GraphWorX64
Collision Detection in 3D

APPLICATION NOTE

September 2013

Description: This Application Note will introduce GraphWorX64 enhanced collision detection for 3D objects.
OS Requirement: Windows 8 x64 (Professional or Enterprise Edition) /Windows 7 x64 (Professional or Enterprise Edition) /Windows Server 2012 x64 /Windows Server 2008 R2 x64 /Windows Vista x64 SP2 (Business, Ultimate, or Enterprise Edition) /Windows Server 2008 x64
General Requirement: GENESIS64 installed on your machine; basic knowledge of GraphWorX64, 3D View in GraphWorX64 and AlarmWorX64 Viewer.

Introduction

GraphWorX64 contains a powerful enhanced feature, which detects the collision of 2 or more objects in a 3D View. The detected collision can trigger a variety of actions:

- Log a TraceWorX message
- Generate a Gen-Event
- Trigger a script
- Change an object's Color

These actions can be triggered either when the collision occurred (On collision start), and/or when the collision has finished (On collision end).

In this application note you will learn the basics of collision detection of two objects in a 3D view.

Preparing the Display

GraphWorX64 does not need any special configuration in order to detect a collision. You create the objects in the 3D view and select the ones you want to be enabled to detect collision. To put it in other words, you can first finish your display and then decide which objects shall be used for detecting collision. Or you do it whenever while creating your display.

In this example, we will use two simple primitive objects, a sphere (Ball) and a cube (Wall). When these two collide both shall change colors and generate a Gen-Event, which will be listed in the AlarmWorX64 Viewer.

1. First, start GraphWorX64, either as stand-alone or through the Workbench. Once loaded, a new display will be ready for us to work with. If you already had GraphWorX64 running, make sure that you create a new blank display.
2. Create a 3D view and under this view add an AlarmWorX64 viewer, as shown in Figure 1.

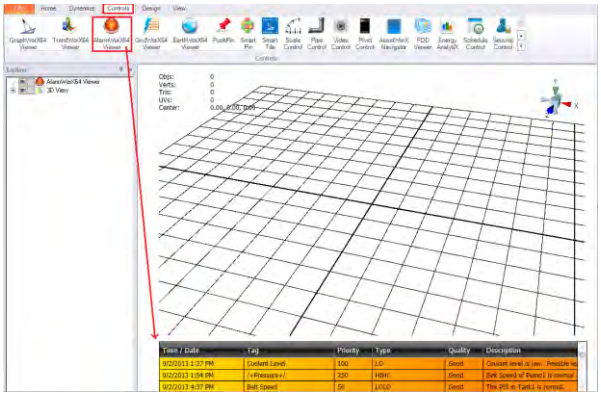

Figure 1 - Display with a 3D View and an AlarmworX64 Viewer

3. Double click inside the 3D view. Notice that the ribbon changes accordingly. From the primitives tools select "Create a cube" and transform thin into a wall like shape. Place it a little bit to the left so it is out of the center, and lets us insert the sphere here.

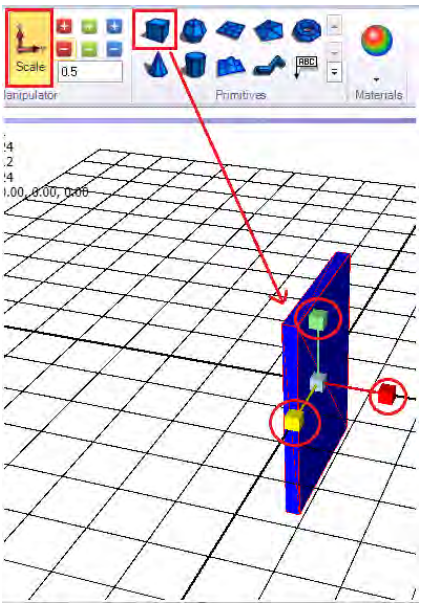

Figure 2 - Create a Wall out of a Cube

4. From the primitives tools select "Create a sphere". Place the wall a little bit to the left, so that we can clearly see them separated.

