

Tutorial 28

Macro Relations

Introduction

This tutorial guides you through the process of creating a macro constraint. Macro constraints let you create a complex constraint, and use it repeatedly as an element or “building block” in other relations.

In this tutorial, you will create a Relation constraint that you will then use within another constraint.

The major steps of this tutorial are as follows:

- Preparing the Scene (page 1)
- Creating a Relation (page 2)
- Connecting the Macro Relation (page 4)
- Animating Properties (page 4)
- Testing the Constraint (page 6)



Note:

This tutorial does not explain how to perform basic functions such as creating Relations constraints, or using attributes in Relations.

Step 1: Preparing the Scene

In this step, you will add a favorite path for the tutorial folder in the Asset browser window. As a result, you will be able to access the tutorial files directly from the interface.

1. From the menu bar, select **File>New**, then select **Layout>Editing**.

MotionBuilder displays a new scene using the Editing layout. This layout displays all the windows you need for your work in this tutorial.

2. Right-click in the Asset browser and select **Add favorite path** from the contextual menu (fig 28-1).

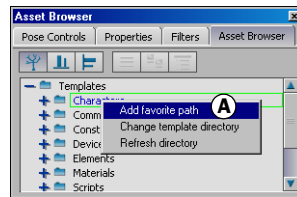


fig 28-1: Asset browser **A**. Select **Add favorite path** from the contextual menu.

3. In the Open directory dialog box that appears, choose the **RelMacro** folder (created when unzipping the *T28_Macro_Relations.zip* file) and click **OK**. The **RelMacro** folder is added as a favorite path in the Asset browser (fig 28-2, A).

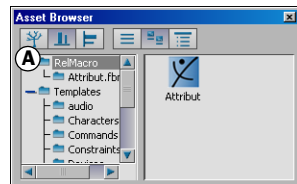


fig 28-2: Asset Browser **A**. Favorite path to the *RelMacro* tutorial folder

4. In the Asset browser, drag the **Attribut.fbx** file from the **RelMacro** folder in the Asset browser into the Viewer window.

2 MotionBuilder 6 Tutorials

Creating a Relation

5. Select **FBX Open>Take 001** (fig 28-3, B).

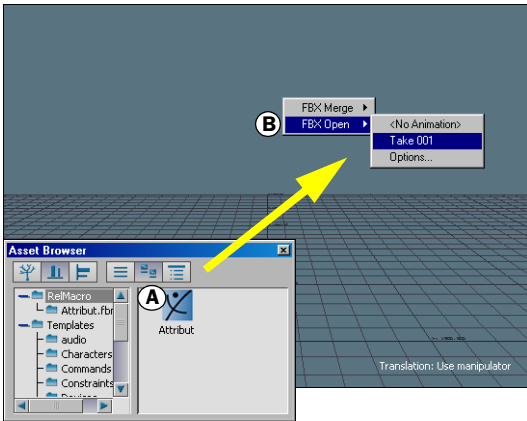


fig 28-3: A. Drag the surfboard.fbx file into the scene. B. The FBX Open menu appears in the Viewer window.

A black wall and a checkered floor loads in the Viewer window. This scene already contains a relation between the keyboard key **F5** and the wall texture scaling.

6. Click inside the Viewer window, and press **F5** to test that the wall texture flashes (fig 28-4).

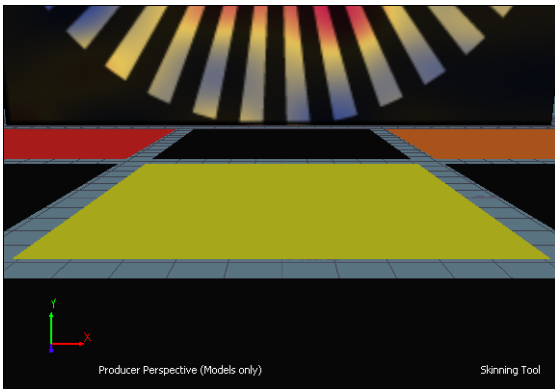


fig 28-4: Press F5 and the wall texture flashes.

Step 2: Creating a Relation

In this step, you will create a complex macro relation using Macro Tools objects. The Macro Tools contain specialized input and output constraint boxes that you can use when creating customized macro relations.

