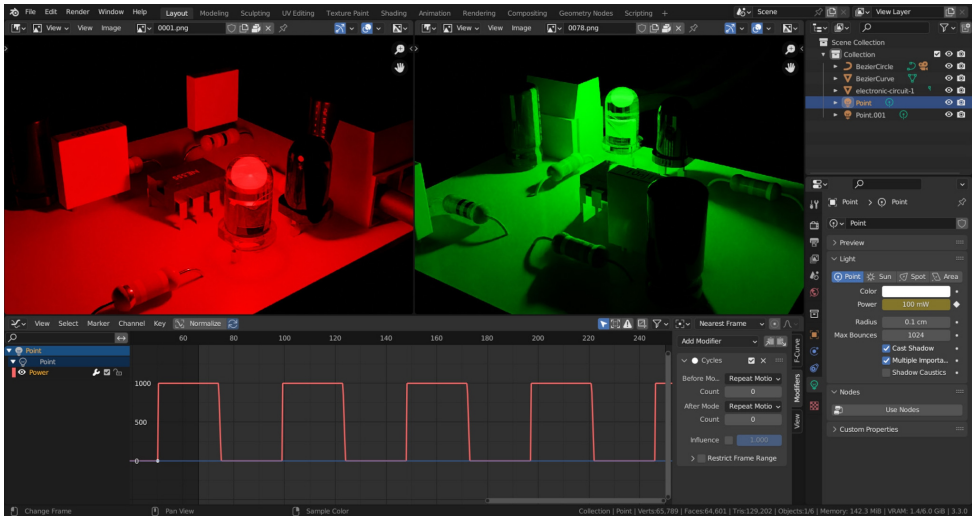


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Hello everyone!

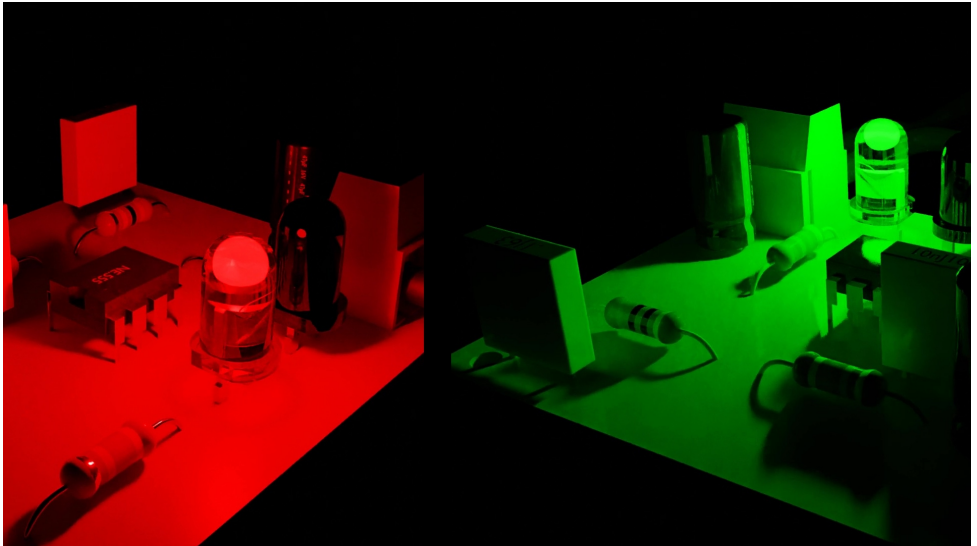
In this short tutorial, we will see how to use Blender's animation **Cycle** modifier to create cyclic animations, meaning we will make certain keyframes repeat themselves cyclically throughout the clip's duration.

The animation curves between keyframes are called **F-Curves**, and Blender provides us with modifiers, aptly named "**F-Curve Modifiers**", that allow us to easily transform them.

One of these modifiers is **Cycle**, which repeats two or more control points (i.e., keyframes) in a cyclical manner.

This is a basic tutorial and was created using Blender version 3.3; however, the **F-Curve Cycle** modifier has been available for several versions and will likely continue to be available in the future.

