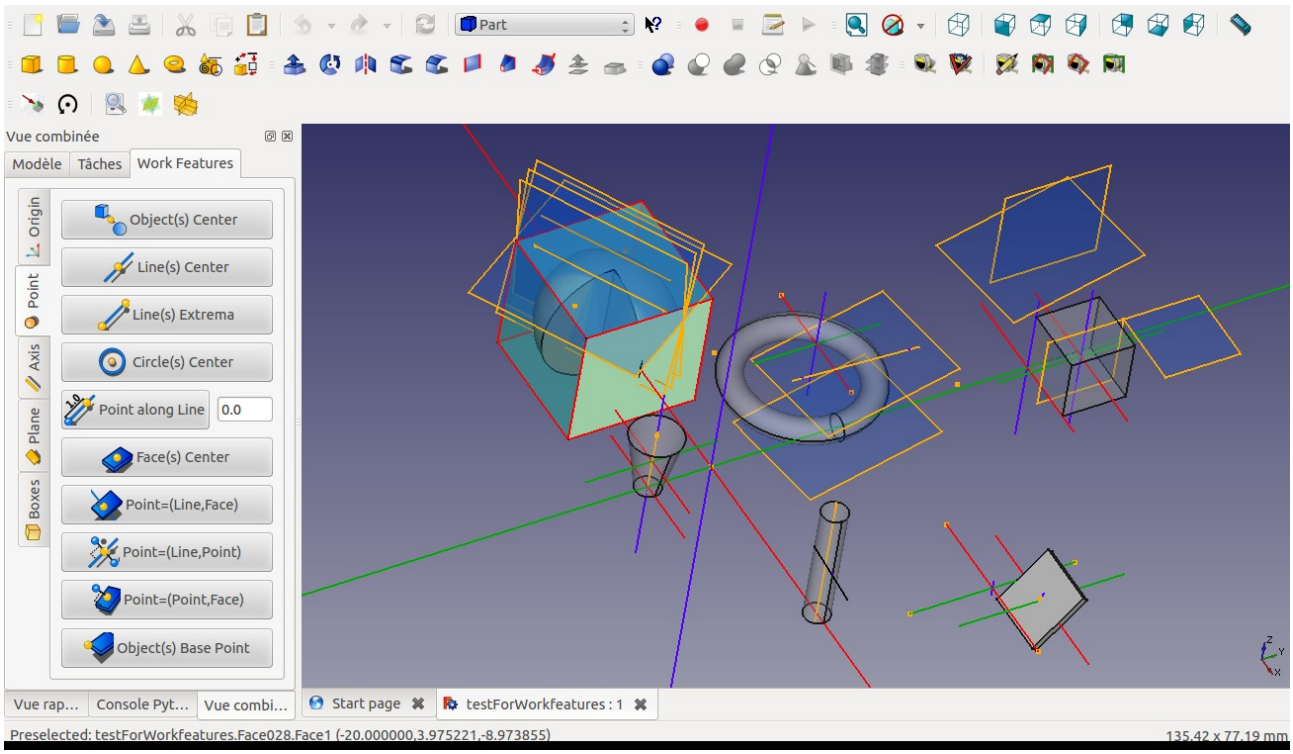
Work features for FreeCAD : Documentation



Version 2016-12 **by Rentlau_64**

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Introduction:

Tool utility to create Points (mid points, center of circle, center of object(s), array of points...), Axes (from 2 points, Normal of a plane...), Planes (from 3 points, from one axis and a point...), Circles , Objects , Parametric curves... and many other useful features to facilitate the creation of your project.

The idea behind this python MACRO for FreeCAD was to give users some "quick" access tiny tools available with all the workbenches.

Except some complex tools like Cut, Rotate and Translate, most of the tools are few "clicks" behavior to give the user quick access to functionalities.

Up to 2016 08 31 release no parametric objects are created (but the willing is to move into this behavior in next future).

This macro was developped using original ideas, codes, and support from :
- Javier Martinez Garcia 2014, 2015 for ideas and first WF codes
  for tje code on parallelism of two faces, forTour camera code...
- Jonathan Wiedemann for Gui ideas and for view codes 2014
  and support
- NormandC for his support
- Yorick for his support
- galou_breizh for macro which creates a circle from 3 selected points
- Eriossoltero for macro Ellipse-Center+2Points
- Ulrich Brammer for Geodesic dome code
- Wmayer Many Thanks for active help on testing and debbuging
- Gaël Ecorchard for HighlightDifference Macro
- lorenz_l for Beam tool Macro
Thanks to all of these people, and special thanks to Mario52 for diverse MACRO codes as FCCamera, cutCircle, cutWire, Delta xyz, bounding box ... and other diverse pieces of codes and all discussions, support, advices, help...merci Mario

Thanks also to those I forget.

