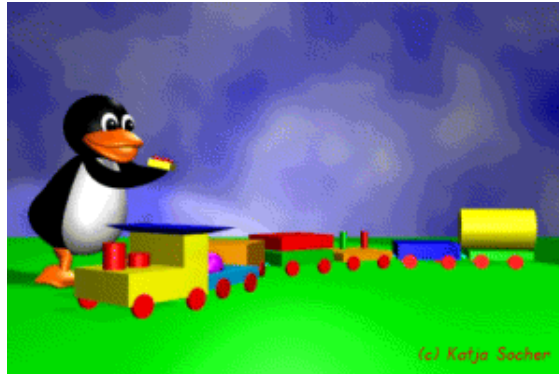# Going 3D with Blender: A toy train

by Katja Socher

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About the author:

Katja is the German editor of LinuxFocus. She likes Tux, computer graphics, film & photography and the sea. Her homepage can be found here.

Abstract:

In this second article in our series about modeling with Blender we create a little toy train. We assume that you have read the first article Going 3D with Blender: Very first steps and built that little stage yourself as we are now using it as our starting point.

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Going 3D with Blender: A toy train

Look at the illustration picture above and imagine it without the Tux penguin. We are now going to create a similar toy train.

Open the default.blend file with our stage settings that we created last time as the starting point for our toy train. (In case you saved them with the sphere and the cube select them by a right click while holding shift down and press x to delete them.) We will begin with modeling the last wagon. I still used Blender version 2.27 when writing this article.

Building the last wagon first

To build it we start with a cube (for the green part): In front view press Space and then Add-->Mesh-->Cube. Then press tab to leave edit mode. With the cube still selected press s (in front view) and scale the cube down so that it has the right height. For the length press s again and hold the

middle mouse button down while moving the mouse to the right. This way you restrain the change in size to the side you are moving the mouse. Finally for the width go to side view, press s and again move the mouse to the right while holding the middle mouse button down.

Sometimes you will find that Blender doesn't want to do what you intended to do. So you also have the possibility to work with numerical values. Just hit n to get to the menu and change the x,y and z values accordingly.

To give it a green colour go to the material button and the white button, click "add new" and change the colour to green (to get exactly my colour: R=0, G=0.82 and B=0). You can either move the sliders with the mouse or you can left click on the letters and then type in the values.

Now we need wheels for our wagon. In front view press Space, then Add-->Mesh-->Cylinder (leave the vertices at their default value of 32) and tab to leave edit mode. Make the cylinder a bit smaller and thinner as you did with the cube: in side view first press s and scale the whole cylinder down then press s again and hold the middle mouse button down while moving the mouse to the right (or hit n to use the numerical values) to make the cylinder thinner. Give it a red material (go to the material button, then press the white button and "Add new" and move RGB to 1, 0 and 0 respectively), then in top and front view place it (press g and move the mouse) on one side of the wagon. The first wheel is ready.

Copy it by pressing shift + d and move (press g) the second wheel to its place. Repeat this until you have all four wheels in place.
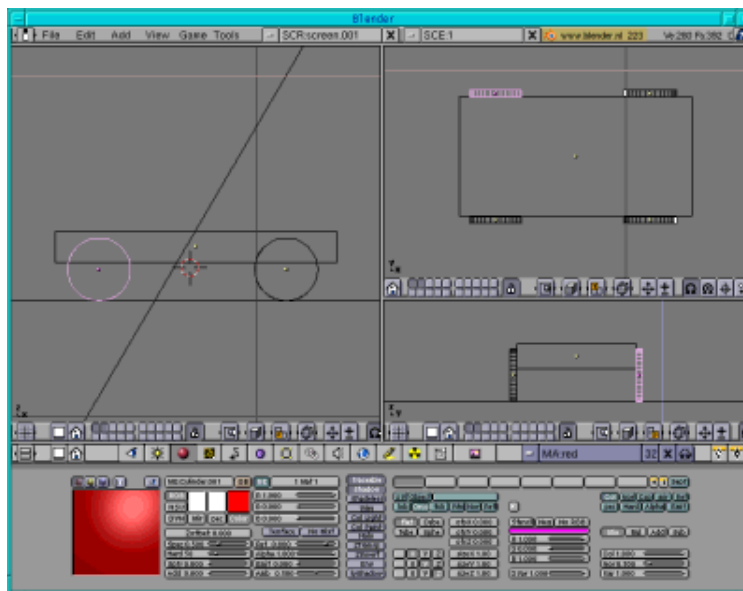

Fig.1 Wheels and green part of the last wagon

Now we still need to build the yellow load of the wagon. In side view hit Space--> Add-->Mesh-->Cylinder, then tab and in top view scale it down (press s) so that the width is as big as the width of the green part. Now press s again and restrain the scaling to the length again (move the mouse to the right while holding the middle mouse button down or hit n to use numerical values). The load should fit exactly on the wagon. Now click g and in front view place the load on the wagon if you haven't done it already and by going to the material button, clicking "Add new" and changing the colour

sliders to R=1, G=1 and B=0 you change the colour of the load to yellow. The first wagon is ready! Congratulations!

