Screw thread tutorial

By Juan Manuel Bautista Hoepfner

Acknowledgements

Inbolch, of shaderscafe.com fame, has already done an explanation of it can be done in Shade. However, newbies might not grasp right away what he is explainng, that is why I decided to do this small tutorial.

Legal stuff

You can copy it, send it to all your friends, etc. However, it is free, as in free beer. So you cannot charge any money for it. If you want to modify it's contents, I must be credited for the original work.

Now, let the fun begin!

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First of all, there are lots and lots of different types of screws, so what I explain here is the **general** philosophy behind doing threads. You have been warned!

Ok, so we start with a new drawing, *grid* turned on, *snap* turned on. (default keys for grid and snap should be **g** and **s** respectively)

We create a curved surface (part->curved surface)

On the bottomleft viewport, we create a closed line (create->closed line). See Illustration 1: Thread section

On the browser window (F9), we make sure that the closed line is inside the curved surface. See Illustration 2: Closed line inside curved surface

If it is not, select the Closed line in the browser window, and drag the Closed line **text** on top of the Curved surface **text**
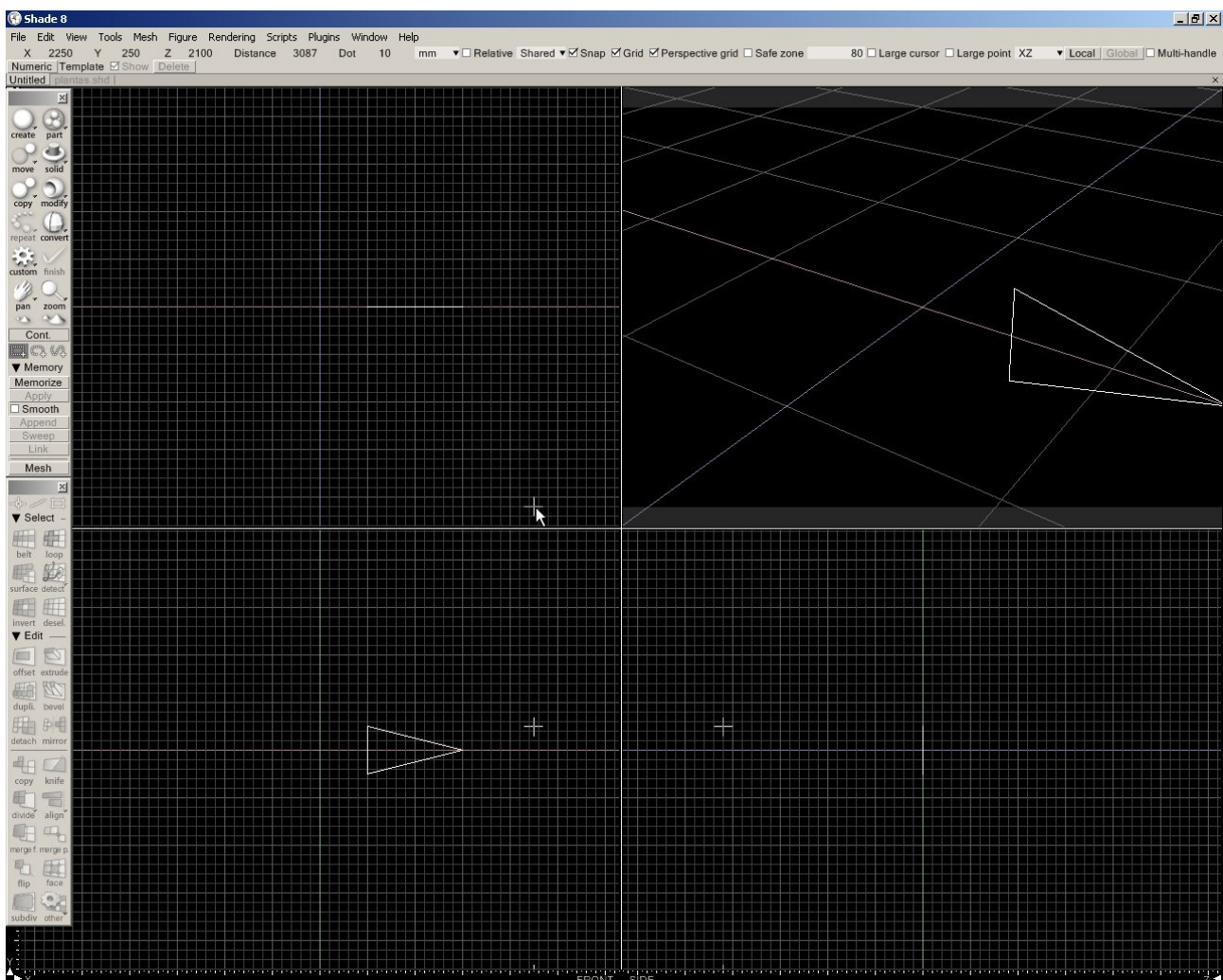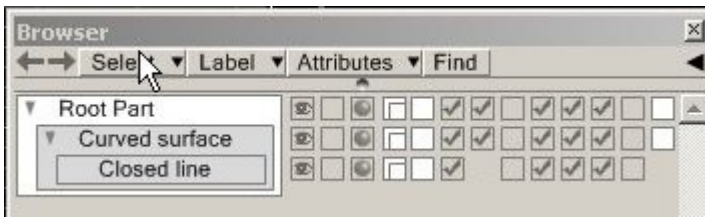

