemble datasets for a vehicle, it is common to specify the reference lengths here. This way, the same scaling will be used for all linked datasets. The scaling for a specific vehicle is usually obtained by taking ratios of dimensions on a sprung mass screen to reference lengths specified here. This allows the same **Animator: Shape Assembly** dataset to work properly with multiple vehicles with different sizes.

⑱ **Shape file links**. Each of these links goes to an **Animator: Shape File Link** dataset as described in the previous section. Different shapes can be assembled, such as a vehicle body, bumpers, windows, lights, etc.

Animator: Group Screen

Use this screen (Figure 5) to group animator datasets together to define a more complex object. The assembled object can be viewed, and its default size can be set to enable resizing by VS Visualizer to match vehicle properties.


Animator: Group

Miscellaneous: Shape File — Crew Cab: Body

Miscellaneous: Shape File — Crew Cab: Details

Miscellaneous: Shape Assembly — 5.5-Ft Box (For Crew Cab)

Miscellaneous: Shape File — All Cabs: Driver (Caucasian Male)

Miscellaneous: Shape File — Crew Cab: Windows

Miscellaneous:

Miscellaneous:

Miscellaneous:

Miscellaneous:

☑ Set reference lengths X 3725 Y 2392 Z 1611 mm

Shape Preview (Side)

Figure 5. Animator: Group screen.

This screen is typically used to create objects with associated reference frames or several user-defined colors. If the object contains more than 20 parts, sub-assemblies can be defined using the **Animator: Group (More)** screen. If there are several shape files for parts that have the same color or need to be rotated or located as a group, **Animator: Shape Assembly** screen should be used to create a sub-assembly.

The **Animator: Group** screen is similar to the various **Generic Group** and **Generic Link** screens in that it has miscellaneous links and fields that have no specific built-in purpose and can be used for many advanced applications. It differs in several ways:

1. Datasets from this library are mainly linked to other dataset screen where animation information is appropriate.
2. It includes the **View with VS Visualizer** button ⑰.
3. It has an option to set X-Y-Z reference lengths for all linked datasets ⑭.

⑲ **Miscellaneous links**. Links are used to include reference frames, shapes, and other datasets related to visualization.

20 **Miscellaneous fields**. Use these fields to assign values to arbitrary keywords. The format is that each line has a keyword and value, separated with white space (at least a single space). These keyword values apply to the previously read data, which is found from the link immediately preceding the data field.

Special Cases

CarSim, TruckSim, and BikeSim contain hundreds of **Animator: Shape File Link** datasets. Most are related to showing vehicles and objects located on the ground. Following are a few descriptions of other uses, which involve custom combinations of advanced settings.

Environmental Spheres and Sky Boxes

Most of the vehicle simulations in CarSim, TruckSim, and BikeSim are set to show the vehicle moving outdoors on a road surface, with an overhead sky, and a distant horizon showing hills. For example, consider the CarSim Quick Start Guide example (Figure 6).