Prerequisite :

1. Install MACRO Work Feature on your system:
   https://github.com/Rentlau/WorkFeature.git

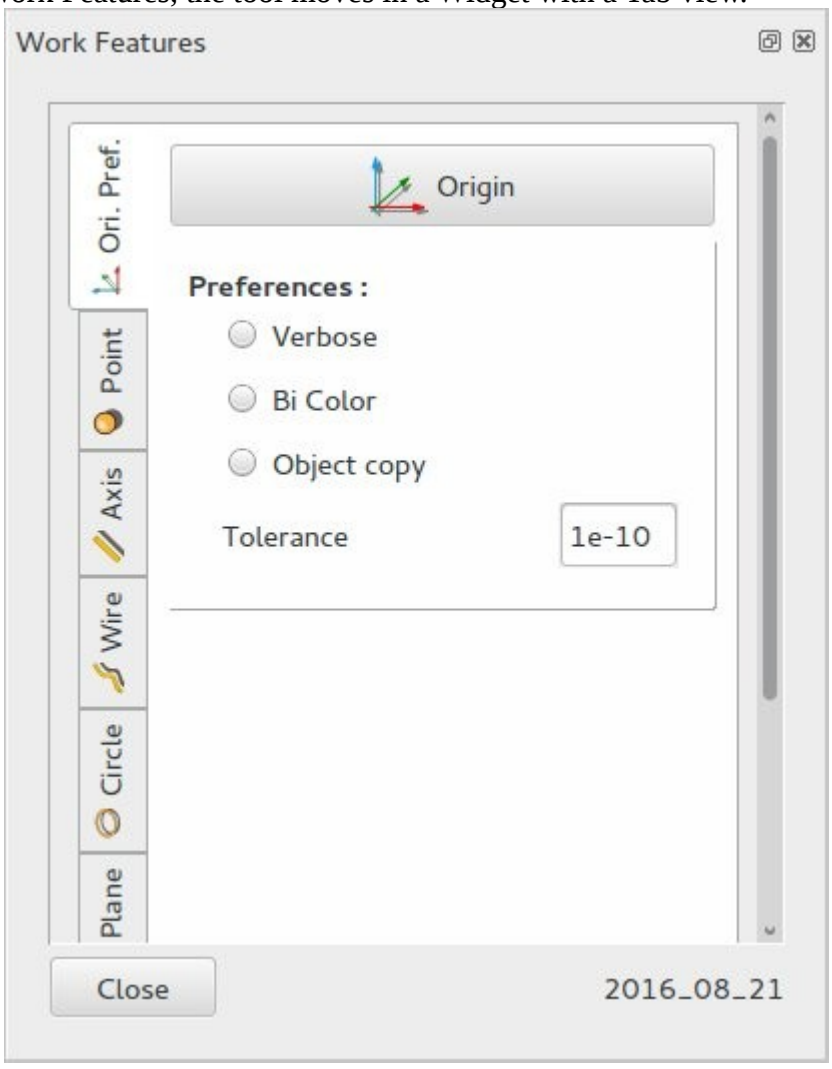
   To learn how to install a MACRO into FreeCAD:
   see Macro Install HowTo
   see Customize ToolsBar HowTo

2. Or use the Addons installer.FCMacro for Customizing FreeCAD:
   https://github.com/FreeCAD/FreeCAD-addons

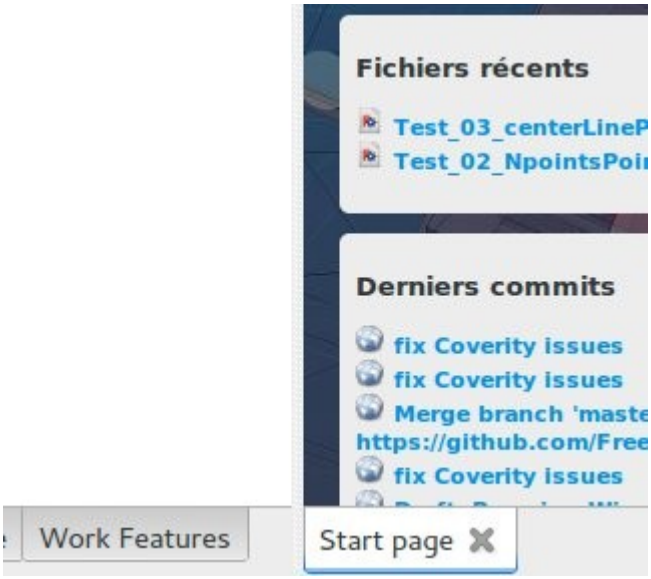
General presentation :

Once installed, the macro is launched by the click on the general icon button :

After activating Work Features, the tool moves in a Widget with a Tab view.



This utility is docked in the “combo view” of FreeCad with "Work Features" label.