Illustration 1: Thread section

Illustration 2: Closed line inside curved surface

So far, so good... Now for the tricky part.

> If the whole **curved surface** is selected, select just the **closed line**.

> Do a **copy->numerical** (Shade8.5) or **copy->special** (Shade 7).

Nothing will happen until you click somewhere, so

> Click in the axis intersection in the top left viewport.

If you are in a hurry, skip the following until the next instruction. Otherwise, read on.

Before continuing, what are we doing?

Curved surfaces are made by drawing several "guide" lines, which are then automatically "filled" with a surface. In this case, a screw thread is generated by rotating and moving vertically our thread section. As we can move, rotate, and scale at once with a move->special/numerical, we can save some time if we use it.

So the dialogue box appears. We want to rotate around the origin the part (that is why we clicked in the origin in the topleft viewport). We want to see it rotated as viewed in the topleft viewport. If you see the pseudoruler guidelines on the left part of the screen and on the bottom, there is a Z with a triangle pointing down to the left (Z axis pointing downwards), and on the bottom left corner a Y with a triangle pointing up (Y axis pointing upwards), and an X pointing to the right. Oh, and at the bottom left, a Z with a triangle pointing left.

They are there to help us remind ourselves what Shade interprets as which axis.

So, if we want to rotate the thread section, according to what axis do we rotate?

The Y axis

Why?

Short answer, the topleft viewport displays the XZ cartesian plane, and we need to rotate it with the "invisible" axis.

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Long answer, see Illustration 3: Explanation of axis values in Shade. We also need to move it vertically as in the bottom viewports, or in the Y axis.
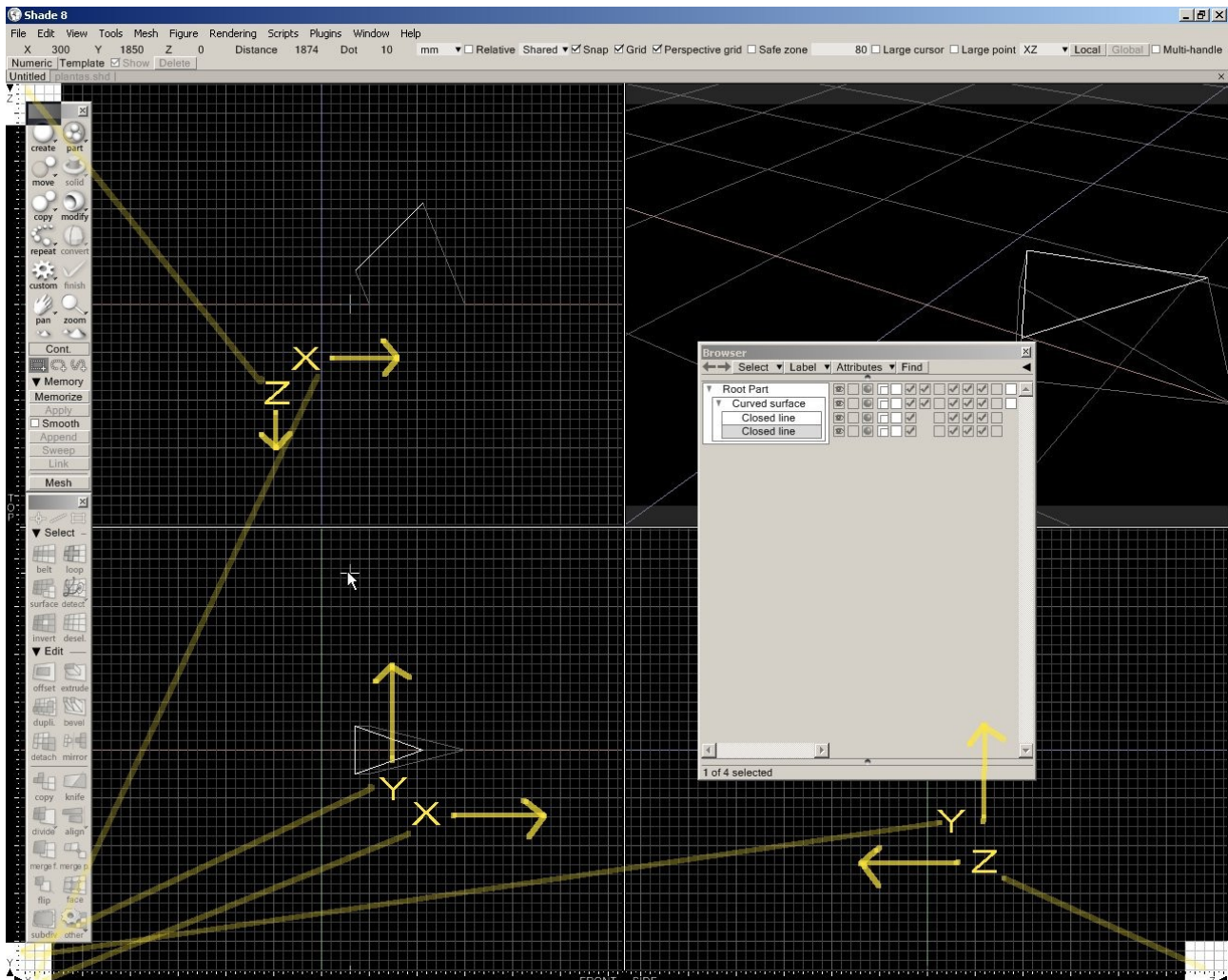