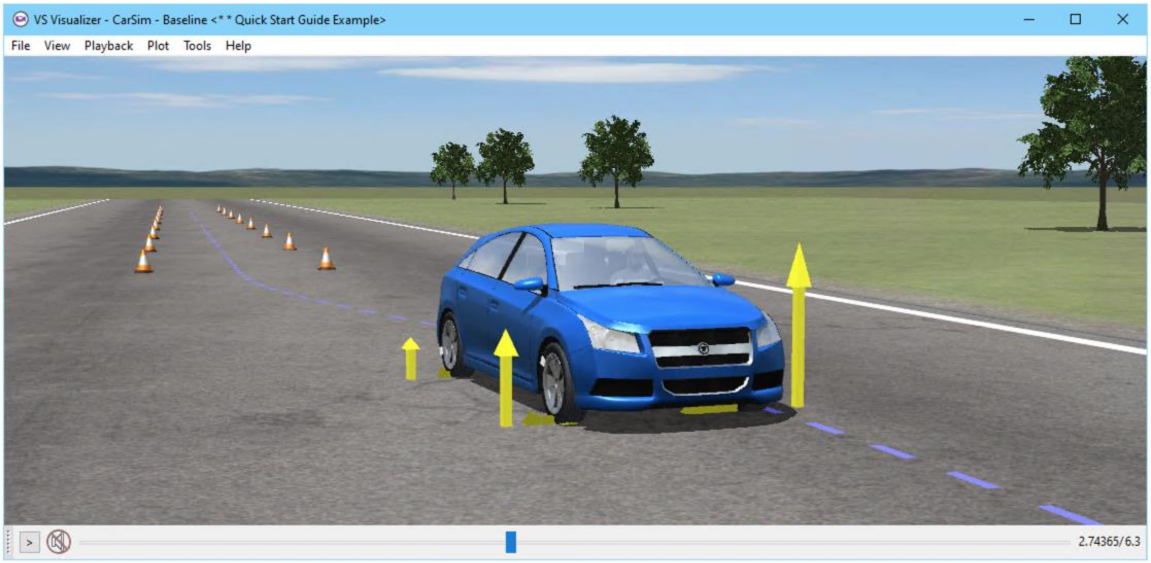

VS Visualizer - CarSim - Baseline <* * Quick Start Guide Example>
File
View
Playback
Plot
Tools
Help
2.74365/6.3

Figure 6. The CarSim Quick Start Guide example, with ground, sky, and force arrows.

Figure 7 shows another view of the CarSim Quick Start example: a straight section of test pavement, with trees on each side. In this figure, the camera was moved back far enough to see the limits of the road surface and the grass on each side. Outside a square green, a different shade of green is visible. Note that there is an apparent large distance between the edge of the road section and the hills seen on the horizon.

The scene seen by a camera involves objects that are close enough to be affected by the angle of viewing of the camera, and a "background" environment that is so far away that it appears to be independent of the position of the camera.

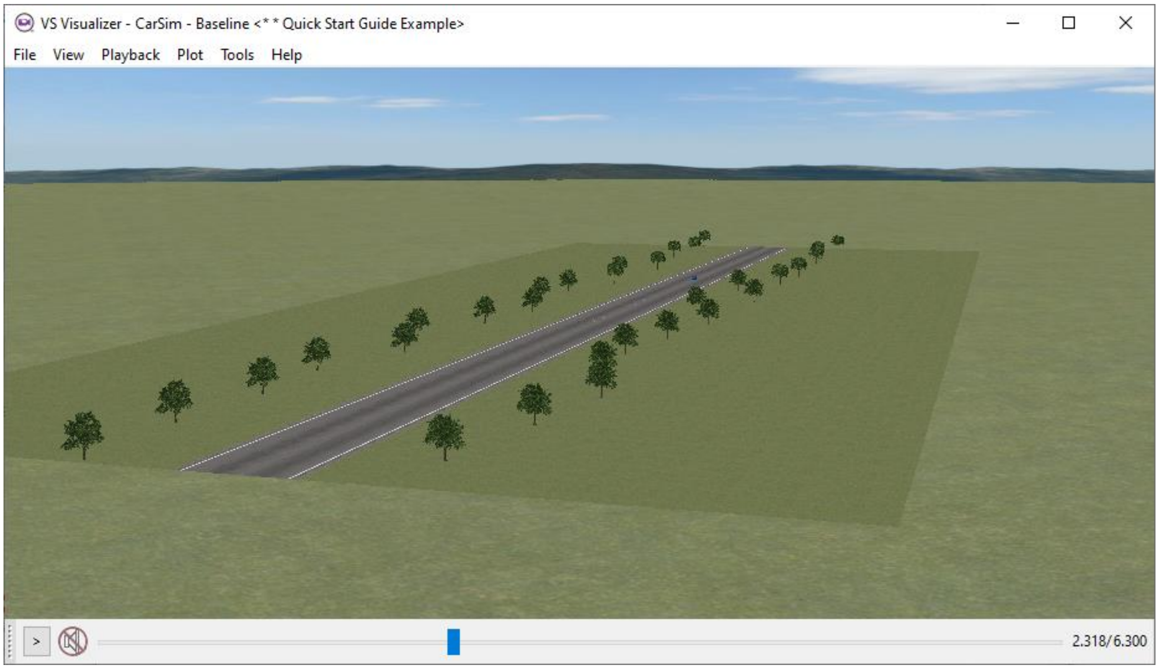

VS Visualizer - CarSim - Baseline <* * Quick Start Guide Example>
File View Playback Plot Tools Help
2.318/6.300

Figure 7. View of the Quick Start Guide CarSim example showing limits of the road surface.

To show an environment with the approximate visual properties without creating a set of animation shapes covering huge distances, most scenes are setup to use *environmental spheres*. An environmental sphere is a collection of animator datasets that provides a background view for the camera that appears to be a long distance away. It contains three parts:

1. A hemisphere shape has the appearance of the sky when viewed from the inside. The diameter of the hemisphere should be large enough to contain the portions of the ground, other vehicles, and other objects that would normally be visible during a simulation. Hemisphere with sky images on the inside are sometimes called *sky boxes* or *sky domes* by 3D artists developing video games.
2. A circular ground shape is matched to the sky box to show a background "earth" for areas not covered with road surfaces or other animator assets.
3. A moving Reference Frame that follows the X-Y-X position of the vehicle is used to locate the sky box and ground shape, such that the view remains static in appearance as the vehicle moves.