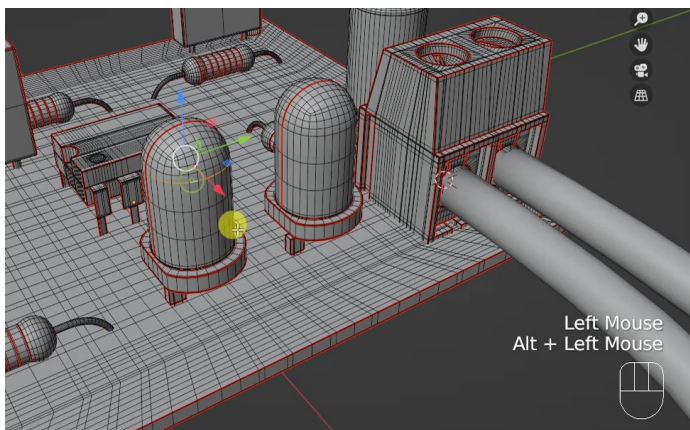
As a practical example, we will create the alternating activation of two LEDs in a 3D electronic circuit model that I am showing on video.



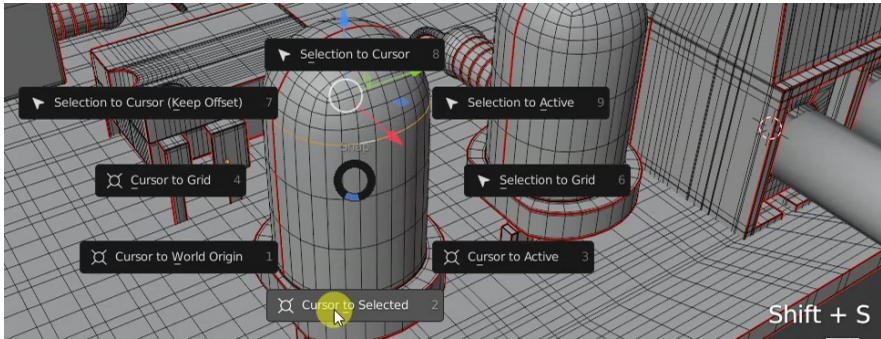
First, I position two different ***Point Light*** sources near the two LED diodes, which have semi-transparent colored containers. Therefore, it is enough to add a white Point Light **in the center of one LED**, duplicate it, and move the copy inside the other LED.

Blender adds new objects where the **3D Cursor** is located.

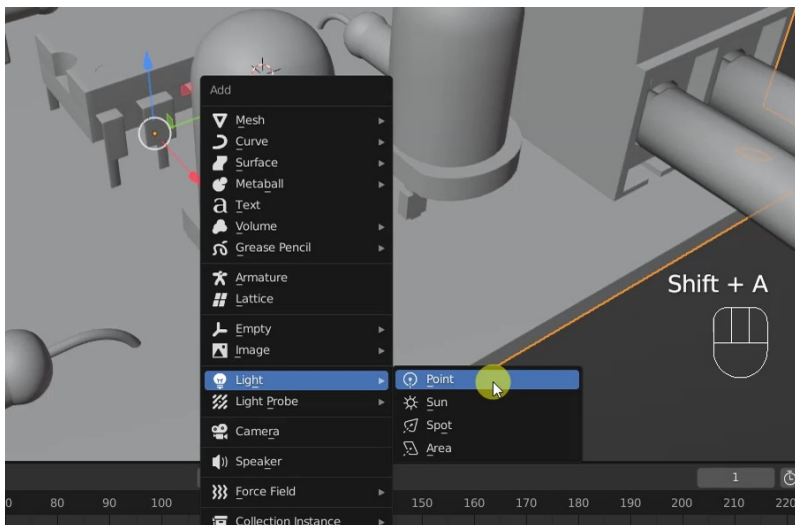
To position the 3D Cursor at the center of the first LED, I select the circuit, switch to Edit Mode, deselect everything, and then select one of the upper vertex rings of the LED with **ALT and left-click on an edge** of the ring I want to select.



Finally, I press **SHIFT+S** and choose "**Cursor to Selected**" from the menu that appears on the screen before returning to Object Mode.



The Point Light source can be easily added from the **Add** menu in the **3D Viewport** (the shortcut is **SHIFT+A**).



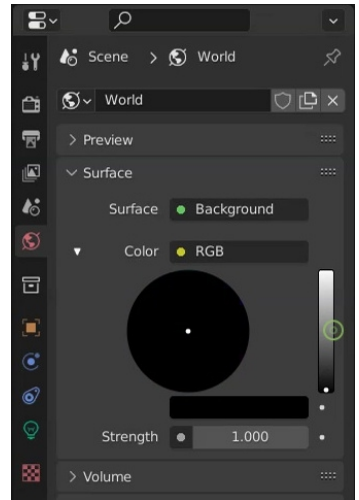
The second light source can be obtained, as mentioned earlier, by duplicating the first, so I press **SHIFT+D** and move the copy inside the second LED.