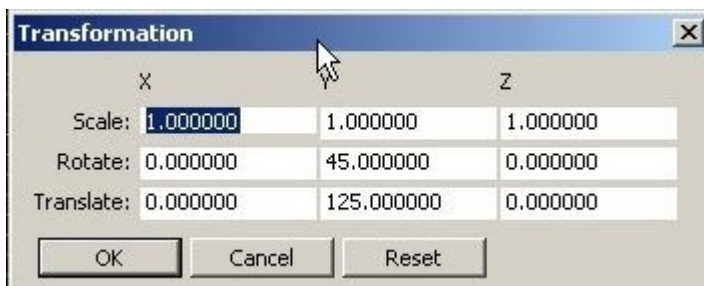*Illustration 3: Explanation of axis values in Shade*

Illustration 4: Transformation values

Now, back to the "active" part of the tutorial.

The dialogue box appears, and we put the values as in Illustration 4: Transformation values

First things first, DONT SELECT ANYTHING JUST YET, LEAVE IT AS IT IS!

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Now the Y value really depends on the side of the section you did originally. In my case, it measures 500 units vertically, so I divided that by 4, gave me 125. As it is a tutorial, it is not **that** important right now, but for your real-life screw, keep that in mind...

Ok, so what did we get? Patience, we just did an intermediate step, we need to do something else to make it useful.
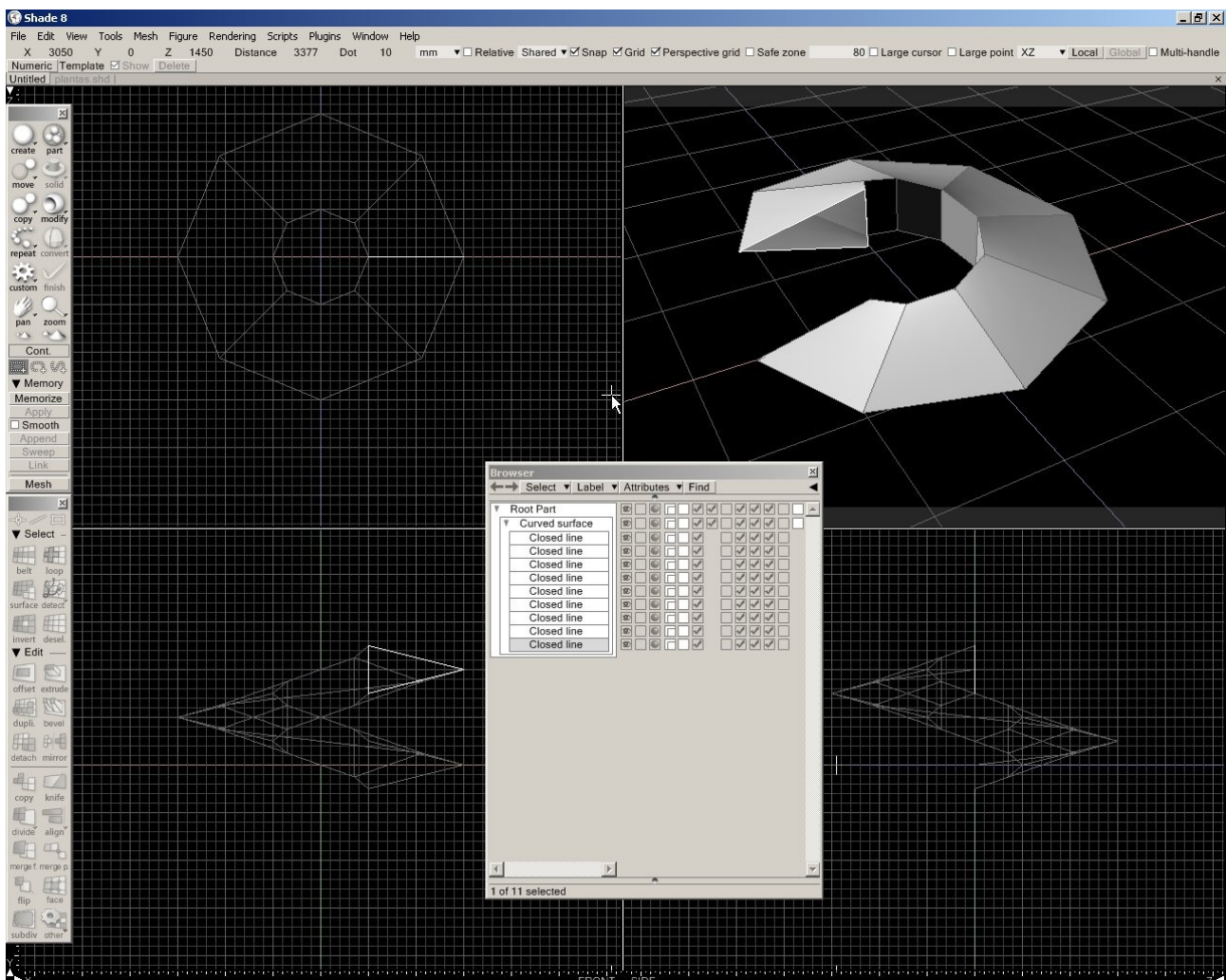
Do a repeat->7 times.

We get a strange thingy!

Illustration 5: Strange thingy

If we look at the topleft viewport, it looks like a doughnut. But if we look at the bottom viewports...

Yes, we have just done our repeating pattern of our thread!

Still doesn't look like much, though...

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We need to "smooth" it a bit

> So we do a modify->switch, it selects one of the mmm... spiral lines. To "curve" it, we do a modify->smooth.