The dark blue wagon

Next is the dark blue wagon which is quite easy to build as you probably already see. In front and top view just select the green cube and the four red wheels by right clicks while holding shift down (in case some other part is also selected unselect it by another right click while still holding shift down) and then duplicate it by pressing shift + d. In top view move it to the left and place it besides the other wagon. In front view change the height of the wagon by right clicking on the cube, then clicking on s and moving the mouse upwards a bit while holding the middle mouse button pressed. Now move the whole cube a bit up and give it a dark blue colour by going to the material button, click "add new" and move the RGB sliders to blue (R=0, G=0, B=1).

It might be a good idea to name the materials according to their colour. So left click in the field that starts with MA: and replace the default Material.00x by typing blue. Do the same for the red, yellow and green materials (e.g. select a wheel and go to the material button, the red colour is shown now, left click in the field that starts with MA: and replace the default Material.00x by typing red and so on.)

Fig.2 Naming the blue material "blue"

By the way you can use + and - of the numpad to zoom in and out of your views. If you want to change the section that is visible after you have zoomed in for example you can move within the view by pressing shift and the middle mouse button while moving the mouse.

Depending on how big you have made the two wagons it can be necessary to scale them down when you add more wagons as you won't be able to see them on your rendered image otherwise. Just select all objects that belong to the train either by clicking b and marking (draw a rectangle around) the two wagons (shift + right click on objects you just unintentionally selected by this) or by holding shift down and clicking on every little object individually, then press s and change the size of all wagons. This way all wagons will get the same change in size and will so fit nicely to each other.

The wheels of our wagons should also slightly touch our floor. By scaling them down they have probably moved themselves up a bit so press g and move everything down on the floor again.

You can always press F12 to make a render and see if the train looks good.

The orange wagon with red and green cylinders

The third wagon is easy as well: Again select the green wagon and its four wheels (click b and mark the objects (draw a rectangle around them), make sure that only the objects you wanted to select are really

selected, otherwise unselect them by shift + right click), duplicate it (shift + d) and move it to the left of the dark blue wagon. Change the colour of the wagon to orange (right click on the cube to select it, then go to the material button, press "Add new" and change the colour sliders to R=1, G=0.647, B=0, don't forget to name your material "orange" then). Now in top view click with the red-white cursor in the middle of the right part of the wagon, then press Space-->Add-->Mesh-->Cylinder, then tab to leave edit mode. Scale the cylinder down (press s) and then in front or side view place (press g) the cylinder on top of the wagon and scale the height up (press s again with holding the middle mouse button down to constrain the scaling) and give it a red colour (go to the material button and click the white button and then red.

The cylinder should now be in the middle of the right part of the wagon (you can see this e.g. in top and front view). Next you only need to duplicate it (shift +d), place it (press g) in the middle of the left part of the wagon and change the colour to green (go to the material button and choose "green" from the list of materials).

Now the third wagon is ready too!

The red and green wagon

For the forth one select all parts of the dark blue wagon, duplicate them (shift +d) and move them to the left. Select the dark blue cube (right click) and change the colour to green. Now in front view duplicate it and place it on top of the other. Change the colour to red. That's it already.

The orange wagon

The same for the next one: In top view select all parts of the dark blue wagon (right click on the blue wagon, then click b and mark the objects), duplicate them and move them to the left. Now select the dark blue cube (right click) in front view again and change its height and its colour (to orange). As the cube will move a bit downwards by scaling it up, move it a bit up. Here we go.

The light blue wagon

By now you should have some practice with moving, scaling, rotating and changing colours. So for the last wagon we will use a new technique.

As you can see it is different from the others as it is open on top. To create it add a grid in top view (hit Space, then Add--> Mesh--> Grid). You are asked for Xres and Yres, choose 8 with both. Click tab twice and select the two outer lines of all four sides (click on b and mark the two lines on top, then click b again to mark the next two lines until you have selected all the two outer lines of the grid).
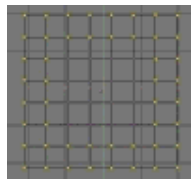

Fig.3 The grid with the two outer lines of all four sides selected

Now in front view extrude the selected points by pressing e and moving the mouse upwards. By extruding you create three-dimensional geometry out of flat, two-dimensional shapes and it is a technique you will frequently use when you work in 3D.