It is not necessary to position the second Point Light exactly in the center of the vertex ring of the second LED, but I take this opportunity to tell you how to move an object to the point where the 3D Cursor is located.

I switch to Edit Mode, select the vertex ring of the second LED (also in this case, with **ALT** and **click on an edge** of the vertex ring I am interested in), and position the 3D Cursor there with **SHIFT+S** and "**Cursor to Selected**".

After that, I go back to Object Mode, select the second light source, press **SHIFT+S**, and select "**Selection to Cursor**" this time.

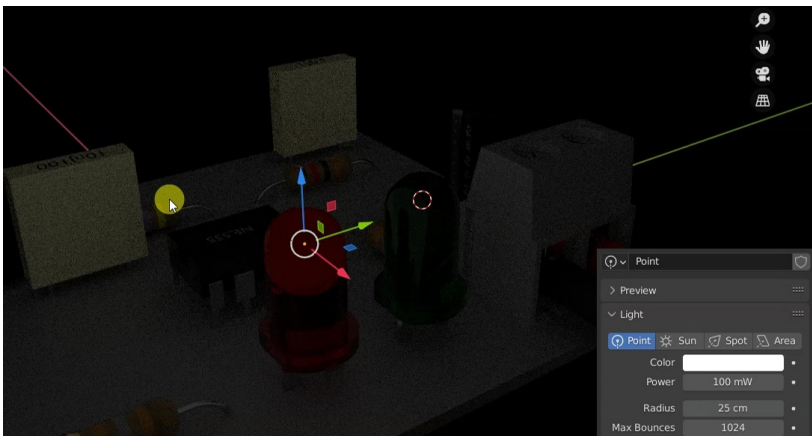
To better appreciate the effect, I make the virtual universe background black, setting **Background RGB** to black in the **World** tab of the **Properties** editor.



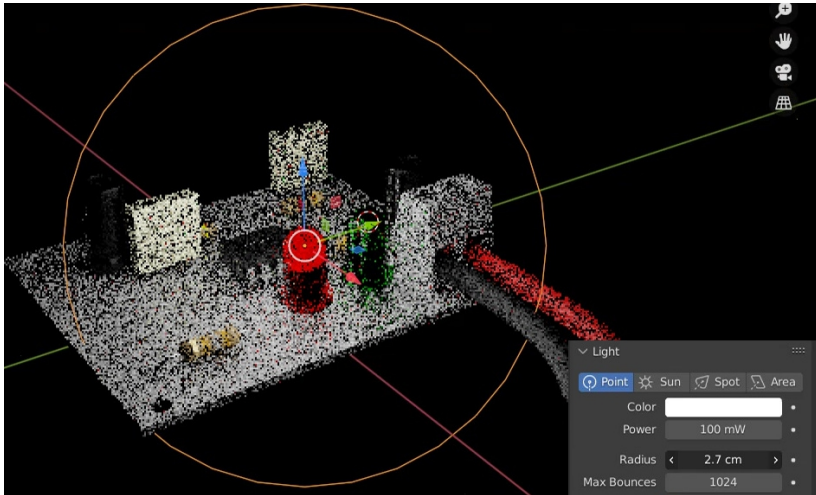
To take a look at the preview of the result, I press the **Z** key while the mouse cursor is inside the **3D Viewport** and choose **Rendered** from the selector that appears on the screen.

The two Point Light sources have too low an intensity; however, to set the lighting correctly, we need to act on both the **Power** and **Radius** parameters of the Point Light.

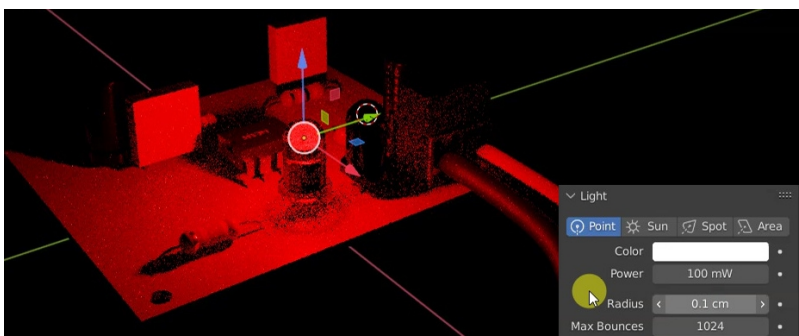
For example, setting 0.1 Watt for **Power** with the default value of **Radius** (25 cm) will result in very dim and, above all, white lighting!