1. Click **Constraints** in the Asset browser. A group of constraints display.

2. Drag a **Relations** constraint from the Asset browser into the Viewer window (fig 28-5).

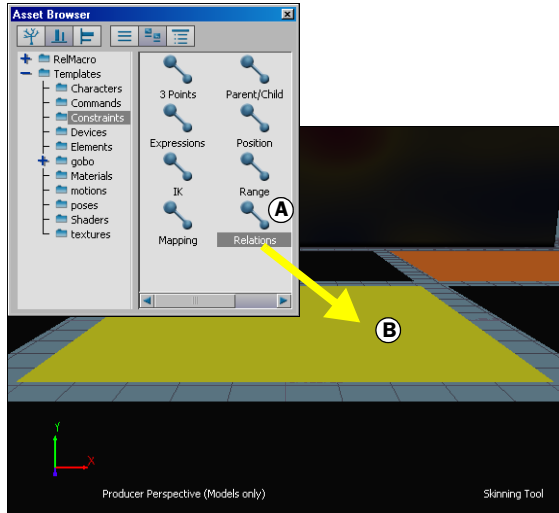


fig 28-5: A. Select a Relations constraint B. Drag it into the Viewer window.

A Relations constraint appears in the Scene browser, in the Constraints folder.

3. Right-click the **Relations** constraint in the Scene browser, select **Rename** from the contextual menu, and name it **RandomBooleantoVector**.

4. Expand **Macro Tools** in the Constraints settings Objects pane, and drag **Macro Input Bool** into the Relations pane.

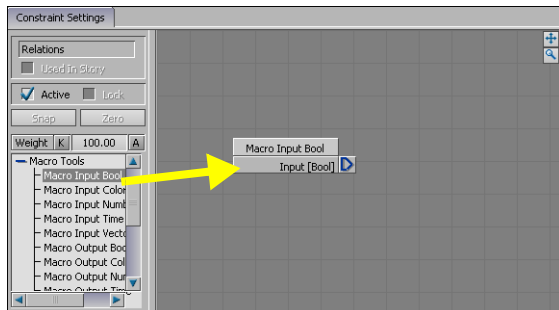


fig 28-6: Drag Macro Input Bool into the Relations pane.

5. From **Other** in the Objects pane, drag **three Triggered Random** constraint boxes into the Relations pane, to the right of the Macro Input Bool box (fig 28-7).

These boxes are named Triggered Random, Triggered Random 1 and Triggered Random 2.

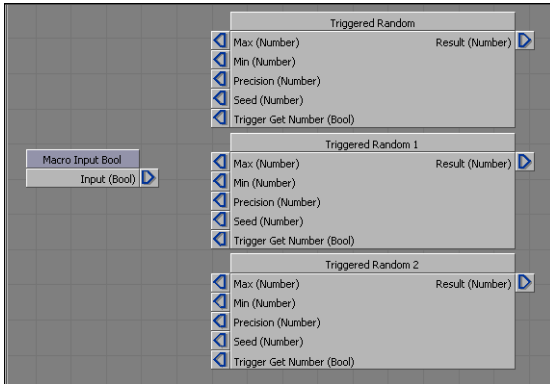


fig 28-7: A Macro Input Bool box and three Triggered Random boxes.

6. From **Macro Tools** in the Constraints settings Objects pane, drag **Macro Output Vector** into the Relations pane and drop it to the right of the Triggered Random boxes (fig 28-8).

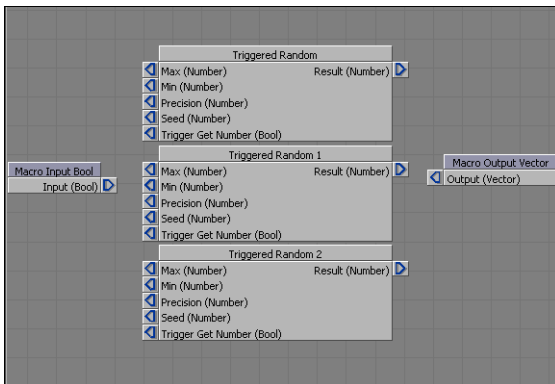


fig 28-8: Add a Macro Output Vector box.

7. Right-click the blue connector arrows on the **Triggered Random** box, select **Set Values** from the contextual menu, and set these values for the following connectors:

- a Max (Number) value of **1.00**
- a Min (Number) value of **0.00**. These Min and Max settings represent the color range values.