> In the browser window, select the other curves and smooth them too. (Note, smooth only works on a one-by-one basis)
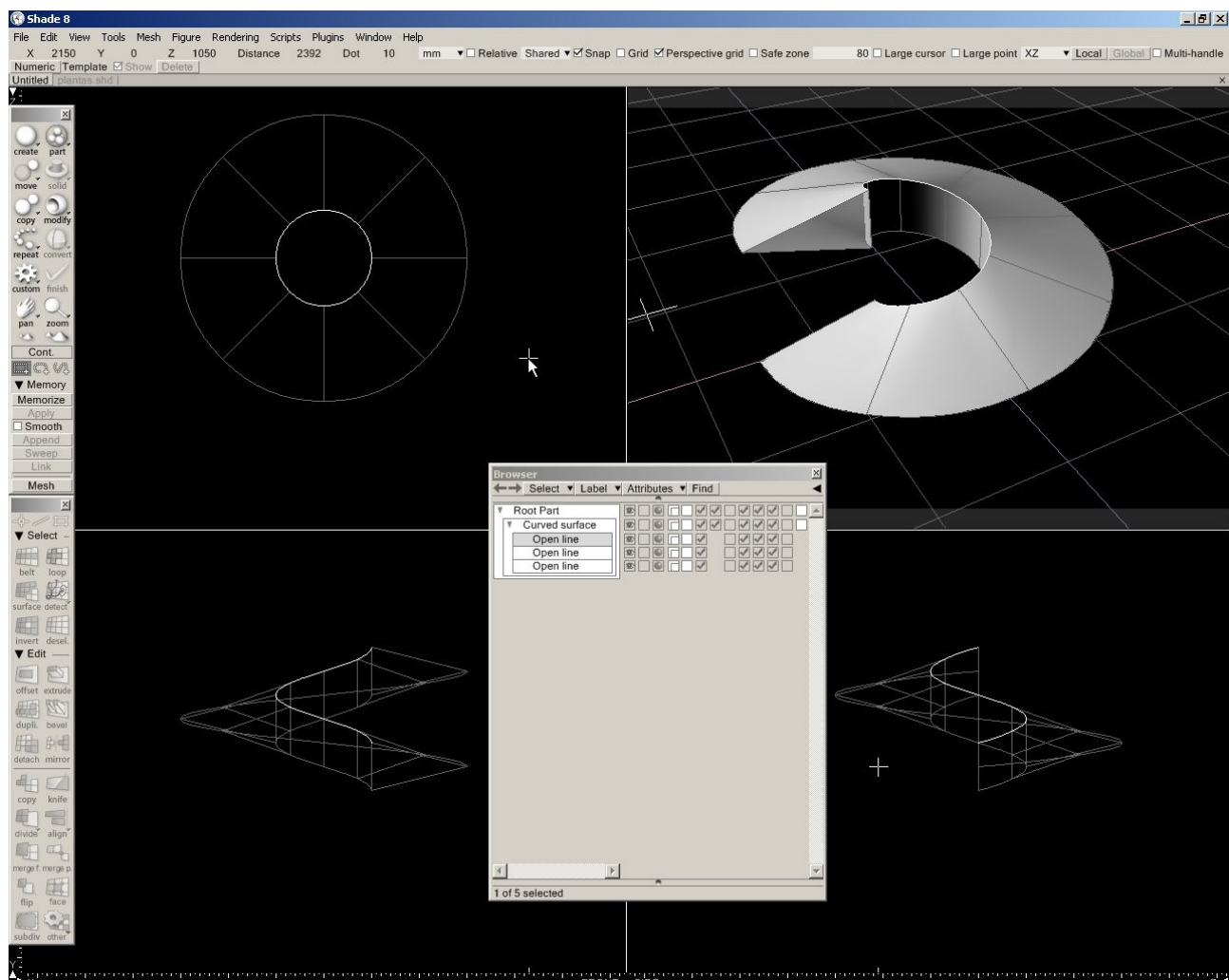
Much better!

Illustration 6: Smoothed repeatable thread pattern
We are almost done.

Before we continue, lets get some order in our naming so we don't have so much trouble later on.

> In the browser window, double click on the Curved surface and rename it to *thread bit* (or something like that).

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Create a part (**part->part**), rename it to threads, and if the *thread bit* is not inside it, drag it inside. (In the browser window, of course)

