

# Gearwheels Tutorial

Version 1.0

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**THEMES:** Mesh modelling, material, animation

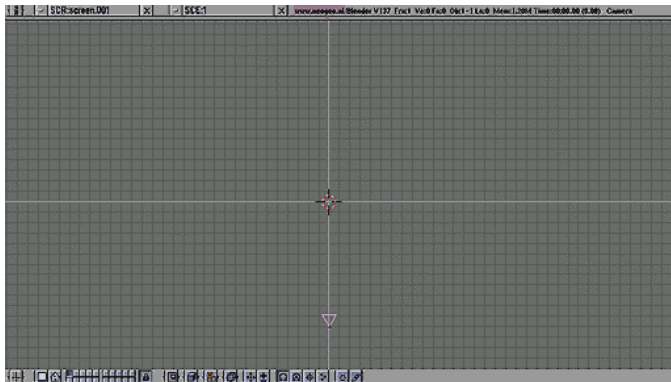
**SKILL:** Beginner

**C-KEY:** No

Blender is a complete modelling, animation, rendering and post production suite created and distributed by NaN, Netherlands. Blender is available for SGI, Sun Solaris, Linux, FreeBSD and Windows 95/NT. Visit [www.blender.nl](http://www.blender.nl) for your free copy of this great software.

## Preparing

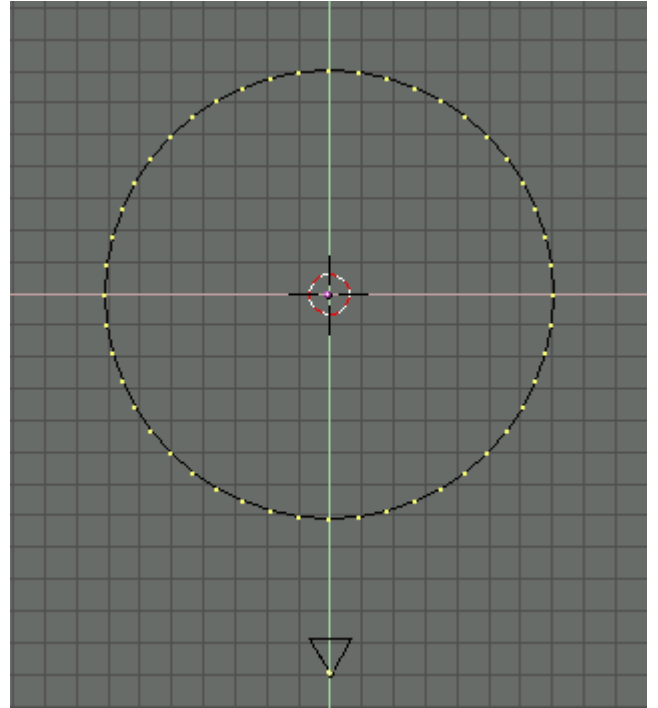
Be sure you are in a 'Top View' , press Numpad-7 to select. Press **x** and **Enter** to erase the selected default plane. Now press the  Zoom key and move your mouse a little down to zoom out the view. Select the camera with right mouse button, press **g** and move the camera down with Ctrl pressed on 5 units down. Your screen should look like this one.