- a Precision (Number) value of **0.10**. The Precision value represents the increment by which the random list is generated. For example, the list could be: 0.4, 1.0, 0.6, and so on.

- a Seed (Number) value of **1.00**. The Seed value is an arbitrary number that generates a given sequence of random numbers.

8. Right-click the blue connector arrows on the **Triggered Random 1** box and set the following values:

- a Max (Number) value of **1.00**
- a Min (Number) value of **0.00**
- a Precision (Number) value of **0.25**
- a Seed (Number) of **2.00**

9. Set the following values on the **Triggered Random 2** box:

- a Max (Number) value of **1.00**
- a Min (Number) value of **0.00**
- a Precision (Number) value of **0.25**
- a Seed (Number) value of **3.00**

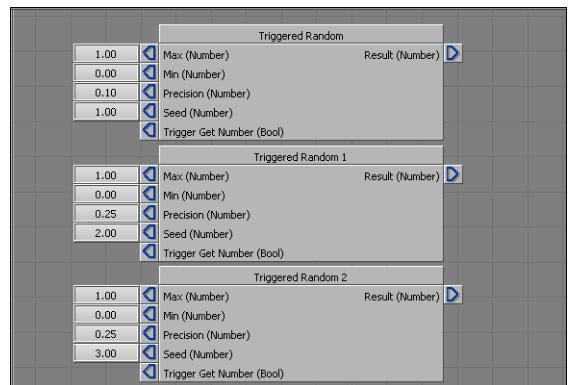


fig 28-9: Values set for all Triggered Random boxes

In the next step you will connect all these boxes to create a Macro relation.

Step 3: Connecting the Macro Relation

In this step, you will connect the constraint boxes that you set values for in the last step in order to create relations that transform a device's output into a random vector

1. Connect **Input** from the Macro Input Bool box to each Triggered Random's box's **Trigger Get Number (Bool)** connector (fig 28-10).

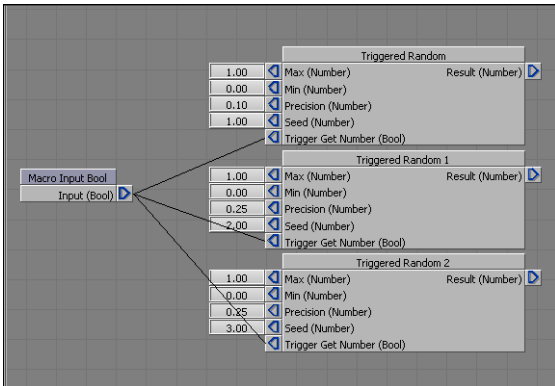


fig 28-10: The Macro Input Bool box is connected to each Trigger Get Number connector.

2. Connect the Triggered Random box's **Result** connector to the **Macro Output Vector** box.

This automatically adds a Number to Vector 1 box using the X value (fig 28-11). Next, you must set the Y and Z values.

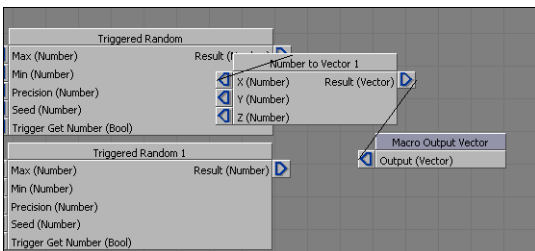


fig 28-11: A Number to Vector 1 box appears automatically when the boxes are joined.

! Note:

You can move the Macro Output Vector box to accommodate this new relations box (fig 28-12). Move a relations box by clicking its title bar and dragging it to another position in the Relations pane.

3. Connect the Triggered Random 1 box's **Result** connector to the **Y (Number)** connector of the Number to Vector box (fig 28-12).
4. Connect the Triggered Random 2 box's **Result** connector to the **Z (Number)** connector of the Number to Vector box (fig 28-12).
5. Connect Triggered Random box's **Result** connector to the **X (Number)** connector of the Number to Vector box (fig 28-12)

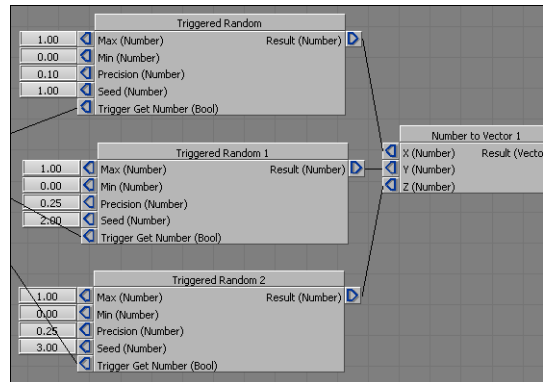


fig 28-12: Connect Trigger Random's result to the X, Y, and Z connector of the Number to Vector 1 box.