With the *thread bit* selected, create a **copy->translate** and in one of the bottom viewports drag the part so the "new" bottom coincides with the "old" top.
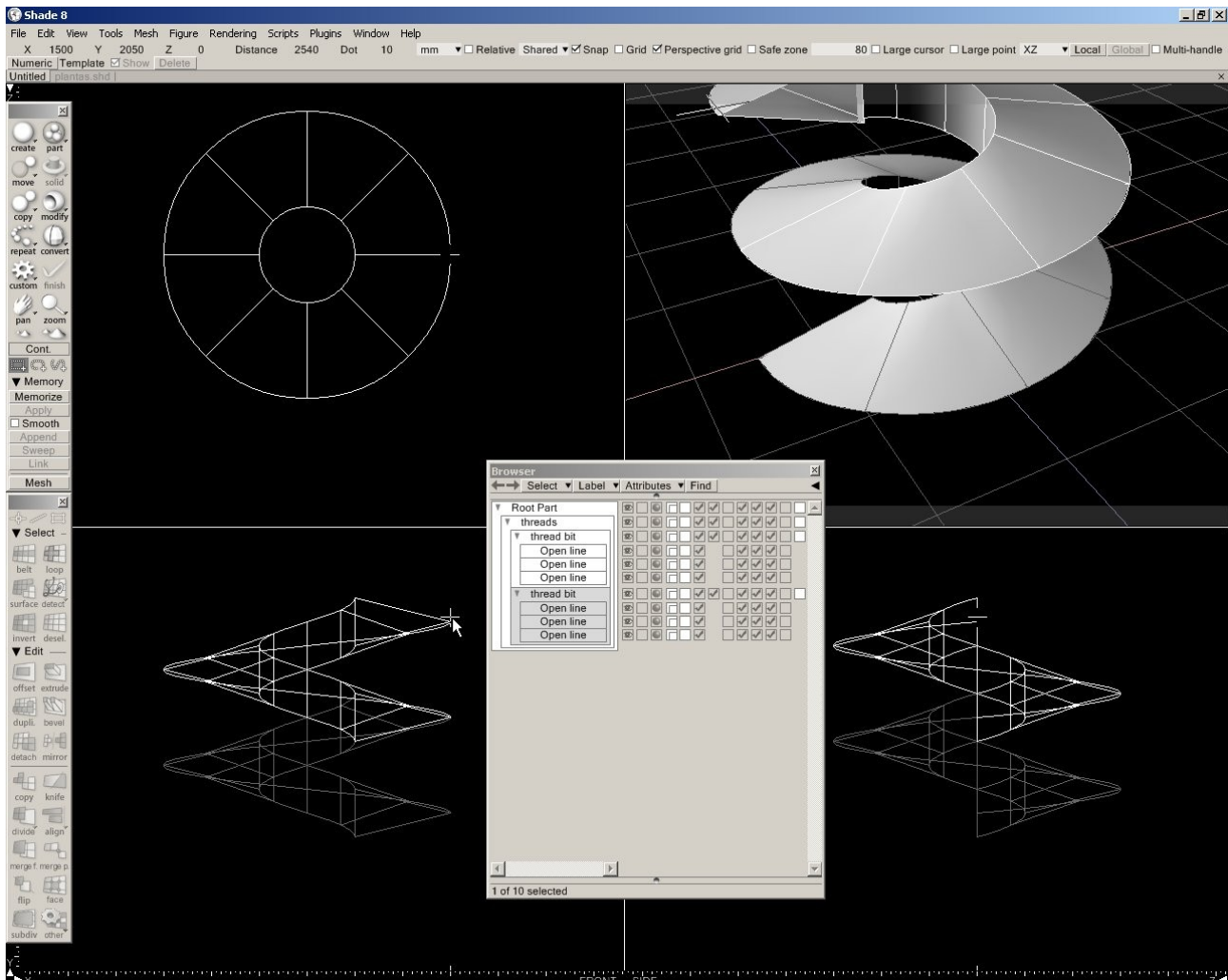

Illustration 7: Screw thread pattern copied once

We do a repeat->10 times (For example), zoom out, and voila! Looking at a thread without a core!

So how about the core?

Well that is the easiest part.

Several ways to do this, but the easiest is:

On the top viewport, create a disk that coincides with the inner circle (**create->disk**).

It surely will appear near the top, but not on the "top" top, so move it to the "top" top (**move->translate**)