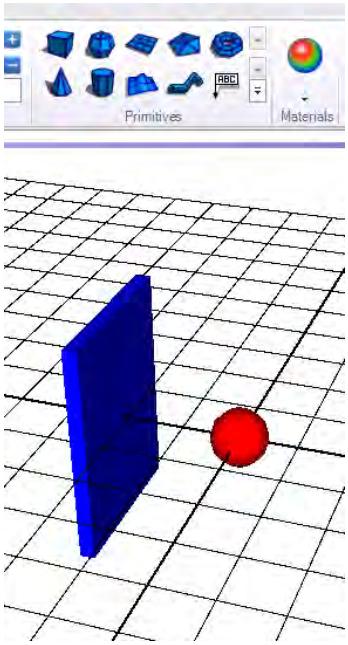

Figure 3 - Create a Sphere

Create a Simple Animation.

We will let the sphere hit the wall using a simulated sine OPC Tag.

1. Select the sphere and then select "Location" animation from the Dynamics.

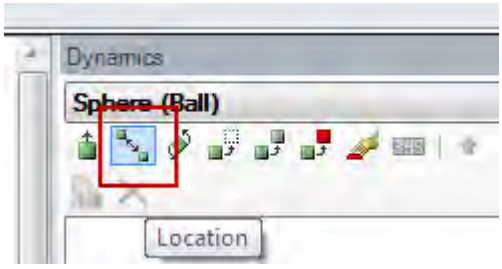

Figure 4 - Location Dynamic

2. As a source, select "localsim:sine" from the Simulation tab inside the Data Browser.

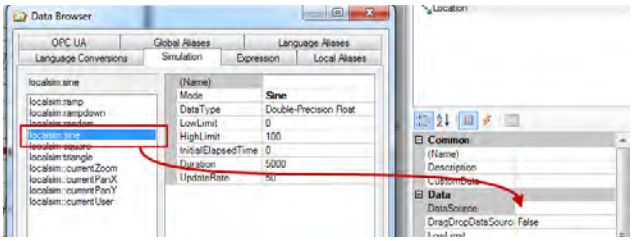

Figure 5 - Select a Simulated OPC Tag

3. Notice that the animation is set to move into the positive X axis. In our case we want the sphere to move towards the wall placed to the left. Thus we need to adapt the animation to move towards negative X axis. The simplest way for us now will be to change the coordinates in the 3D path.

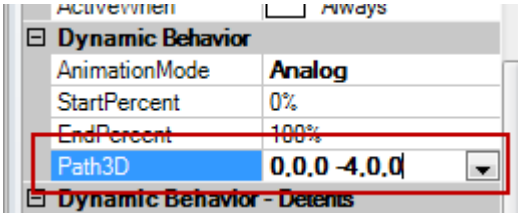

Figure 6 - Change the Path3D

NOTE: depending on your regional settings you might find the coordinates separated by semi colon (;). When changing directly in this field, the coordinates need to be entered separated by commas (,). If you need fractions, use point (.) as a decimal separator.

4. Change the views so you can be sure your ball will hit the wall or go through it. For a quick check, use the view tools. Figure 7

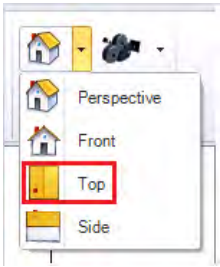

Figure 7 - View tools to quickly check our settings

5. To be sure we are on the right track, go into runtime and see the ball moving the way we want it, and that the wall and ball collide. Feel free to modify the location of the ball or its location path as needed.
6. Exit runtime.

Configure the collision detection.

If you did the runtime test you will need to double-click inside the 3D view to continue editing.

With the Collision detection tools inside the advanced ribbon, you can include, exclude or restrict objects for the collision detection.

Figure 8 - The Collision Detection tools

You can select each object and include it or select several and then press include.