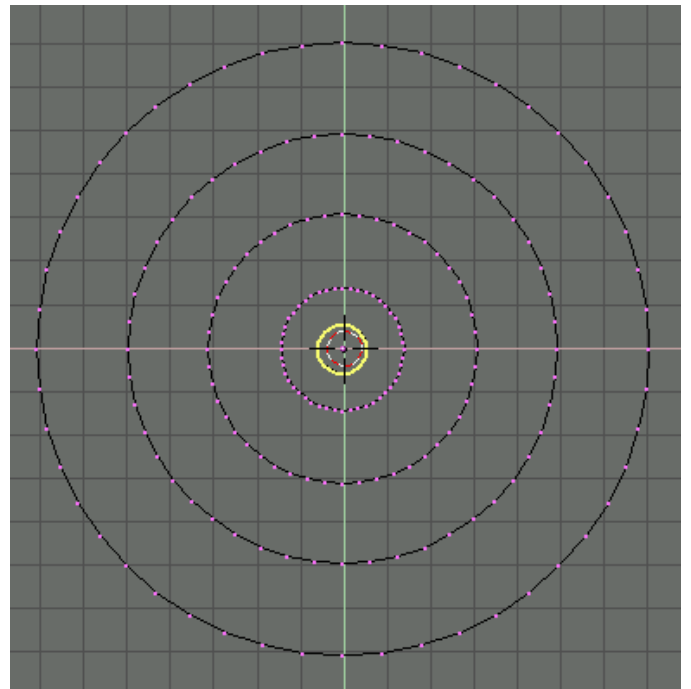
## Shaping

Press **Spacebar** for menu and choose 'Add > Mesh > Circle'. Now enter 48 for the number of vertices (You can use left + middle mouse buttons to switch to a type mode). A little circle will appear.

Press **s** for SCALE and move your mouse to get the circle a little bigger. Use **Ctrl** again to adjust the x,y size to 5.000.

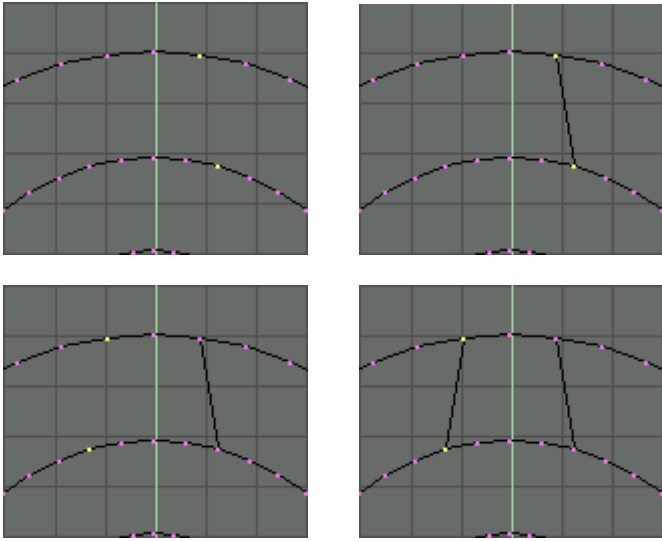


Process with next 4 circles with 3.500, 2.200, 1.000 and 0.400 x, y sizes in this way (be sure you don't move 3D-Cursor by these steps). Zoom in a little.

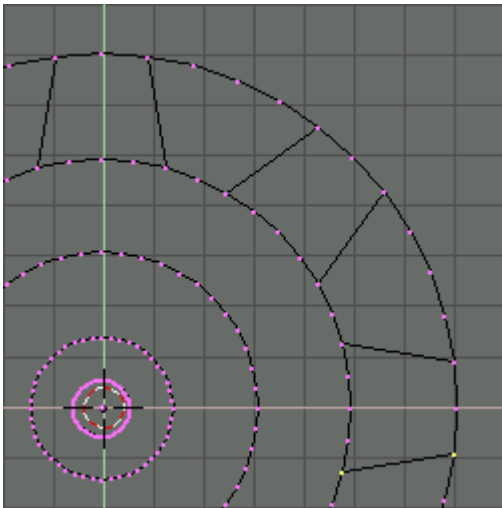


We have to connect and remove some vertices to get teethes. We begin at the top and select one vertex with a right mouse button on the outside circle- and one on the second outside circle with a right mouse button + Shift.

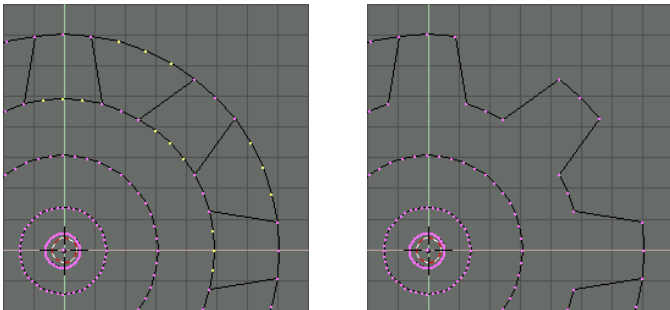
Press **f** to connect both. Make the same on the left side.