It should have been created inside the "threads" part, and we do not want it there, so drag it outside (in the browser window). It can help if you collapse the "thread bit" parts, clicking on the triangles to the left of the text.

Once that is done, rename the Disk to *core*.

In one of the bottom viewports, zoom out till you see all the threads, and extrude **downwards** (**solid->extrude and drag**) till the bottom of the threads. See Illustration 8: Threads bits inside the thread part
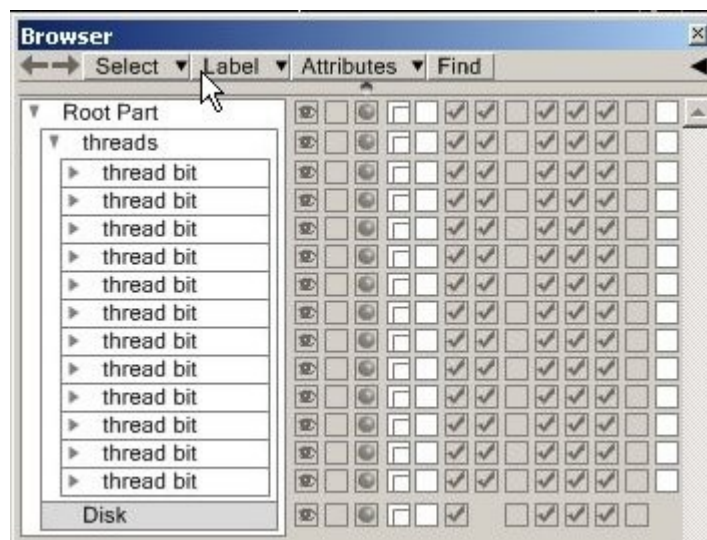

Illustration 8: Threads bits inside the thread part

To do the head, it depends on the head. But for doing a hexagonal head, this is one (of several) ways to do it:

Create a disk that is slightly bigger than the threads in the top viewport.