Moving the camera back even more shows the hemisphere shape of the sky box (Figure 8). If viewing the animated simulation from this far-away view, the sky box appears stationary, with the road section inside moving relative to the sky box.

The environmental globes used in CarSim, TruckSim, and BikeSim are typically assembled with **Animator Group** datasets that link to a **Reference Frame** for the environmental shapes, with links for a skybox and at least one link for a ground background shape (Figure 9).

Recent versions of CarSim, TruckSim, and BikeSim include just a few example sky box datasets (Figure 10).

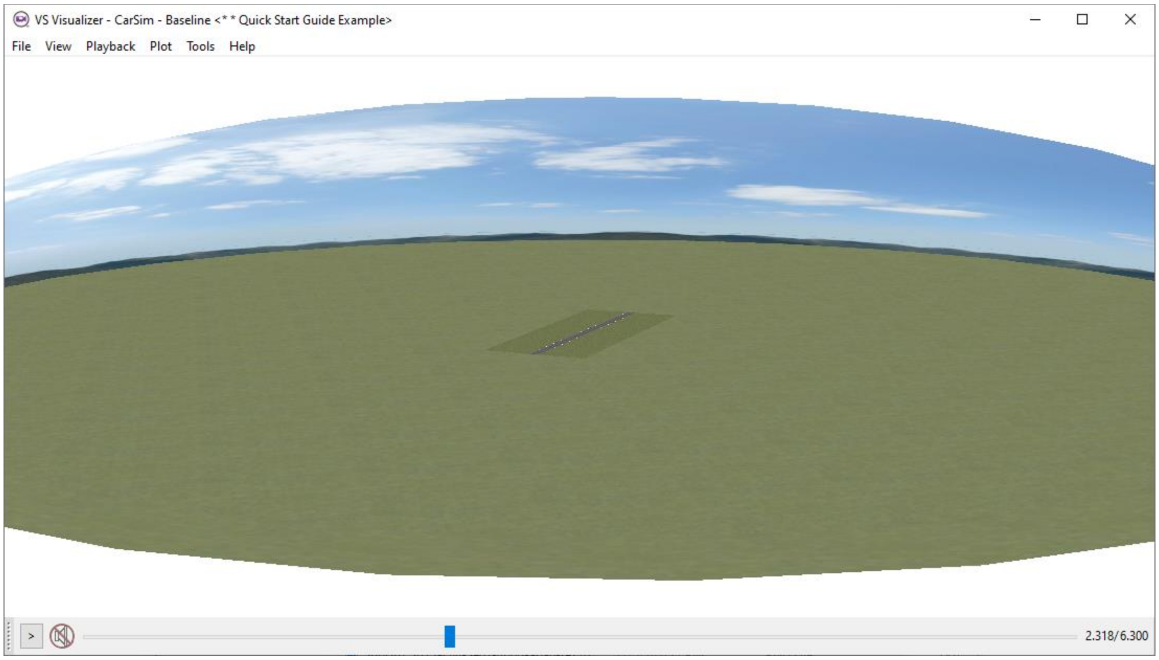
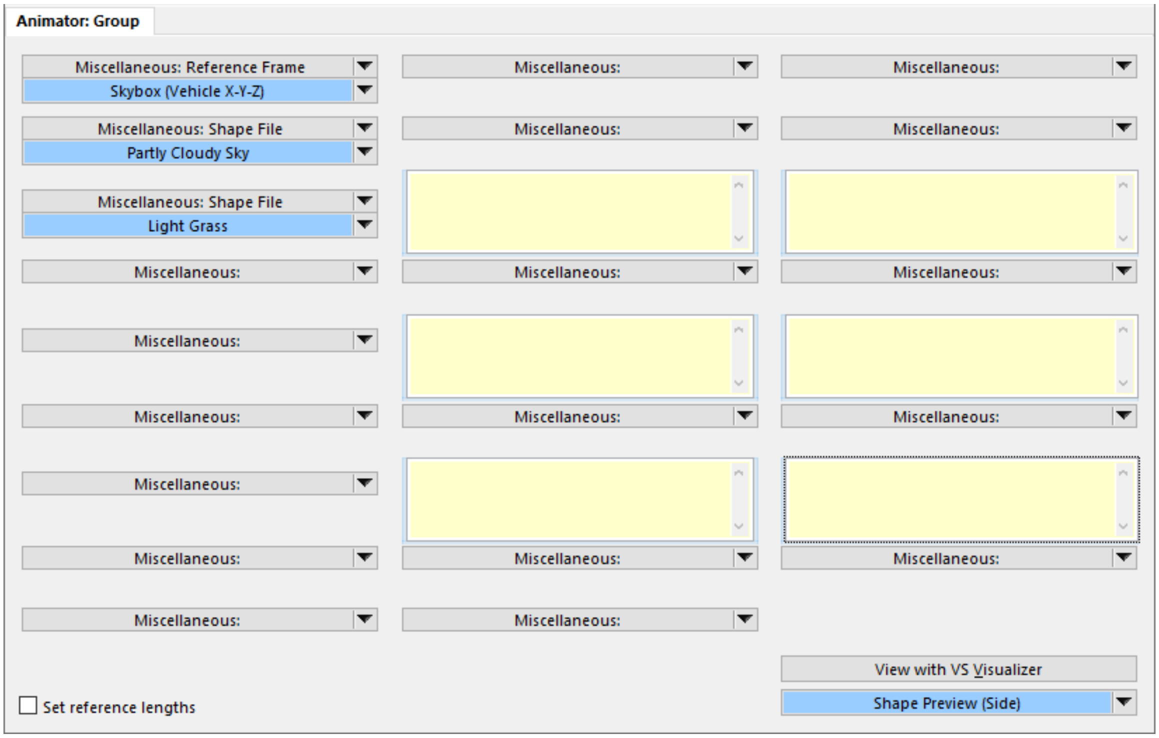