You have now created a Macro relation. In the next step, you will make this Macro relation connect to a device so you can use it to control the floor's appearance.

Step 4: Animating Properties

In this section you will learn how to make the floor tiles in the scene change colors randomly when you press a key on the keyboard.

1. Expand the **Materials** folder in the Scene browser and select **Middle**, **BackRight**, **BackLeft**, **FrontRight**, and **FrontLeft**. (Or, select everything in the materials list except Default Material, BlackTiles, and Wall.)

2. Open the **Properties** window. Verify that **Group All** (fig 28-13, B) is selected from the Group Properties menu and that the **Diffuse** setting's **Animate** button (A) (fig 28-13, B) is activated.

If not, select Group All from the Group Properties menu and click the **Animate** button (A) to activate the **Diffuse** setting for the selected materials.

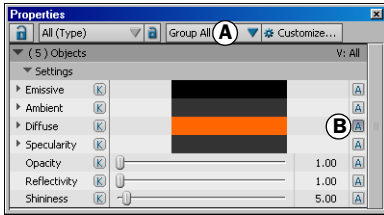


fig 28-13: The Properties window. A. Ensure that Group All is selected from the Group Properties menu B. Diffuse setting's Animate (A) button.

Next you will connect the Macro relation to the floor tiles.

3. Expand **Constraints** in the Scene browser, and rename **TextureScaling** Relation as **WallTexture_FloorColors**.

4. Make sure the **WallTexture_FloorColors** relation is selected and activate **Lock** in the Scene browser to select the Relations pane open (fig 28-14, A).

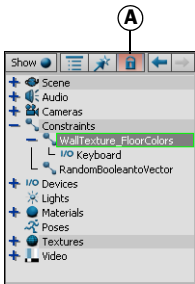


fig 28-14: Scene browser A. Lock button.



Note:

Do not confuse the Scene browser's Lock button with the Lock option in the Constraint Settings window.

5. From Materials in the Scene browser, select **Middle**, **BackRight**, **BackLeft**, **FrontRight**, and **FrontLeft**.

6. Drag these materials into the Relations pane, and choose **Receiver** from the Sender/Receiver menu, next to the Keyboard, Number to Vector and Walltexture relations.

Each material becomes a Relations box in the relations pane.

7. From **My Macros** insert **five RandomBooleantoVector** boxes.



Note:

You created the name *RandomBooleantoVector* in Step 2 of this tutorial.

8. Connect each Material's (Middle, BackLeft, and so on) **Input** to a different input of the 5 **RandomBooleantoVector** boxes (fig 28-15).

As you do this, each colored tile in the Viewer window turns black.

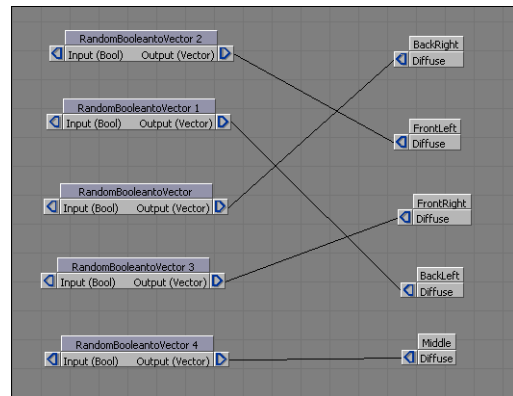


fig 28-15: Connect each Material's output to a different RandomBooleantoVector box.