The rest you should already know by now: Click tab to leave edit mode. Give it the right size (press s and scale it to make it fit to the other wagons) and a light blue colour (R=0 G=0.714, B=1), add the four wheels by copying them (shift +d) from another wagon and place them accordingly (press g).

Finally you hit Space and then Add-->Mesh-->UVsphere (change both, the number of the segments and the rings back to 32) to add the sphere. Press tab, scale the sphere down (press s), place the sphere inside the wagon (press g) and change the colour to pink (go to the material button, then click the white button and "Add new", then move the colour sliders to R=0.8, G=0 and B=1). Now go to the edit button (the button that looks like a square with yellow edges) and press "set smooth" (as you already did with the sphere in our previous article). The sphere will get a much smoother look (a smooth surface).

The connection between the wagons

Before modeling the locomotive let's first connect our wagons: Again add a grid (I chose 8 for the values of Xres and Yres again but you could also choose Xres=8 and Yres=2..) in top view to our scene, extrude it a little bit in front or side view by pressing e and moving the mouse, then press tab to leave edit mode and now in top view again resize it (press s). Its length should be from the center of one wagon to the center of the other with a little space between the two wagons and it shouldn't be larger than one-third of the width of the wagons (see Fig.4 and 5). Give it a material (R=0, G=1, B=1). Duplicate it (shift +d) and place it between all wagons (don't forget the one between the last wagon we modeled and the locomotive).
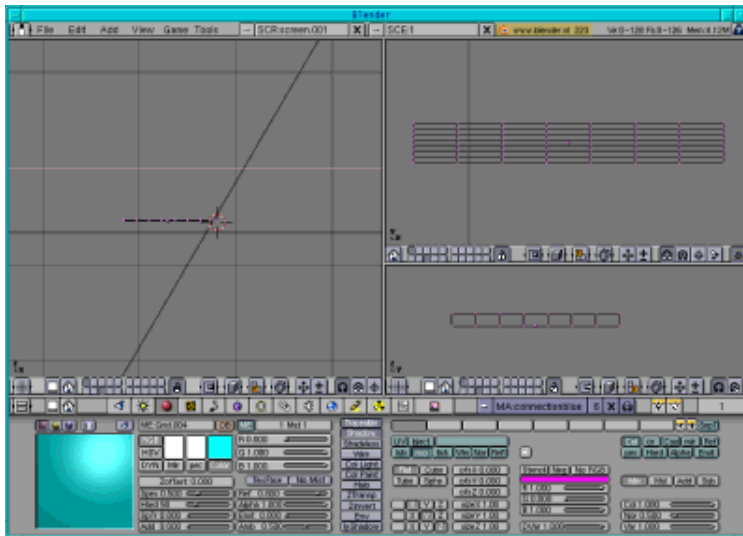

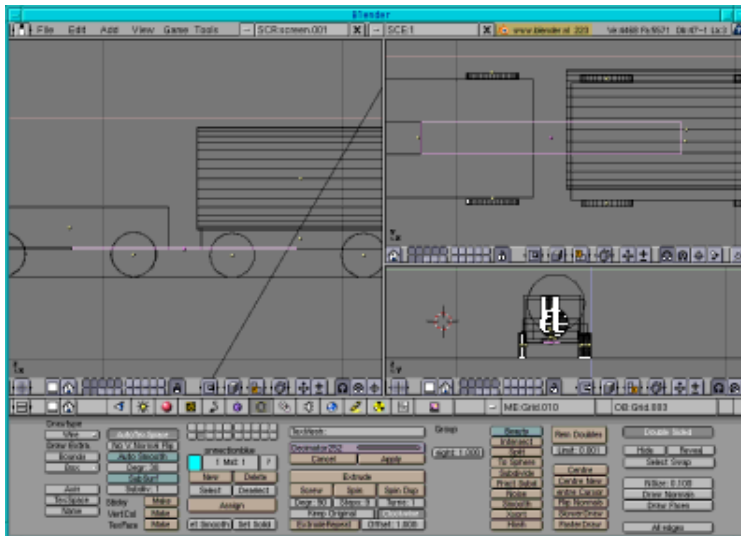Fig.4 The grid for the connection between the wagons

Fig.5 A connection grid between a wagon

The locomotive

Now the locomotive shouldn't be too difficult either: Again add a grid (Xres and Yres being 8 again) to our scene in top view. Then extrude it (press e) in front view. Press tab twice and select (click on b, then mark with the mouse) only the right upper half of the locomotive (the four points on top and to the right). Extrude (press e) this part upwards again. Now give the whole object a yellow colour.