VS Visualizer - CarSim - Baseline <* * Quick Start Guide Example>
File
View
Playback
Plot
Tools
Help
>
2.318/6.300

Figure 8. View of the Quick Start Guide CarSim example showing limits of the sky box.


Animator: Group

Miscellaneous: Reference Frame
Skybox (Vehicle X-Y-Z)

Miscellaneous: Shape File
Partly Cloudy Sky

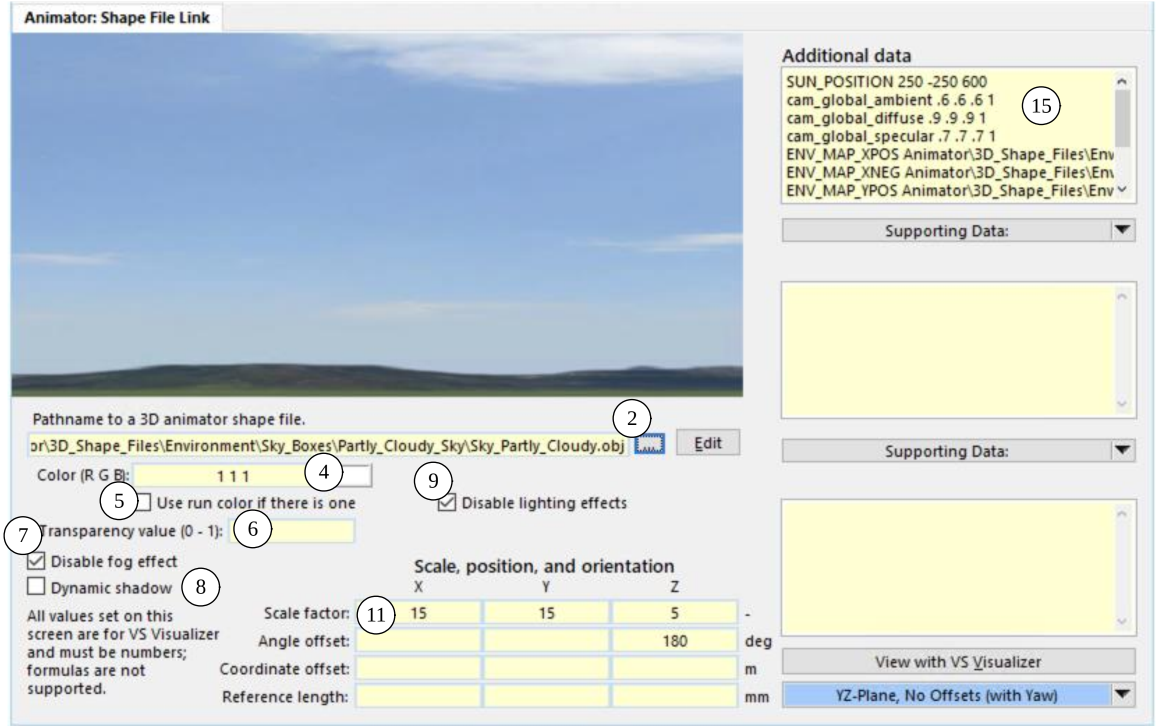
Miscellaneous: Shape File
Light Grass

□ Set reference lengths

Shape Preview (Side)

Figure 9. The environment sphere used for the Quick Start Guide example.