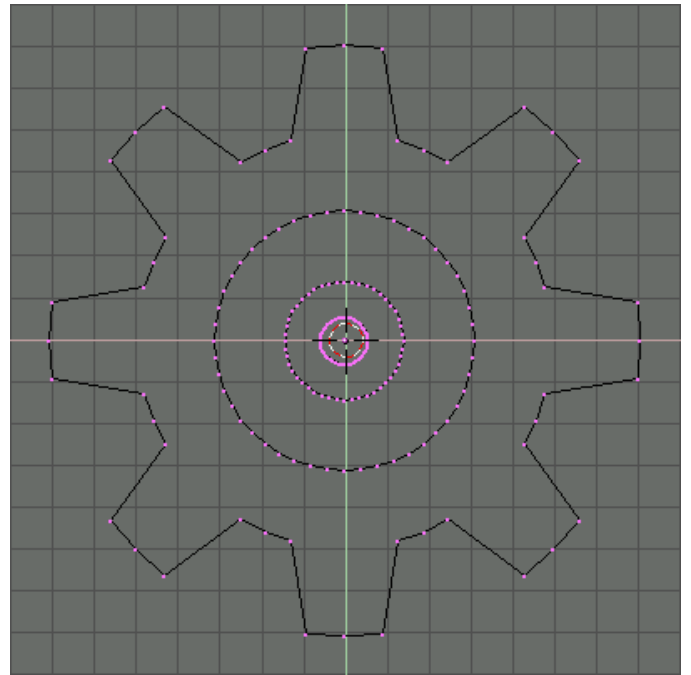
Process with next 3 teethes.



Remove now unnecessary vertices. First select them, then press **x** and **Enter** - you get a teeth.

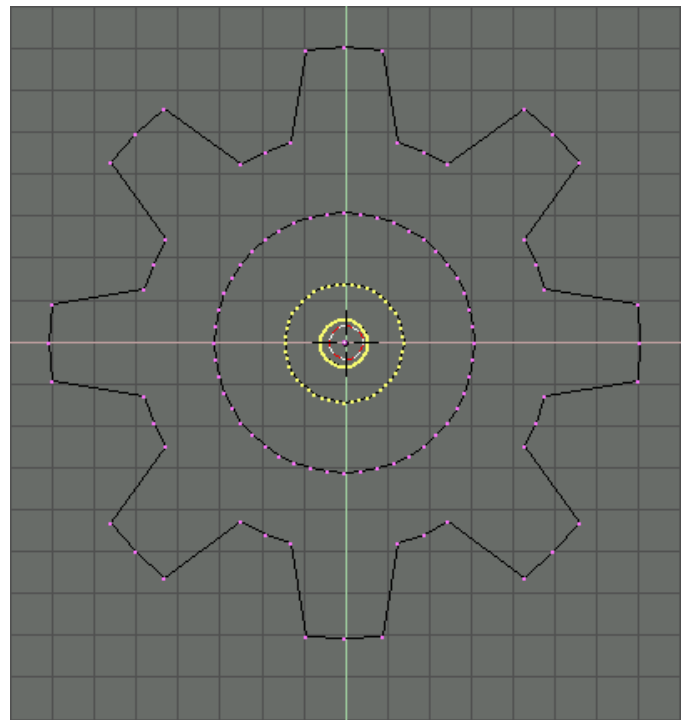


Make other teethes in this way. The shape is ready now.



### Extrude

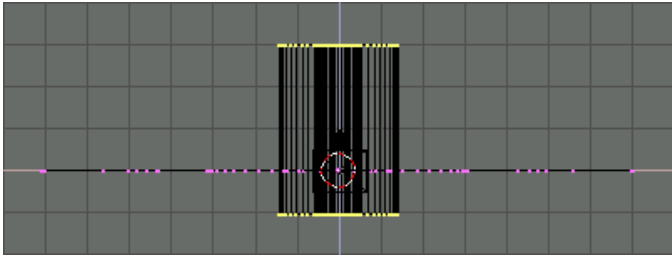
Be sure you don't leave edit mode. Press **b** once and select two internal circles.