The four upper points should still be selected, extrude (press e) them again (but only a little bit). The new upper points are selected now. Still having them selected press s while holding shift down and move the mouse away from the model to make this part bigger (see Fig.6). Now we have the outline.
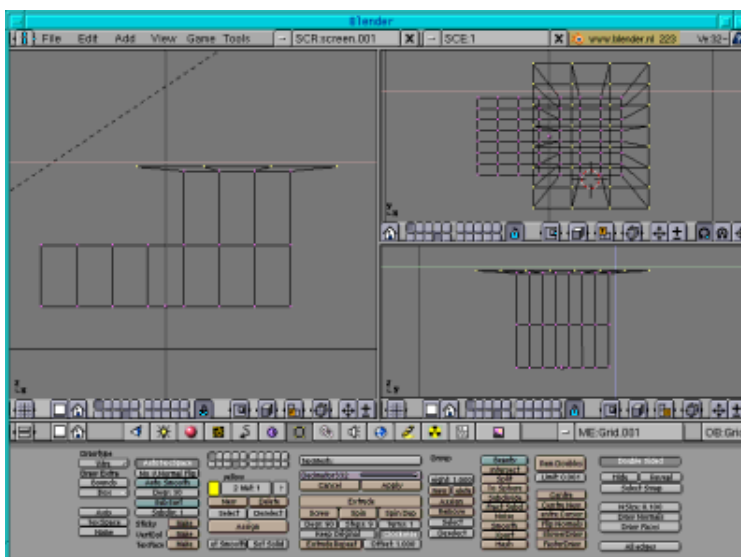
Fig.6 The outline of our locomotive

To give the roof of the locomotive the blue colour select the first line of points below them as well (at the moment only the top upper line is selected, to select the line below them as well press b and mark the line as always before). Then go to the edit buttons and press "new" under the box where the colour is displayed. Next press the "Select" box. Before pressing "Assign" go back to the material button again and click on the blue material. (Note that if you wanted to change the colour to one that doesn't already exist you first have to press "Add New" before you change the colour sliders to your chosen colour.)

Fig.7 The buttons to assign more than one colour to one object

The rest is "old stuff" again: Scale the locomotive to a size that it fits to the other wagons (press s), add the wheels like for all the other wagons and place the locomotive to the left of the other wagons. Then duplicate (shift +d) the red cylinder from the wagon with the two cylinders, resize it (press s) and place it in front of the locomotive. Duplicate and resize this again (it should have half the length of the other), move it to its place and you have successfully modeled your toy train!

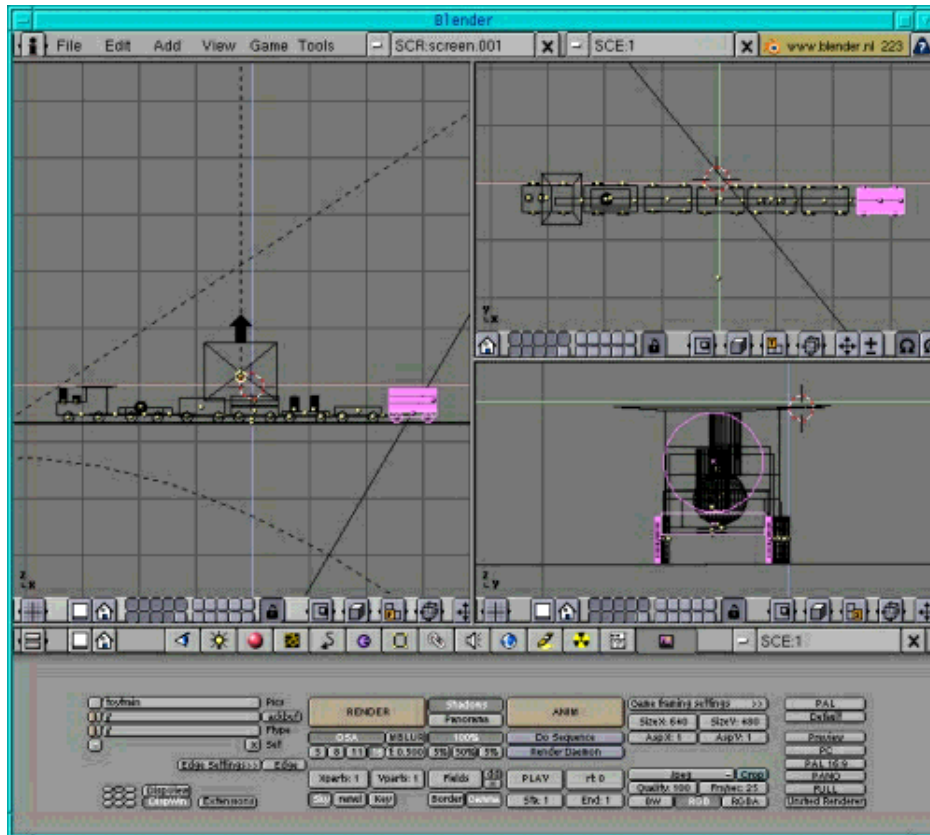Here is a screen shot of the three different views in Blender:

Fig.8 Our train in the three different views

Finally

Your toy train is ready now. But somehow if you render it (press F12) no shadows are displayed (even though you have pressed the Shadow button in the Display menu). Just select the spot light and press the "Only Shadow" button in the lamp button menu. Now give the spot light a higher energy level (e.g. a value of 5.0) and render your image again. There should be some shadows visible now.

Time to admire your work! :)
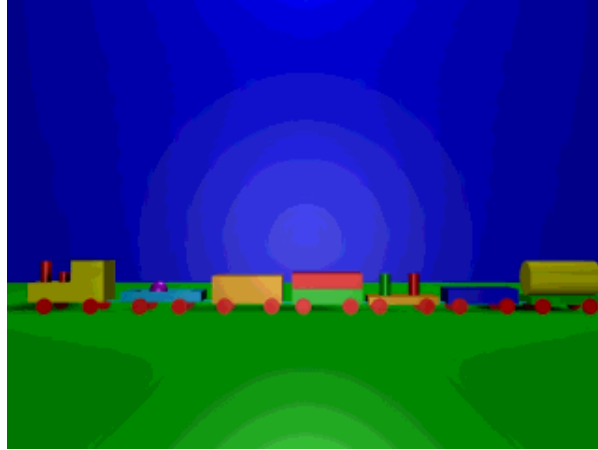
Here is our train:

Fig.9 Our train

If you move the camera a bit up in side view and then rotate it so that it looks down on the train you get this:
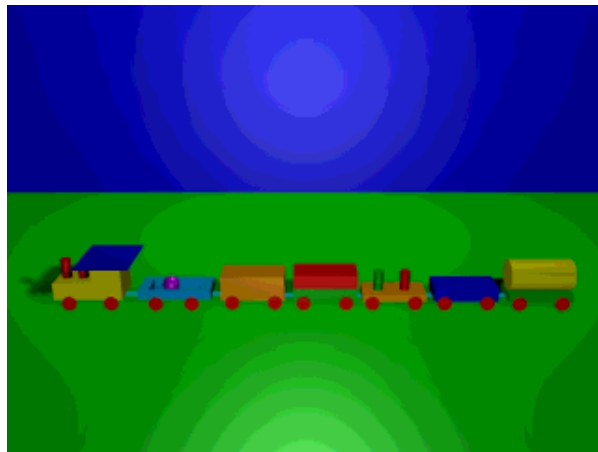

Fig.9 Our train from above (click on the image to get it in big)

To save it as a .jpg image enter the directory and file name in the field with the default entry /render (left click, then type in the name) and also press the Extensions button. With this button pressed the picture is actually saved with the extension .jpg (or whatever format you choose) while otherwise the extension is not shown. Press the OSA button plus any of the numbers below (for quality), press the shadows button to see the shadow the train creates, change the End:250 field to End:1 (either make a left click and move the mouse to the left until the number has changed to 1 or hold shift down while left clicking in the field and then type in the value), choose the values of SizeX and SizeY depending on how big you want your image to be, choose Jpeg or any other format, press the RGB button and when you now hit the anim button your rendered image is finally saved.

Don't forget to save your train as a .blend file as well (go to the menu --> Save as --> type toytrain.blend (or however you want to name it)-->Save file) so that we can reuse it again next time!

Have fun and happy blending:)

References

- The Official Blender site (here you get the latest information about the further development of Blender, you can download it, there are tutorials ..): http://www.blender.org

- Blender cafe (in English and French):
  http://www.linuxgraphic.org/section3d/blender/pages/index-ang.php

- General articles about 3D graphics and animation: http://webreference.com/3d/

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