Besides showing a hemisphere shape with a matching internal image of a sky and horizon, the datasets include advanced settings that define lighting information that is matched to the image, as described below.



Animator: Shape File Link

Additional data

```
SUN_POSITION 250 -250 600
cam_global_ambient .6 .6 .6 1
cam_global_diffuse .9 .9 .9 1
cam_global_specular .7 .7 .7 1
ENV_MAP_XPOS Animator\3D_Shape_Files\Env
ENV_MAP_XNEG Animator\3D_Shape_Files\Env
ENV_MAP_YPOS Animator\3D_Shape_Files\Env
```

Pathname to a 3D animator shape file.

or\3D_Shape_Files\Environment\Sky_Boxes\Partly_Cloudy_Sky\Sky_Partly_Cloudy.obj

Color (R G B): 1 1 1

☐ Use run color if there is one

☑ Disable lighting effects

Transparency value (0 - 1):

☑ Disable fog effect

☐ Dynamic shadow

All values set on this screen are for VS Visualizer and must be numbers; formulas are not supported.

Scale, position, and orientation

	X	Y	Z	
Scale factor:	15	15	5	-
Angle offset:			180	deg
Coordinate offset:				m
Reference length:				mm

YZ-Plane, No Offsets (with Yaw)

Figure 10. Animator Shape File Link for a sky box.

② Pathname to shape file. The shape is a hemisphere, with an image showing a partly cloudy sky.

④ The color is set to white, to provide the image with the original coloring intact.

⑤ The option to **Use run color if there is one** is disabled to always leave the coloring intact.

⑥ Transparency is not set, leaving the object 100% opaque.

⑦ The option **Disable fog effect** is checked, again to show the image intact.

⑧ The option **Dynamic Shadow** is unchecked. The sky is not intended to show any shadows.

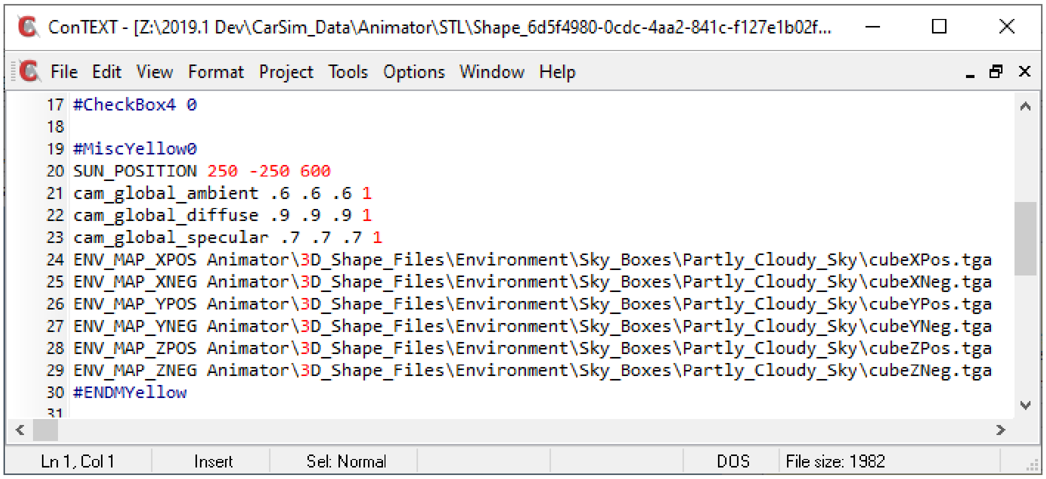
⑨ The option **Disable Lighting Effect** is checked to disable any shading of the sky.

⑪ Scale factors are used to magnify the hemisphere. The scaling is the same for the X and Y directions (a factor of 15); the Z scaling is less (5), explaining the flattened shape of the globe seen in Figure 8.

⑮ The position of the light source is specified with the keyword `SUN_POSITION` to match the position of the light source to the sky image. Other commands for VS Visualizer are also used here to control the global ambient lighting (with components red, green, blue), global diffuse lighting, and global spectral lighting.

The miscellaneous yellow field is not large enough to see all the contents in the figure, but the settings can be seen in the associated Parsfile (Figure 11).

Six more graphic files (with extension `.tgs`) are specified for further controlling the lighting in size directions with the commands `ENV_MAP_XPOS`, `ENV_MAP_XNEG`, etc.