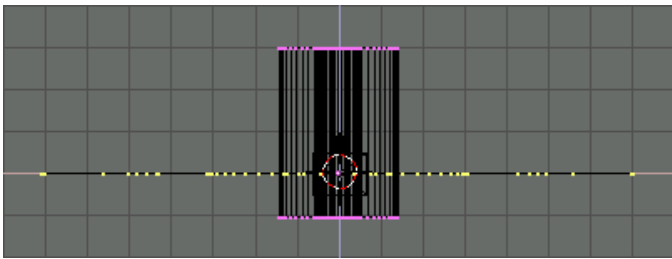
Now select front view (**Numpad-1**). Press **e** and move the mouse up to 4 units with **Ctrl** pressed. Press left mouse button to accept.



Switch to top view (**Numpad-7**) and select both internal circles again. Go to the front view (**Numpad-1**) and move the central part of the wheel to one unit down.

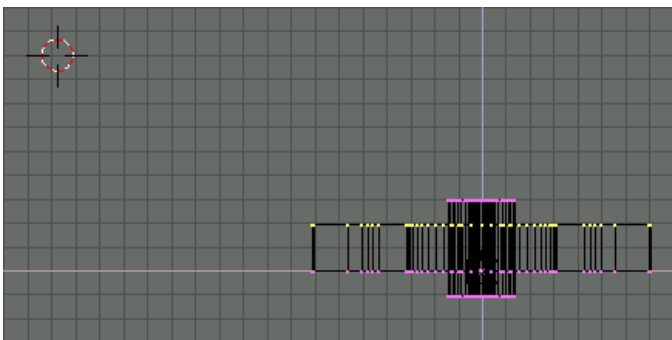


Stay in the front view. First deselect all with **a**, then select all vertices except of central part circles. Use **b** key again.

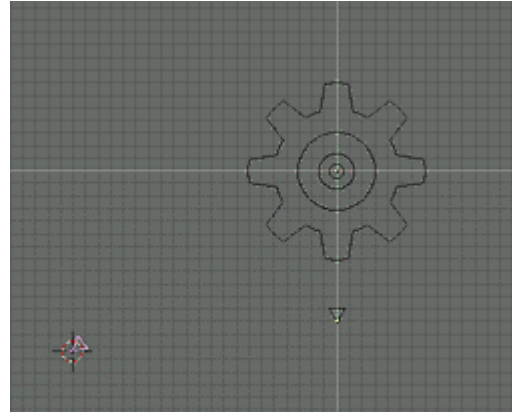


Press **e** to extrude the rest and move the mouse up to 2 units. Escape the edit mode.

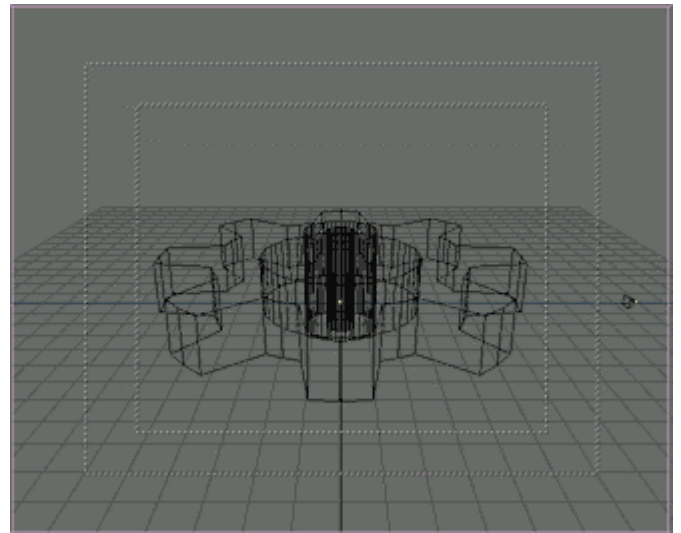
Take a look... First zoom out and insert a new camera with **Spacebar>Add>Camera**



