TUTORIALS

“REAL-TIME SHADOWS”

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**TUTORIAL - “REAL-TIME SHADOWS”**

**INTRODUCTION**

From ARPlugin version 2.2, all 3D objects can now cast and receive real-time shadows. Shadows permit to create more realistic scenes as well as more good-looking models.

You can use one directional or omni light as created in 3ds Max® to be the light source which can be used to generate shadows on other objects during the AR visualization. Please note that also spot lights can be used, but at the moment, they will be treated the same as omni lights.

**EXAMPLE ‘Moving the sun’**

In this tutorial, we will show how to correctly setup a scene to have shadows and how to configure some of the main properties of a light acting as a “sun” object, along with some interesting effects you can achieve by setting up the light’s properties. In particular, we will configure two markers: one will hold the whole 3D model while the other one will act as a light source.

![Sundial model](image)

**Step 1: Modeling**

For this tutorial, since we are not going to work directly on the 3D objects, you can use any model you want. You are free to use any 3D model you already have. We chose to model a simple sundial, as you can see from the screenshot below.
Step 2: Viewing the model with shadows

The easiest way to make ARPlugin display shadows is to ensure that your scene only has one light which has the On box checked in the Shadows section. So, create a Directional light and put it on the scene so the sundial will create a shadow. Ensure that the newly created light is configured to generate shadows by checking its parameters from the 3ds Max® properties panel.

Then, add a marker to the Active Markers’ list and open its Marker Configuration panel. Select the objects you want to view in AR, along with the light source.

If you start the AR visualization of the model, you should see the 3D scene with shadows enabled as the screenshot below.
This is not what we are looking for, because in this way, if we move the marker, all the objects (along with the light source) will move accordingly.

**Step 3: Configuring the light source**

Since we already setup one marker, we only need to configure one other marker. Open the Main panel, choose another marker from the library and add it to the Active Markers’ list.

We will use one marker to hold all the 3D objects and the other one to act as the light source. Let’s call the first marker **Marker A** and the second one **Marker B**.

Open the marker A Configuration panel, select the sundial object from the 3ds Max® viewports and click on the “Include” button. Ensure that only the sundial object is attached to this marker and not the light we want to use as the “sun”.

Now, switch to the marker B panel, select the light you want to use to generate shadows and click on the “Include” button.
Select the light from the *Attached Objects*’ list and click on the **Properties**... button: you will notice that the usual *Object’s Panel* will show up, but this time it contains a new section (see image below).
The “light configuration” section will appear every time you will need to configure properties for an object which is recognized as a light by ARPlugin. If you check the **Cast Shadows** box, the selected light will be used to generate shadows on other objects during the AR visualization. Additionally, the new section will expand with new options:
As you can see from the panel above, you can select three options which can tell which markers can be affected by the light:

- **Current**: this option means that only the objects of the marker containing the “Sun” will have shadows. Other markers (even if you attached the same objects to them) will not.
- **All**: this option means that all markers will be affected by the sunlight
- **From list**: this option permits you to choose which markers will be affected by the sunlight among all the active markers.

For our goal, check the **From list** option and then click on the name of the **Marker A**.

As you can see from the image above, a “+” sign appeared on the selected marker. In our case, you can see that only the “AR-media” marker’s objects will emit a shadow. This is what we want because the other marker will only contain the “Sun” and no other visible object.

**NOTE**: the **Details** option permits you to set the overall shadows’ details. If you notice bad performances during the AR visualization, you can try to set this option to Medium or Low.

**Step 4: Viewing the scene**

Now, the markers’ configurations are finished, all we have to do is check the results in Augmented Reality. So, when displaying in AR, keep **marker A** on a fixed position and then try to move **marker B** around the environment to see how the shadows dynamically adapts to the light’s orientation.
Step 5: Notes about the light object

There are some remarks you must understand before using shadows in ARPlugin.

- Since ARPlugin only supports one light which can generate shadows, you cannot include a light with the Cast Shadows box checked to another marker. In fact, if you try to attach the light to another marker, you will be asked if you want to switch the light it to the current marker (see image below).