ConTEXT - [Z:\2019.1 Dev\CarSim_Data\Animator\STL\Shape_6d5f4980-0cdc-4aa2-841c-f127e1b02f...
File Edit View Format Project Tools Options Window Help
Ln 1, Col 1
Insert
Sel: Normal
DOS
File size: 1982

```
#CheckBox4 0

#MiscYellow0
SUN_POSITION 250 -250 600
cam_global_ambient .6 .6 .6 1
cam_global_diffuse .9 .9 .9 1
cam_global_specular .7 .7 .7 1
ENV_MAP_XPOS Animator\3D_Shape_Files\Environment\Sky_Boxes\Partly_Cloudy_Sky\cubeXPos.tga
ENV_MAP_XNEG Animator\3D_Shape_Files\Environment\Sky_Boxes\Partly_Cloudy_Sky\cubeXNeg.tga
ENV_MAP_YPOS Animator\3D_Shape_Files\Environment\Sky_Boxes\Partly_Cloudy_Sky\cubeYPos.tga
ENV_MAP_YNEG Animator\3D_Shape_Files\Environment\Sky_Boxes\Partly_Cloudy_Sky\cubeYNeg.tga
ENV_MAP_ZPOS Animator\3D_Shape_Files\Environment\Sky_Boxes\Partly_Cloudy_Sky\cubeZPos.tga
ENV_MAP_ZNEG Animator\3D_Shape_Files\Environment\Sky_Boxes\Partly_Cloudy_Sky\cubeZNeg.tga
#ENDMYellow
```

Figure 11. Parsfile for the sky box dataset.

Note The VS Visualizer commands used here are all documented in the *VS Visualizer Reference Manual*.

Arrow Shapes

Arrows are used to visually indicate forces, moments, wind, and other vectors that have a direction and magnitude. These are managed using the **Animator: Wheel Arrows and Other Indicators** library screen. Arrows in specific directions are usually made by linking to an arrow shape, and using the transform options to scale and orient it.

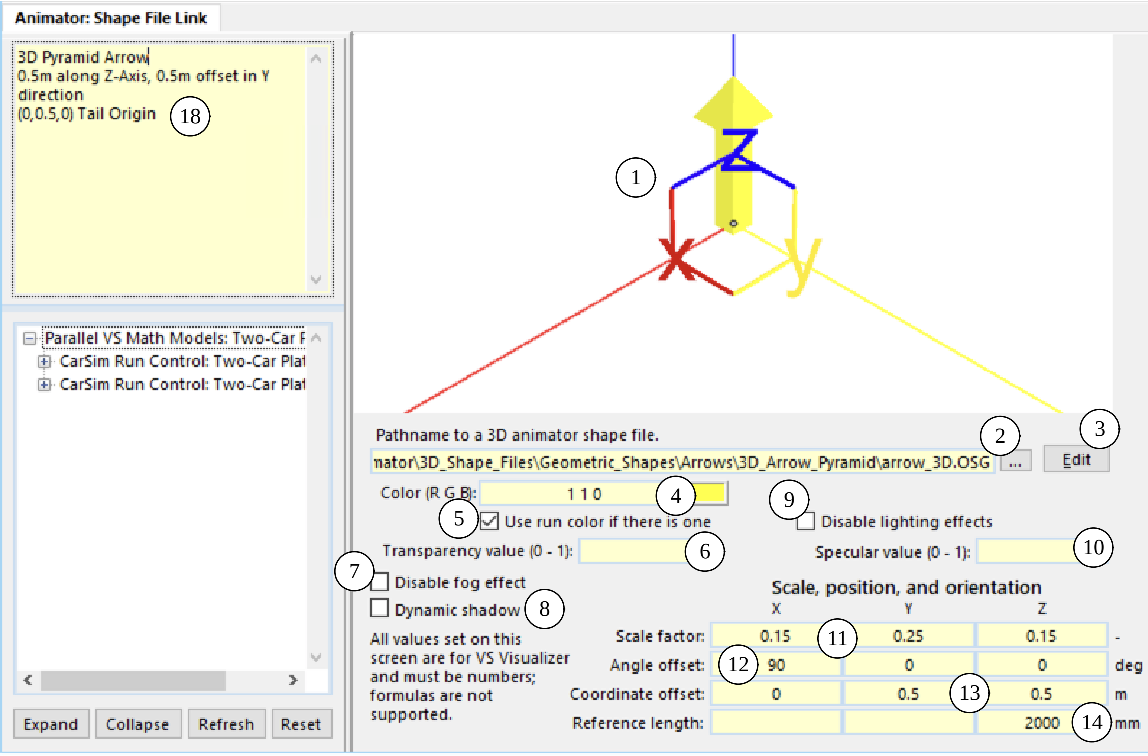
For example, Figure 12 show a 3D arrow shape that is used to indicate vertical tire force in Figure 6, along with many examples.