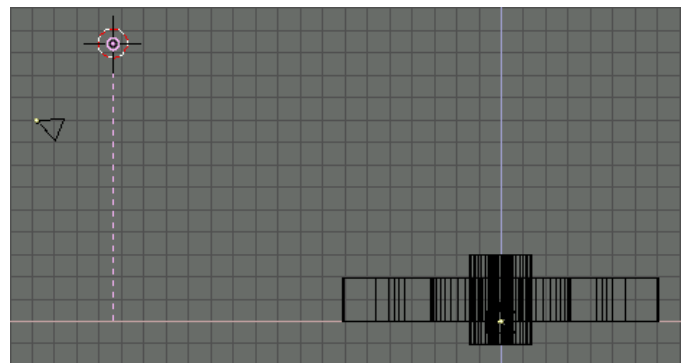
Switch to top view and rotate a camera with **r** a little.



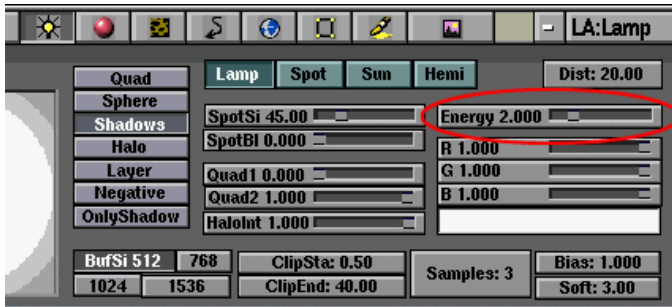
Press now **Ctrl+Numpad-0** to see the gearwheel. You should probably play with **g** and **r** buttons (move and rotate your camera) to get a good picture in the camera view (**Numpad-0**)



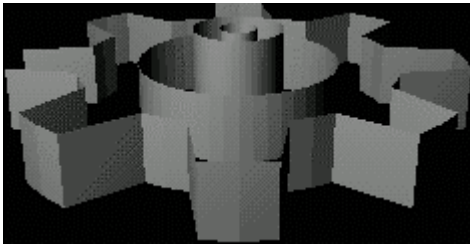
To see anything insert light now **Spacebar>Add>Lamp**.



Press **F4** to select lamp properties and set "Energy" to 2.

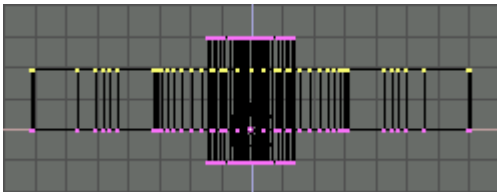


Press **F12** to render... Our wheel is hole! :-/

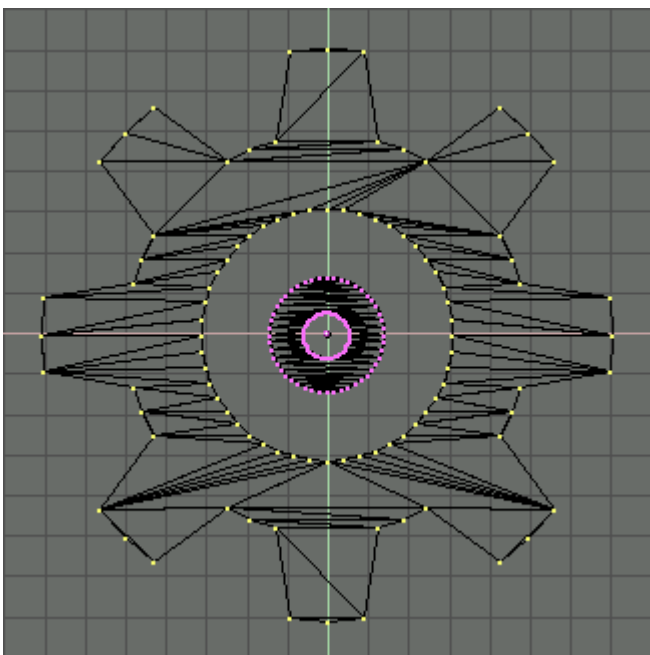


There are no faces on the top and bottom of our wheel.