  ![Warning: the following light is already configured to cast shadows and is attached to the AR-media marker: Direct001. Do you want to maintain the configuration and switch this object to the current marker?](image1)

  If you click on the “Yes” button, the light will be removed from the old marker and attached to the current one. If you choose “No”, then the light will not be included in the current marker.

- Let’s say you have more than one light in a 3ds Max® scene and you already configured one light to generate shadows. If you now attach another light to a marker and check the Cast shadows box, you will be asked if you want to use this object to generate shadows or not (see image below).

  ![Warning: another AR light object is configured: Direct001. Do you want to set the current object and discard this one?](image2)

  If you click on the “Yes” button, the old light will not generate shadows anymore but the current light will. If you choose “No”, then the current light will not generate shadows.

Going further

Viewing the light source: if you completed the Sundial tutorial, you may have noticed that during the last AR visualization, the shadow on the sundial only changed upon rotation of marker B. In fact, if you tried to translate the marker, no changes in the shadows were visible.
This happens because the “Sun” light source is treated as a *Directional Light*: these types of lights do not have a real “position” in the scene, but they are only defined by a 3-dimensional vector. This vector defines the direction of the light in the environment. So, when rotating **marker B** you act on the direction of the light. Please note that the initial configuration of this vector reflect the actual direction as configured in 3ds Max®.

Sometimes, during AR visualization, it cannot be so easy to guess what the current direction of the light is by looking at the shadows. ARPlugin permits you to view a representation of the light source in order to have a better understanding on how you want to move/rotate the light source.

During the AR visualization, enter the *Lighting Management Mode* by pressing the **F8** key and press the **Spacebar**. You will see that a 3-axis geometry with a yellow cylinder will pop-up somewhere in the screen (see screenshots below).

Two things can be inferred from the images above:

- It is possible to move the light source even without moving the respective marker. This can be done by using the following keys:
  - E/D will rotate light source around its local Z axis
  - Q/A will rotate light source around its local X axis
  - W/S will rotate light source around its local Y axis
- The light’s model geometry is placed with respect to the marker’s position and will follow it just like any other 3D object. Additionally, that geometry has a fixed size: this means that if you modify the marker’s size from the **Marker configuration** panel, you will see a smaller/larger object. This is not really an issue, since that is only a “helper” object. Once you will get some skills with the whole management features, you won’t even need it anymore!

**Enabling soft shadows:** during the AR visualization, you will be able to configure even more parameters regarding shadows’ display.

If you enter the *Lighting Management Mode* by pressing the **F5** key, you can interact with the light source as well as configure some parameters. Press the **H** key to see a list of all the available commands.

To enable soft shadows, press the **CTRL+2** keys. While in this mode, shadows’ contours will be softened just like you can see from the image below.
Please note that since soft shadows’ display requires more processing power than simple shadows, you may experience the overall framerate falling. This also depends on various factors: model’s complexity, resolution of the camera frame and overall hardware’s power. If this happens, you may want to change the Visual Accuracy parameter to Fastest by pressing the ALT+1 key.

Displaying only shadows: one interesting feature offered by ARPlugin is the possibility to only display shadows during the AR visualization (see images below).

This particular visualization mode can be useful if you want to know how accurate the shadows are displayed during the AR visualization.

The Only shadows mode can be activated by following these simple steps:

1. Enter the Lighting Management Mode by pressing the F8 key.
2. Make sure you have the Visual Accuracy parameter set to Highest by pressing the ALT+2 key.
3. Press the CTRL+0 key to only visualize shadows.
4. Press the ALT+0 key to turn back to the classic visualization.

Animated light: since a light is none other than an object in 3ds Max®, you can achieve some interesting results if you try to animate it by simple rotation and translation operations.

Conclusion

This tutorial offered an overview about lighting and how to set up its main properties. You should now be able to correctly setup a 3D scene to cast shadows as well as configuring a more complex scene with multiple markers.