The linked shape is a 3D arrow made by an artist. The arrow is oriented along the Y axis, with its point at the origin of the coordinate system. However, we want the arrow to point up (in the Z direction), with the base of the tail on the ground, some distance from the tire to which it is associated. The scaling in each direction is set such that the X and Z components used a scale factor of 0.15 ⑪, while the Y component has a scaling of 0.25. Given the original length of 2m, this scaling changes the arrow length to 0.5m.

To make the arrow to point up, rather than in the original direction of the Y axis, we specify a rotation of 90° about the X axis ⑫ (and 0 for the other axes). The original artwork has the tip of the arrow at the origin; we want the tail to be at the origin, so we add a Z offset of 0.5m ⑬. We also want the arrow to be some distance from the tire, because otherwise it would be hidden by the tire and vehicle. To do this, we add a Y offset of 0.5m ⑬, as shown in the example (Figure 6, page 8).

This arrow is a 3D structure. We want some shading to see the geometry, so the checkbox **Disable lighting effects** ⑨ is not checked, nor is the box to **Disable fog effect** ⑦. However, the **Dynamic shadow** box is not enabled ⑧, to avoid having the arrow cast a shadow on other objects.

The checkbox **Use run control if there is one** is checked ④, enabling the arrows to be colored from other datasets.



Animator: Shape File Link

3D Pyramid Arrow
0.5m along Z-Axis, 0.5m offset in Y direction
(0,0.5,0) Tail Origin

Parallel VS Math Models: Two-Car F
CarSim Run Control: Two-Car Plat
CarSim Run Control: Two-Car Plat

Pathname to a 3D animator shape file.
nator\3D_Shape_Files\Geometric_Shapes\Arrows\3D_Arrow_Pyramid\arrow_3D.OSG

Color (R G B): 1 1 0

☑ Use run color if there is one

Transparency value (0 - 1):

☐ Disable fog effect

☐ Dynamic shadow

☐ Disable lighting effects

Specular value (0 - 1):

All values set on this screen are for VS Visualizer and must be numbers; formulas are not supported.

Scale, position, and orientation

	X	Y	Z	
Scale factor:	0.15	0.25	0.15	-
Angle offset:	90	0	0	deg
Coordinate offset:	0	0.5	0.5	m
Reference length:			2000	mm

Figure 12. Arrow shape, set up to show vertical forces.

Animated Pedestrians

OSG shapes permit an object to be animated within the associated reference frame. This capability is used to show moving objects such as walking pedestrians (with moving arms and legs) and pedaling bicyclists.

Figure 13 shows the **Animator Shape** dataset for an OSG file that represents a walking pedestrian. Most of the animated OSG objects are largely self-contained, requiring little information other than the pathname for the OSG ②. A unique feature is that you can view the animation of the object by clicking the View button ⑰; in turn, VS Visualizer shows the object going through repeated cycles of the animation ⑱.

The figure shows typical settings:

② Only OSG files support animation of the shape within its reference frame.