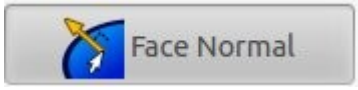
But the widget can be moved and located any place you want.

The set of tab widgets will appear, the different functions are sorted by type of output.

Most of the time a function is accessible by a few clicks:

first by selecting already existing graphic entities in graph view, then

by a final click on one button (with icon and text).

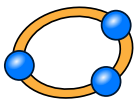


The convention used for the Icons is :

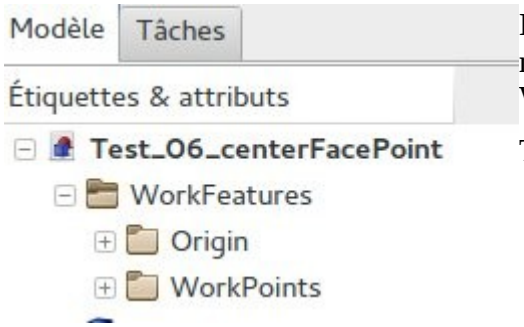
Blue for already existing graphics objects to select and

Orange for the entities to be created.

Hereafter one icon explanation:



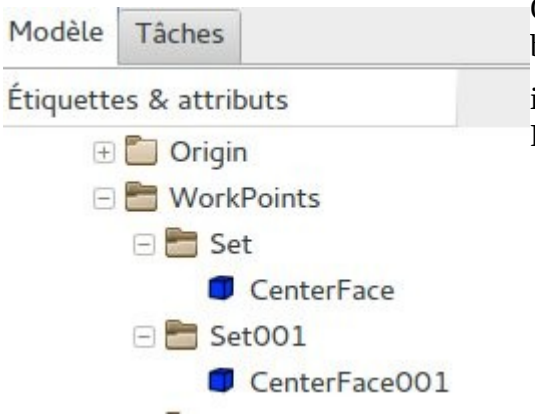
You must select **3 existing points** in order to create a **circle**.



Each new use that corresponds to a function group will result in a creation of a new subGroup below WorkFeatures Group in “Model tab” of FreeCad.

The possible sub Groups are :

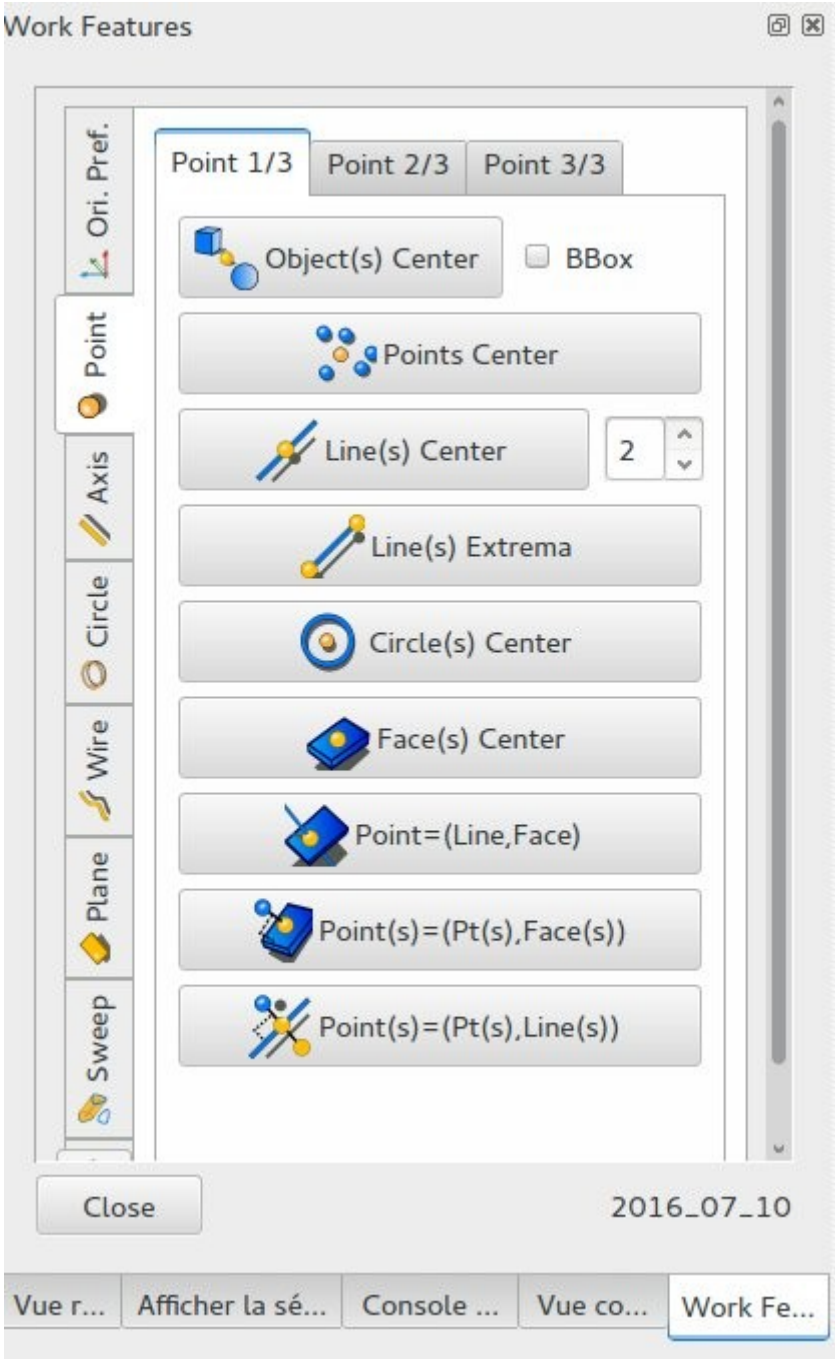
```
'Origin','WorkPoints','WorkAxis','WorkPlanes',
'WorkCircles','WorkArcs','WorkBoxes',
'WorkWires','WorkImages','WorkObjects',
'Rot_Trans'
```