9. Connect the **Input (Bool)** of each **RandomBooleantoVector** box to **F6** on the keyboard box (fig 28-16).

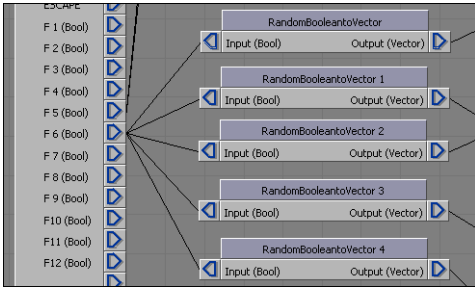


fig 28-16: Each **RandomBooleantoVector** box is connected to **F6** on the keyboard box.

10. Right-click in the Relations pane, and select **Hide All Unconnected** from the contextual menu (fig 28-17).

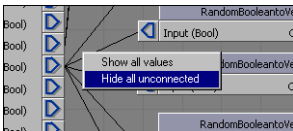


fig 28-17: Select **Hide All Unconnected** from the contextual menu

This removes all unused connectors on relations boxes, which lets you see your constraint more clearly (fig 28-18).

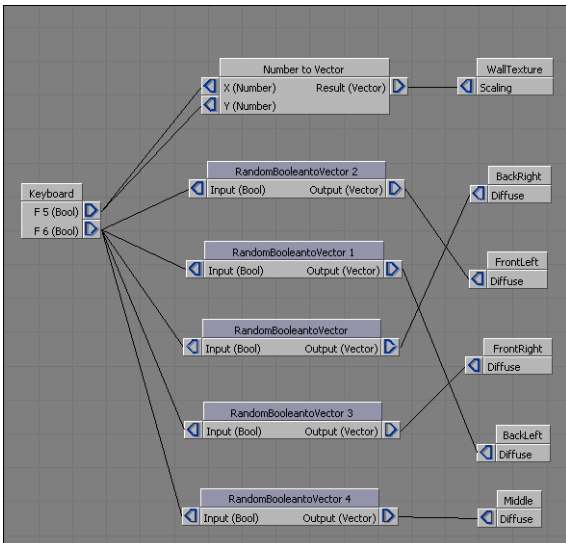


fig 28-18: Click **Hide Unconnected** to show only the connectors that are used in the constraint.

11. Right-click in the Relations pane again and select **Show All Values**. The value of each connector used appears in white next to the corresponding relations box (fig 28-19).

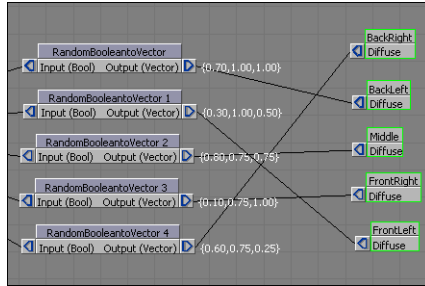


fig 28-19: The value of each connector appears in white next to the corresponding relations box.

! Note:

Use **Show All Values** only when creating constraints and deactivate it when you are viewing the take. The constant refreshing rate setting slows down the display.

Step 5: Testing the Constraint

In this step, you will test the constraint you created with your Macro constraint.

1. Press **F6** on the keyboard several times, and watch what happens to the floor tiles in the Viewer window.

The colors change due to the variable values generated by the constraint. Watch how the values fluctuate with each change in the Relations pane.

2. Press **F6** and **F5** at the same time to create interesting effects on the wall and floor tiles (fig 28-20).

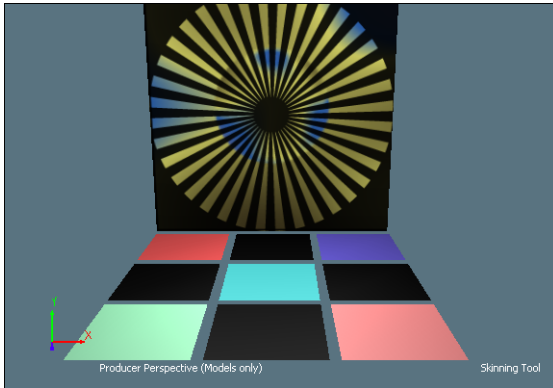


fig 28-20: Press F5 and F6 to create interesting effects with the wall and floor.

3. Activate the **Free Running** option in the Video settings to make the wall pattern undulate, or go to the first frame of the take (**Ctrl-Home**) and play it (**Ctrl-Spacebar**).

Conclusion

In this tutorial, you created a complex relations constraint to use as a macro in another relation to modify the behavior of a floor texture.

Use this technique as a time-saving measure when making complex relations constraints so you do not have to build the same constraint many times.