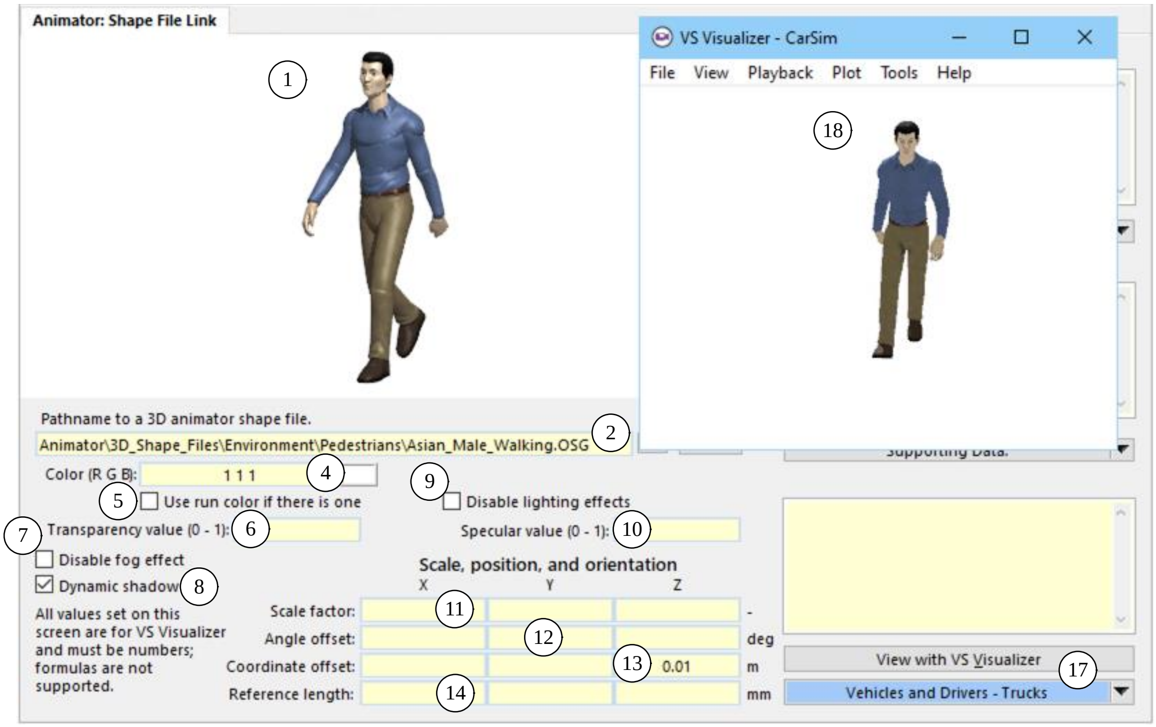
④ The objects typically have multiple parts with different coloring. To show them properly, the color set here should be white (1 1 1).

⑤ The **Use run color if there is one** checkbox should be unchecked. If not, you might see humans with green skin!

⑥ The transparency field is usually blank, to leave the colors intact.

⑦ The **Disable fog effect** checkbox should be unchecked.

⑧ The **Dynamic Shadow** box should nearly always be checked for detailed objects such as the pedestrian.



Animator: Shape File Link

Pathname to a 3D animator shape file.

Animator\3D_Shape_Files\Environment\Pedestrians\Asian_Male_Walking.OSG

Color (R G B): 1 1 1

□ Use run color if there is one

Transparency value (0 - 1):

□ Disable fog effect

☑ Dynamic shadow

All values set on this screen are for VS Visualizer and must be numbers; formulas are not supported.

□ Disable lighting effects

Specular value (0 - 1):

Scale, position, and orientation

	X	Y	Z	
Scale factor:				-
Angle offset:				deg
Coordinate offset:			0.01	m
Reference length:				mm

View with VS Visualizer

Vehicles and Drivers - Trucks

Figure 13. Animator Shape dataset for a walking pedestrian.

⑨ The **Disable Lighting Effect** box should never be checked for detailed objects such as the pedestrian.

⑩ The specular field should usually be blank for detailed objects created by a 3D video artist. The object contains details lighting/reflection information internally for skin, clothing, etc.

⑪ - ⑭ The adjustments for angle, scale, offset, and reference length are usually blank for detailed objects created by a 3D video artist. However, in the example, a slight Z offset was used after observing the shoes sinking slightly into the ground when walking.

Note Moving objects such as pedestrians and bicyclists are linked to **Animator Reference Frame** datasets that link the position of the object to output variables from the VS Math Model. The Reference Frame may also specify the scale factor of internal time to simulation time with the VS Visualizer command `SHAPE_SET_TIME_FUNCTION`. Please see the **Help** document *Animator Reference Frame* for details.

Creating Custom Signs

As signs vary around the world, it is prohibitive to attempt to design all possible sign images to provide within the VehicleSim product. Users can create an '`.OSG`' Animation Shape File of a sign with a user-defined image to include in their databases. An image can be applied onto a blank sign to be animated with VS Visualizer. Use an image editing program that can work with `.tga` files.

1. Navigate to the `Road_Signs` directory in the VehicleSim Prog folder (e.g., `CarSim_Prog\Resources\Animator\3D_Shape_Files\Environment\Road_Signs`):

2. Create a copy of the `Custom_Sign` folder to within this directory and rename it to describe the new sign (e.g. `Stop_sign`).

3. Inside this newly copied folder is an 'images' folder. Within it, open the image file `Sign_Front_di.tga` using an image editing program.

4. Copy and Paste the new desired sign image into the editor and 'Save' to overwrite the existing tga file. Please note that the new .tga image must maintain its original dimensions.

5. There are two OSG files included in the folder. One is to depict a Circular sign, the other a Rectangular one. In the VehicleSim Product, create a dataset from **Animation Shape File Link** library to link to the one of the OSG files.