Select wheel, go to edit mode with **Tab**, then press **b** and select top side vertices.

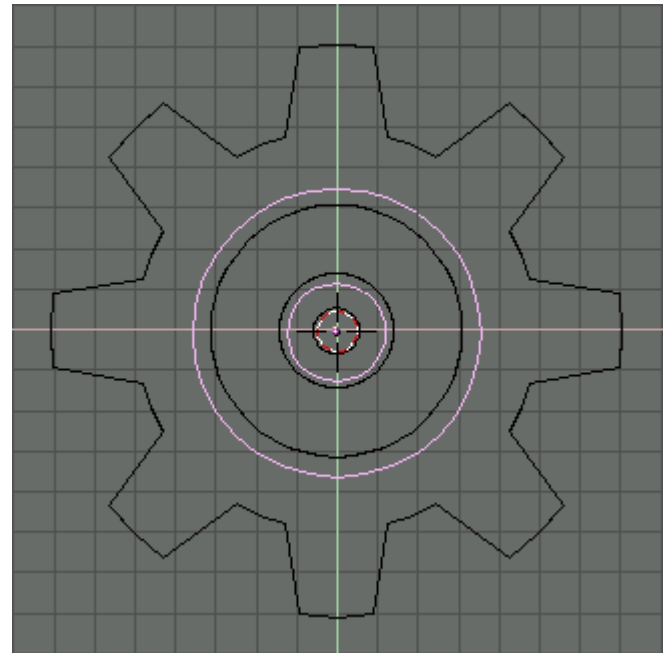


Press **Shift-f** to create faces. Repeat these steps for both sides of a wheel and central part of the wheel. You can see in the top view our gearwheel has now faces on that sides.



Press **z** to see results

We have to insert a wheel in the center of our gearwheel. Insert two circles (Spacebar>Add>Mesh>Circle).



Extrude both and create side faces in the same way we did it before (note this wheel have to be a little lower as a gearwheel).

Press right mouse button and shift + right mouse button to select a gearwheel and a new wheel. Press Spacebar>Edit>Object>Join (or **Ctrl+J**) to compound both.

Press **F9** to switch to mesh mode buttons and give a mesh and object name.



Press **F12** to see results.

## Material

Press **F11** to hide render window.

OK. Let's create a material for our wheel.

Be sure the wheel is selected and hit **F5** to go to material window. To create a new material press menu button [-] and choose 'ADD NEW'. The new material with default properties is ready. We will change some settings to get yellow metal material (something like gold).

First press a button with small red ball in the top left corner of material window. Set color sliders (RGB mode) to the values: R: 1.0, G: 0.85, B: 0.0. To get the "metal look" set Spec: 0.4, Hard: 9.0, Ref: 0.8. You should get something like this.



Press F12 to render. Do you like it? I hope not!

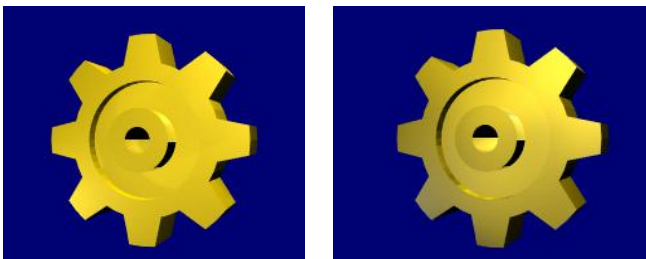
The best way to simulate a "metal look" is the use of real reflections. You can get these using EnvMap button in texture window. This is a C-Key feature however (You should buy a key to unlock some blender function). A simple image reflection (clouds for example) should be enough for many purposes.

Press F6 to open texture window. Press menu button [-] and choose 'ADD NEW' to create a new texture. If you have some good clouds pictures, press Image button and load one. I will use blender's clouds. This is a procedural texture. Results will be not so good as with a real image, but they should be ok too.

Press Clouds button and set NoiseSize to 0.5. Go back to material window F5. Set for texture input (left group of green buttons) Ref and for texture output type (right group of green buttons) Col and Ref. Be sure NoRGB button is pressed and the color of texture set to black R:0, G:0, B:0.