If not almost on top, move it almost to the top

Extrude it so it looks right.

(Shade8.5 Do a **convert->convert to polygon mesh**) Click on convert.

A dialogue box appears, in Divisional (lateral) choose **6**, and in divisions (longitudinal) choose **1**.

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Rename the Polygon mesh to head.

Create a new part, rename it to screw, and drag threads, core, and head inside it.
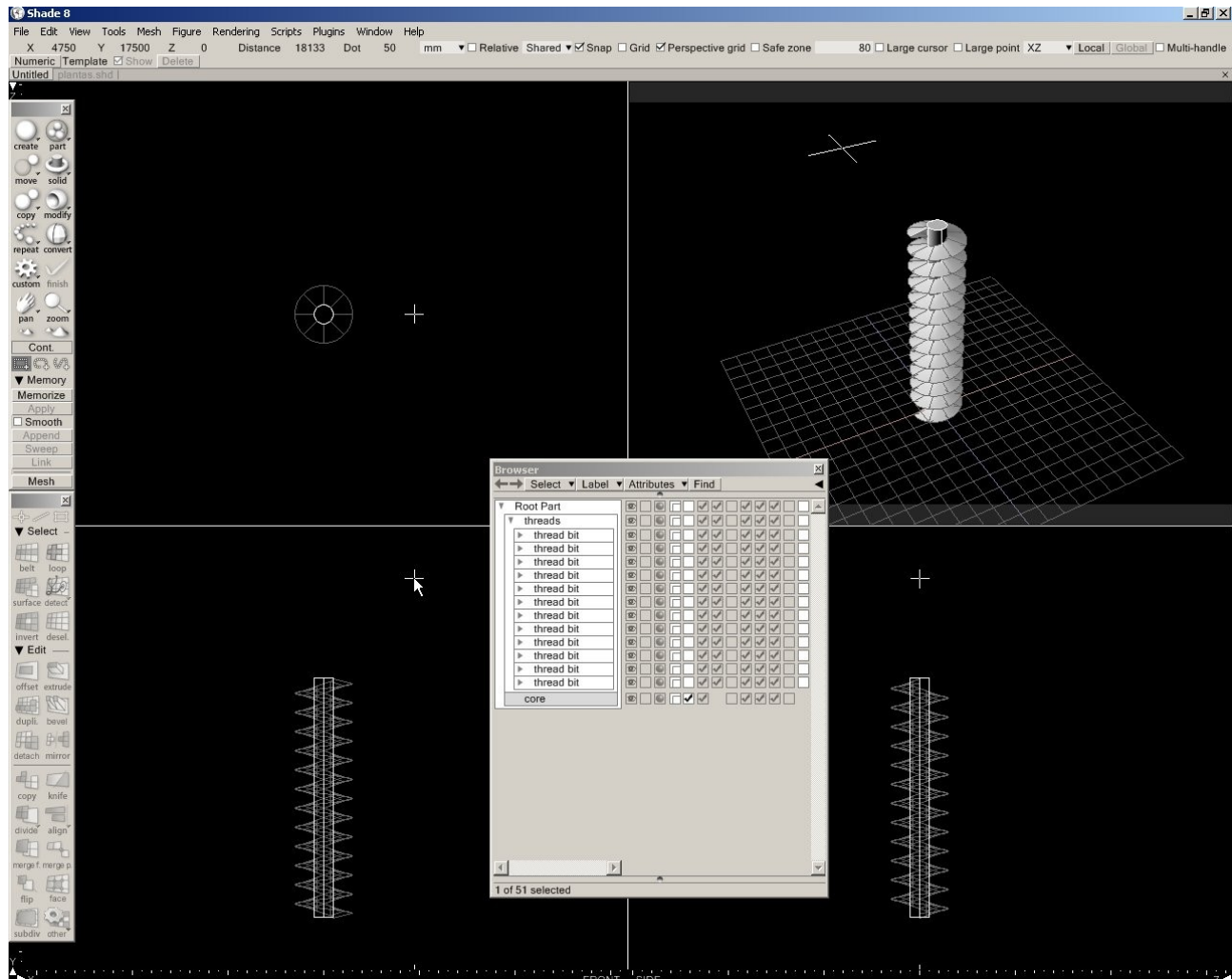

Illustration 9: Complete thread

Now this step is for the purists!