This is because the **Radius** parameter indicates the size of the light source, so it is as if we placed a 25 cm radius light bulb in the scene, which we can see by zooming out: the circle that appears when we select the **Point Light** represents its dimensions!



By setting a much more suitable value for **Radius**, such as 0.1 cm, we will achieve the desired result.



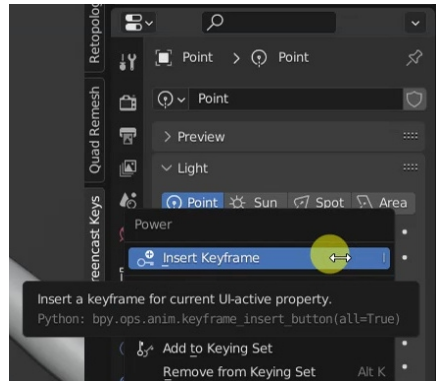
Before going any further, let's set the **Radius** to 0.1 cm for the second light source as well, to avoid unpleasant surprises. In this case, however, set **Power** to 0, because initially, the second LED will be off.

Finally, it's time to talk about animation!

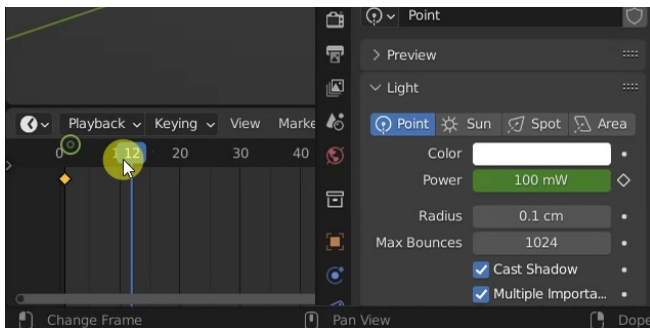
The footage I intend to create consists of 250 frames, at 25 frames per second.

The LED on/off cycle must last 2 seconds, so obviously, each LED will stay on for 1 second, or 25 frames.

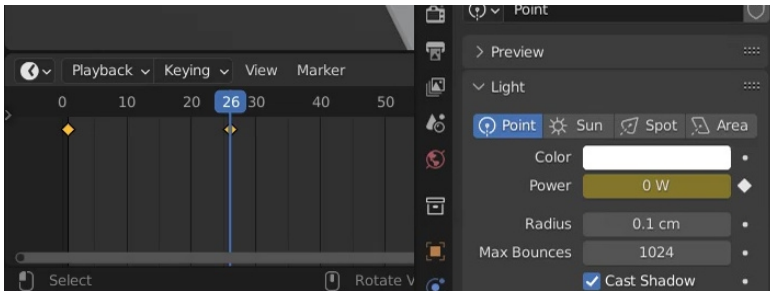
First, I position myself at **frame 1 of the animation** and insert an animation keyframe for the **Power** field of the first LED. I do this by placing the mouse cursor over the Power field of the Point Light, then right-click and choose "**Insert keyframe**" from the menu that appears on the screen. Alternatively, when the mouse cursor is over the **Power** field, I can press the **I** key directly, which is the shortcut for **Insert Keyframe**.



The **Power** field will change color, and in the **Timeline**, we will see a **diamond** appear, indicating that we have indeed inserted an **animation keyframe**.



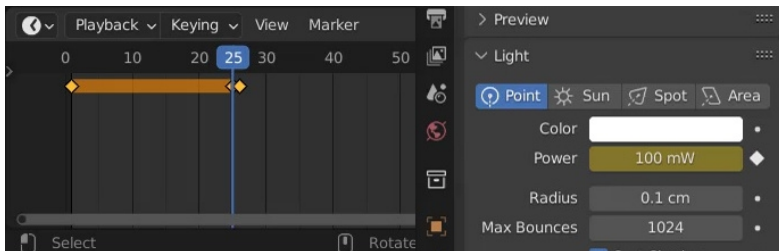
The first LED must turn off at frame 26, or after one second of animation, so I move to the 26th frame of the animation, set **Power** to 0, and insert a keyframe for this value...