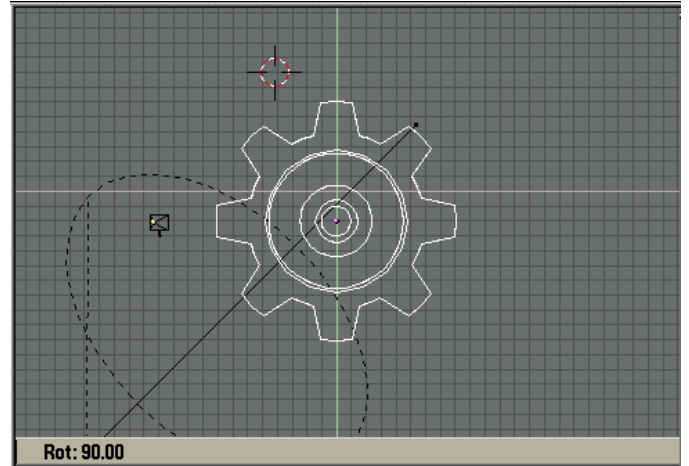
Press F12 and see the difference.



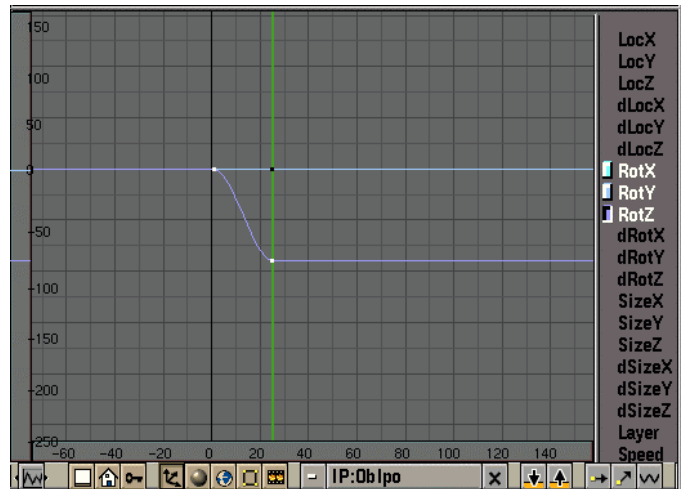
If you don't get something like me try to play with Ref and Col sliders, lights energy value or something else ;-)

## Animation

The animation will include 100 frames. Select with Shift-left arrow the first frame if not so. Be sure the gearwheel is selected, press **i** and **Rot** to add a key frame for rotation. Use arrow keys to select frame 25. Press **r** and rotate the wheel to 90 degrees with **Ctrl** pressed.

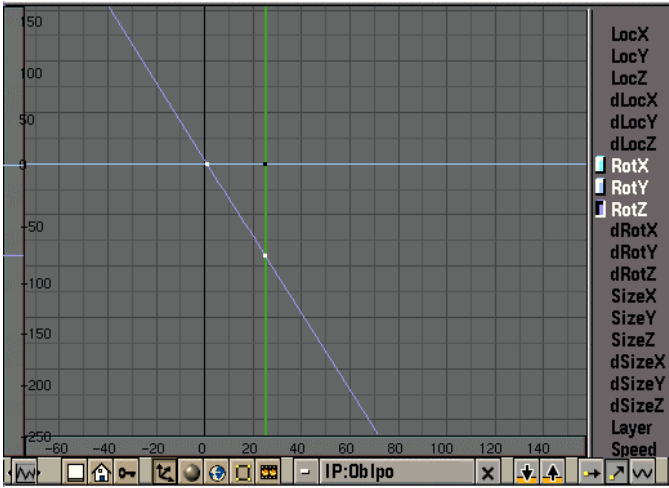


Then go to render window (F10) and set 100 for "End:"-button. You can use **Shift** with **left mouse button** again to enter exact value.