I doubt there is a screw that looks like the one we just did. But NOW you know how to do your own screw!

First, if you are a polygon-reducing junkie, you could have used an open line to do the thread.

Second, The core could have been incorporated to the section.

Third, if you want to do a screw like the one Inbolch did, that is what you will have to do, as well as also scale the section while rotating. And repeat n Times all the way till you are done, instead of doing multiple copied curved surfaces. Just one with each section

progressively smaller.

Fourth, if you look at the end part of the thread, it is not "closed" To "close" it, select the end section, copy->paste it in place, and drag the new line outside the curved surface hierarchy.
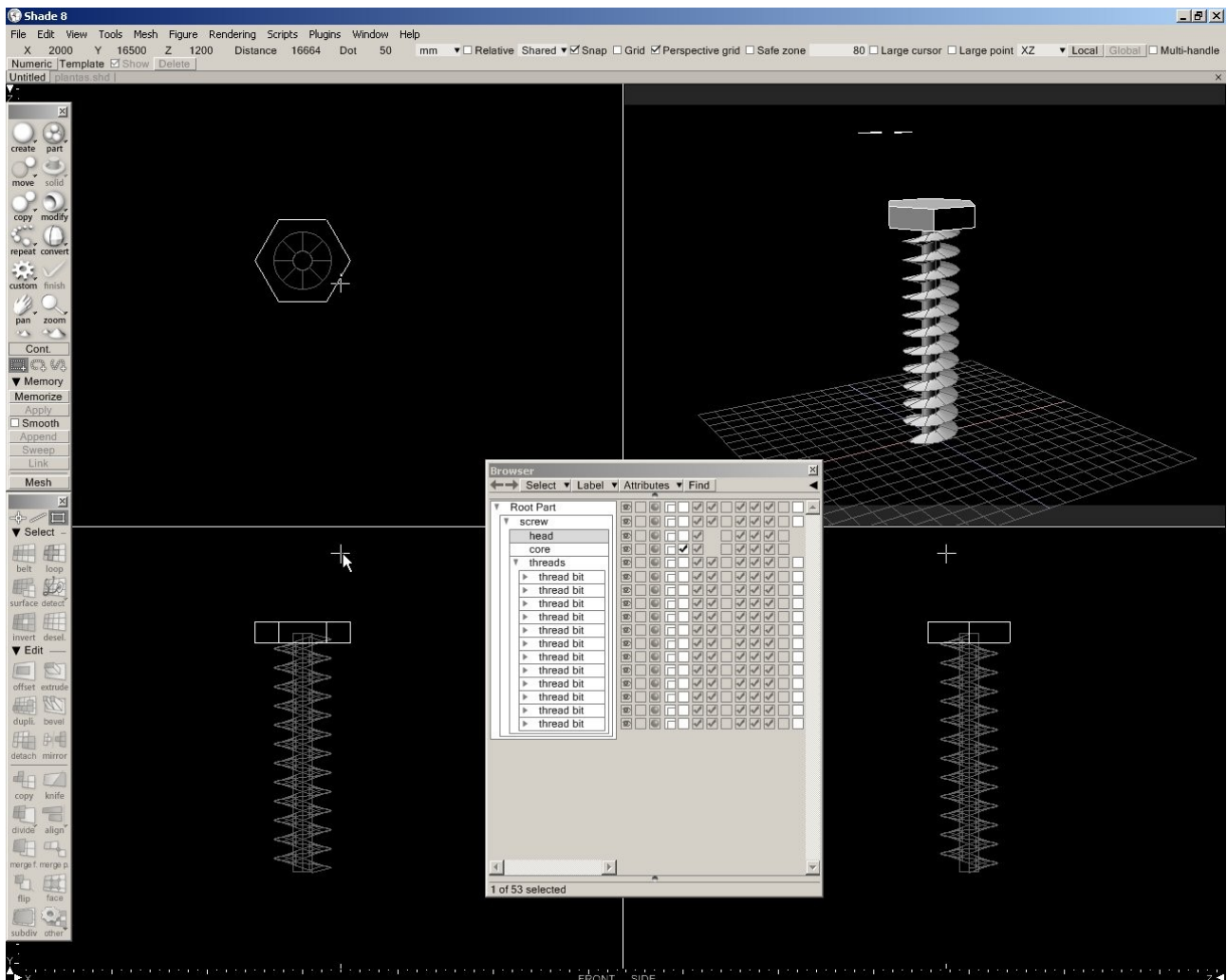

Illustration 10: The completed threaded screw

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