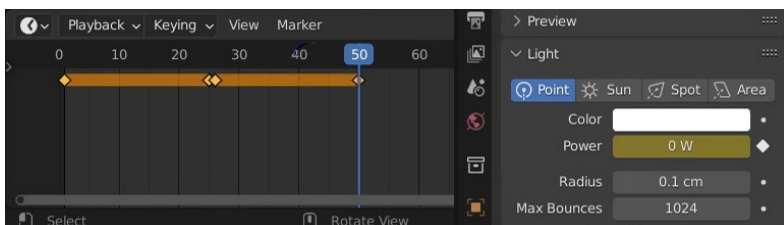
... is everything done?

Well, not quite! In an animation like this, the **Power** value would drop from 0.1 Watt to 0 Watt **over the course** of the 25 frames; however, we want the LED to turn off **instantly**, from 0.1 to 0 Watts.

To solve this problem, I position myself at frame 25 of the **Timeline**, where **Power** is 4 milliWatts (value interpolated by Blender), write 0.1 Watt in the **Power** field, and **insert the keyframe**.



We're not done yet: for the same reason, I position myself at frame 50 of the animation and insert the keyframe for **Power** with its value set to 0 Watt; this way, when the animation becomes cyclic, **the value will instantly change** to 1 at frame 51.



After that, the first LED will be on for the first 25 frames with constant intensity and off from frame 26 to frame 50.

I need to perform **the same operation** but with inverted *Power* values for the **second Point Light**.

After selecting the second **Point Light**, I position myself at the first frame of the animation and insert a keyframe for the *Power* field with a value of 0 Watt.

Then I move to the 25th frame to insert a keyframe for *Power*, still at 0 Watt (because I want **an instant, not gradual, turn-on**).

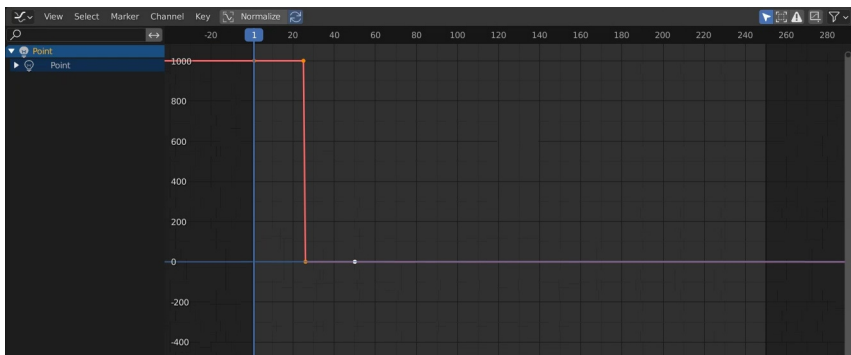
At the 26th frame of the animation, I write 0.1 Watt in the *Power* field and insert an animation keyframe.

Then I move to the 50th frame of the animation and insert a keyframe for *Power* at 0.1 Watt, **concluding the animation cycle**.

Examining the result obtained up to this point in *Rendered* mode in the 3D Viewport, we see that the first cycle is executed correctly; obviously, from the 51st frame onwards, the second LED will be **permanently on**, while the first LED will remain off.

Now it's finally time to **make this animation cyclic**, which is the main topic of this tutorial!

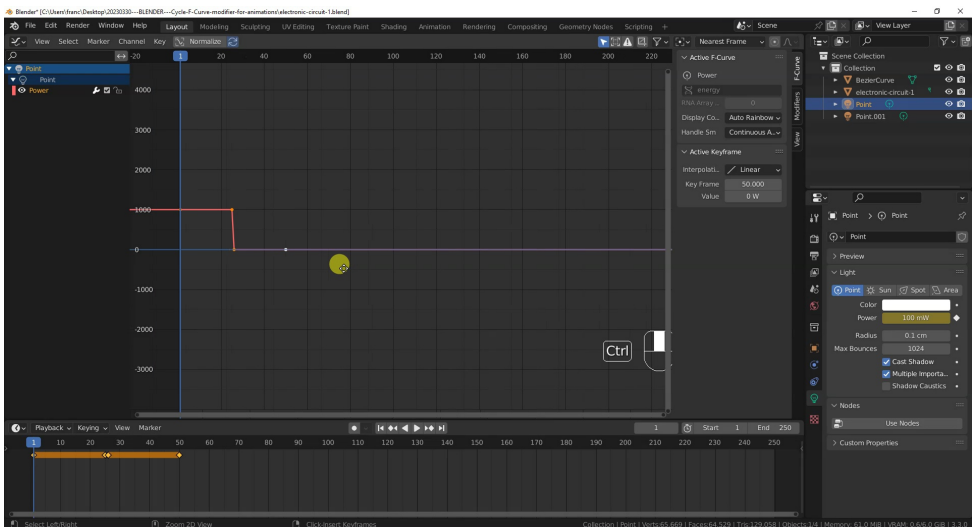
We open the *Graph Editor* and select the first **Point Light** to examine its **animation curves**.