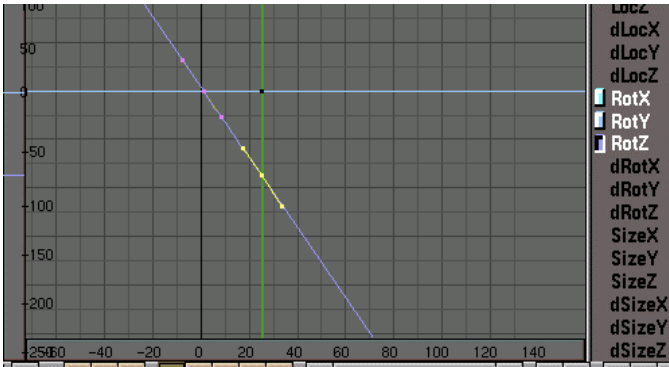
Open IPO window (**Shift-F6**). Select RotZ curve (press **RotZ** button) and press "set extend mode to direction" button.



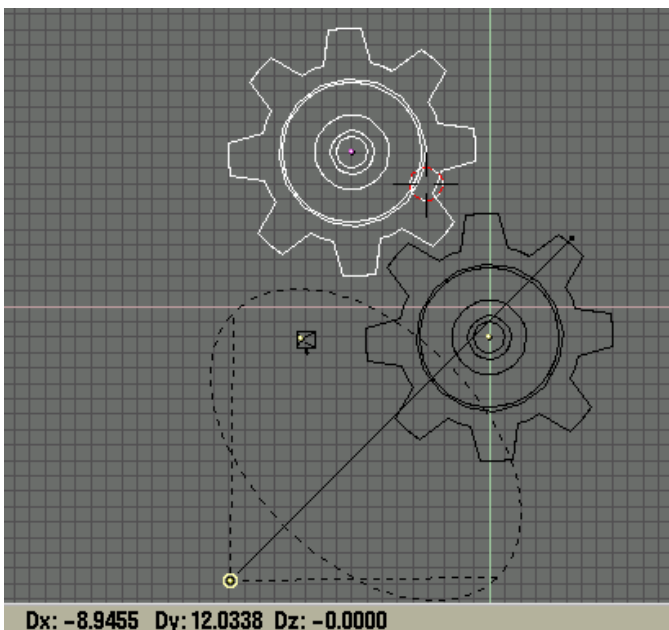


Put the mouse in 3D window and press **Alt-a** to animate. You can see your wheel rotating. Press **ESC** to abort

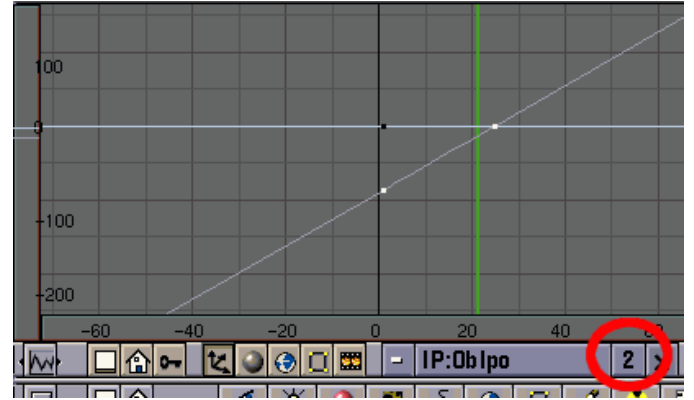
If the rotation isn't smooth enough at 100 frame select rotation curve in IPO window go to Edit mode (Tab), select bottom vertex with right mouse button, press **g** and move it with top or bottom arrow keys until you get smooth animation.



The rest is quite simple. Duplicate the wheel. Select it, press **Shift-d** and move it to a new place.



Be sure new wheel is selected and go to IPO window. Press there "2" button and select "single user".



Be sure you are not in edit mode (vertices don't have magenta or yellow color) and the steep curve is selected. Press **s**, **x** and Enter to mirror the curve to x axis. Maybe you have to correct wheels positions.

To render the animation go to animation window **F10**, input directory and filename in Pics input field and press big ANIM button. Be sure Fields button is not pressed.



To see results use PLAY button.

### Bottom line

I hope you have got some fun with this tutorial. If you have critics, comments or suggestions please write me to alex@camouflages.de