Later we will have a closer look to the "Settings" tool.

1. Select the ball and then hold the shift key when you click the wall.
2. Select "Include" from the collision detection tools.

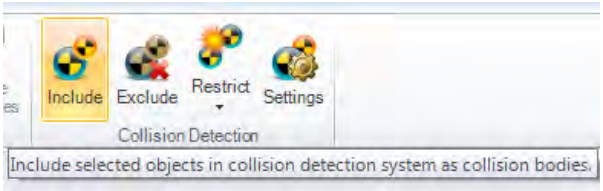

Figure 9 - Select the Include tool

3. Select the "Settings" tool. In the dialog that pops up you should be able to see the two objects in the registered bodies list. If any is missing, repeat steps 1 and 2 selecting the missing object (either ball or wall).

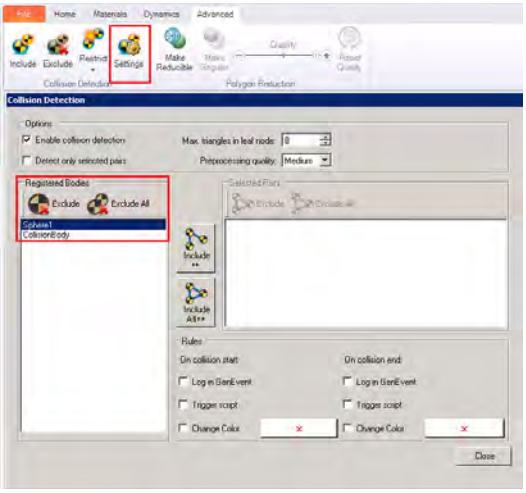

Figure 10 - Collision Detection Settings

4. Either select the bodies you want to have included and click "Include", or you simply click "Include All" so the collision detection knows which pairs to monitor.

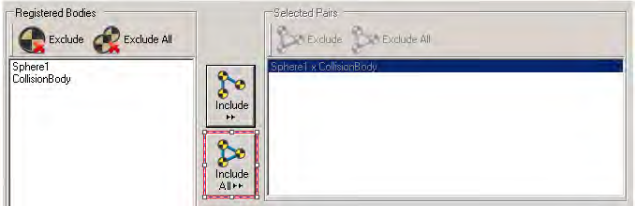

Figure 11 - Include Bodies to be Pairs

5. In the lower part of the dialog we will define what shall happen when this pair collides. In our case we want to change the color of both bodies and generate a Gen-Event. We want to trigger at collision start and on collision end. While the bodies collide, change the color to red, on collision end, return to original color (leave the default color setting as "x").

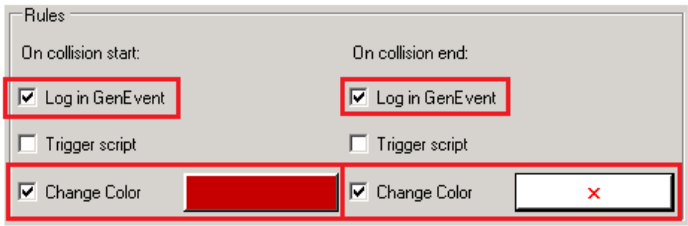

Figure 12 - Define the Rules

6. Make sure the "Enable collision detection" option is checked. Then you can close the dialog.

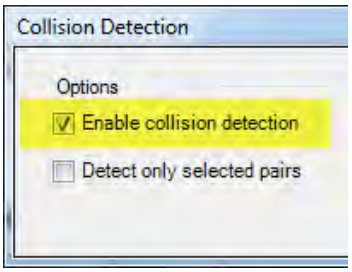

Figure 13 - Enable collision detection & close

Configure the AramWorX64 Viewer

In order to see the events posted by the collision detection, we need to configure the AlarmWorX64 Viewer.

1. Double click outside the 3D-view to exit it.

2. Select the AlarmWorX64 viewer we added at the beginning of this Application Note. If you did not see one on your display, you can add it now. You will see the ribbon adapting accordingly. Either select "Configure Viewer" from the tool or double click on the viewer to bring up the configuration.