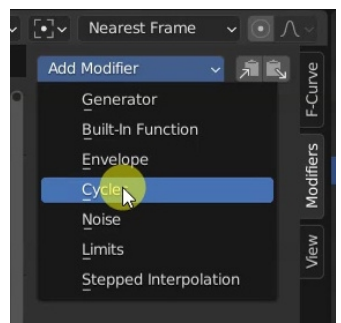
We will notice the presence of only one curve: **Power**, obviously.

If the curve should have an exaggerated size, we can compress **the scale of the Graph Editor** with **CTRL and the middle mouse button**, moving the mouse horizontally or vertically, depending on the axis to be compressed or expanded, to better view the curve.

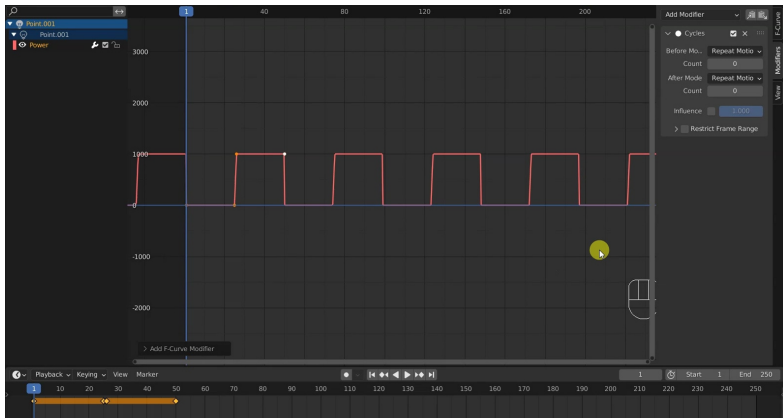
The values we inserted are clearly visible, and for each keyframe, the value of the **Power** field is also visible in the **F-Curve** tab of the **Graph Editor** (which you can open or hide with the **N** key).



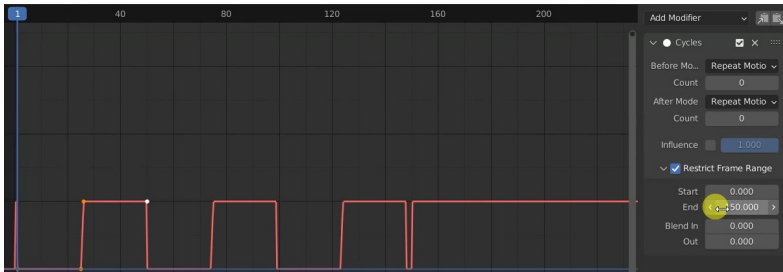
To make this animation cyclic, we select all existing control points with one of Blender's selection tools, such as the **A** key, the **B** key, or any other method that comes to mind; then, we open the **Modifiers** tab in the **Sidebar** (shortcut **N**, as mentioned earlier) and add a **Cycles** modifier: done!



We repeat the same operation for the **second Point Light**: we select its **Point** channel in the Graph Editor, select all the control points of the curve, and add a **Cycle** modifier.



In our case, the default settings of the Cycle modifier will work just fine for both light sources; however, I want to point out the possibility of limiting the cyclic repetition to a specific frame range of the animation: it will be enough to select the "**Restrict Frame Range**" checkbox and set the frames for the **Start** and **End** fields.



By opening a **3D Viewport** editor and starting the animation in **Rendered** mode, we can examine the result obtained; I would like to note that, when selecting one of the two **Point Lights**, in the **Timeline** we will only find the keyframes we set, as the others are not physically present but are created by the **Cycle modifier**.

In fact, a large part of the tutorial focused on setting up the scene, as using the modifier is quite simple, but I took the opportunity to discuss other topics such as **Radius** for **Point Lights** and the proper setup of keyframes to achieve instant on and off for the LEDs.

Well, I hope this tutorial was helpful to you!
See you soon!