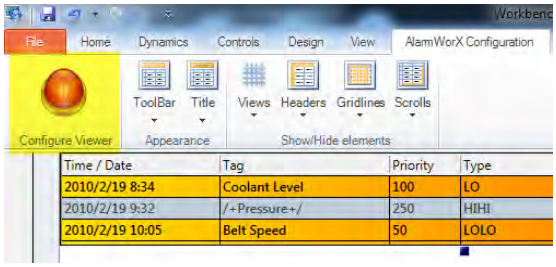

Figure 14 - Access the control configuration

3. Select "Event Subscription" as source from the drop down menu in the grid.

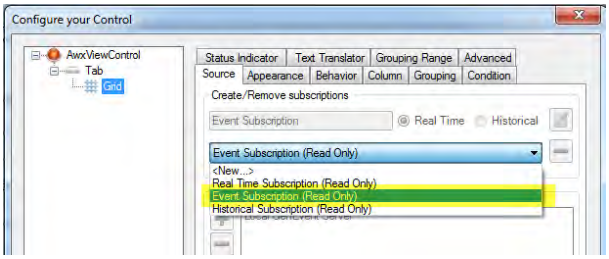

Figure 15 - Selecting the Event Subscription

4. Close the dialog.

See it in action.

Now is a perfect time to save your work. Next go into runtime and let see what happens. You should see the ball moving and colliding with the wall. As soon as they collide, both shall change colors to red. And when the collision ends, they shall return to their original colors.

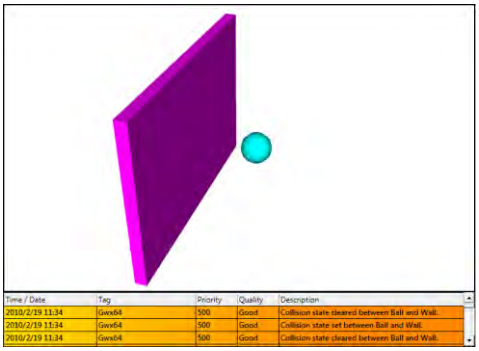

Figure 16 - Before Colliding

Figure 17 - Colliding

See in the AlarmWorX64 viewer the messages "Collision state set between Sphere1 and CollisionBody" and "Collision state cleared between Sphere1 and CollisionBody" alternate accordingly.

Extended Example

You can add a new sphere and animate this to collide with the wall too. But do not do anything when the balls collide with each other.

Try different settings in the Collision detection settings and get familiar with its potential.

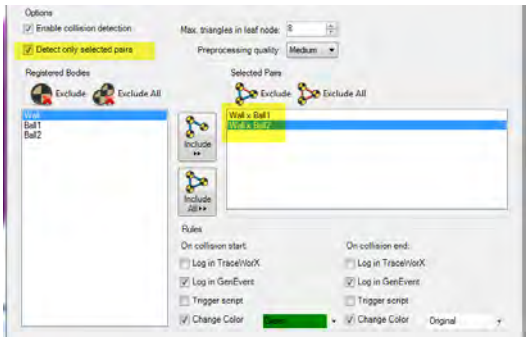

Figure 18 - Settings for More Pairs

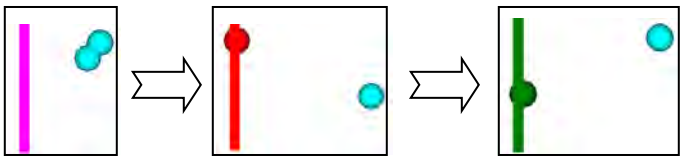

Figure 19 - Balls Colliding from Top View

Conclusion

This was just a very brief introduction to collision detection in GraphWorX64. You should have also learned how to set up your display to trigger a Gen-Event. You can also combine the collision with triggering a script to popup a message about the collision. For scripting capabilities, refer to the Help Files or other Application Notes.