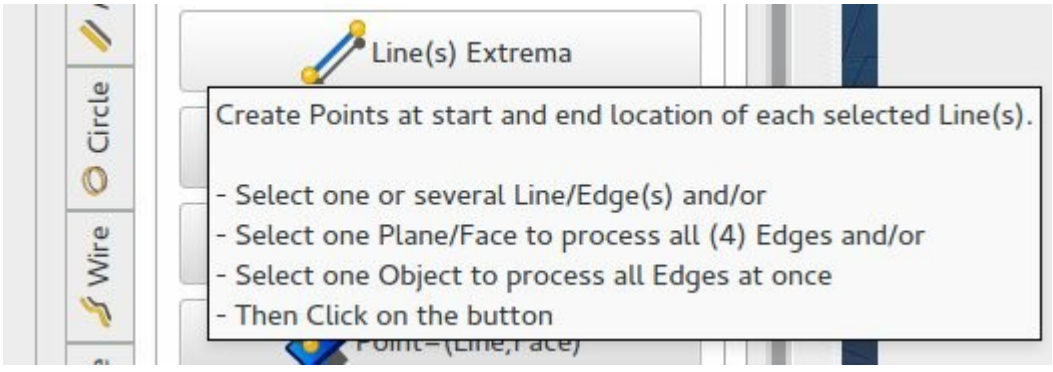
Once a sub Group created the entities will be placed below (some time in a sub set).

is a group created in the name of Tag used. The Axis, Point and Planes origin are directly keyed to hidden.

All functions regarding point creations are sorted under the “Point” tab.



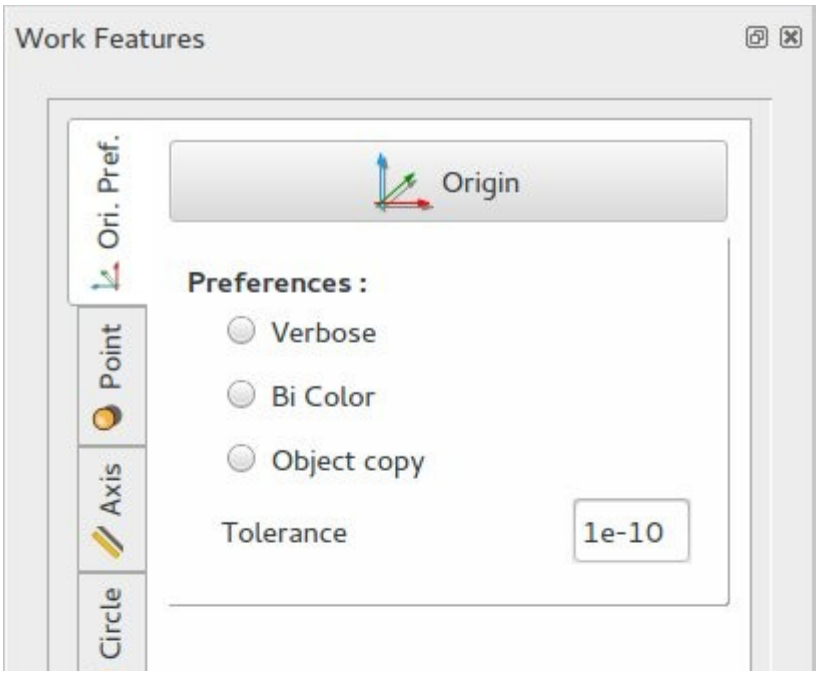
In general tool tips are visible with a short description of the function when the mouse is located above one button.



List of TABs :

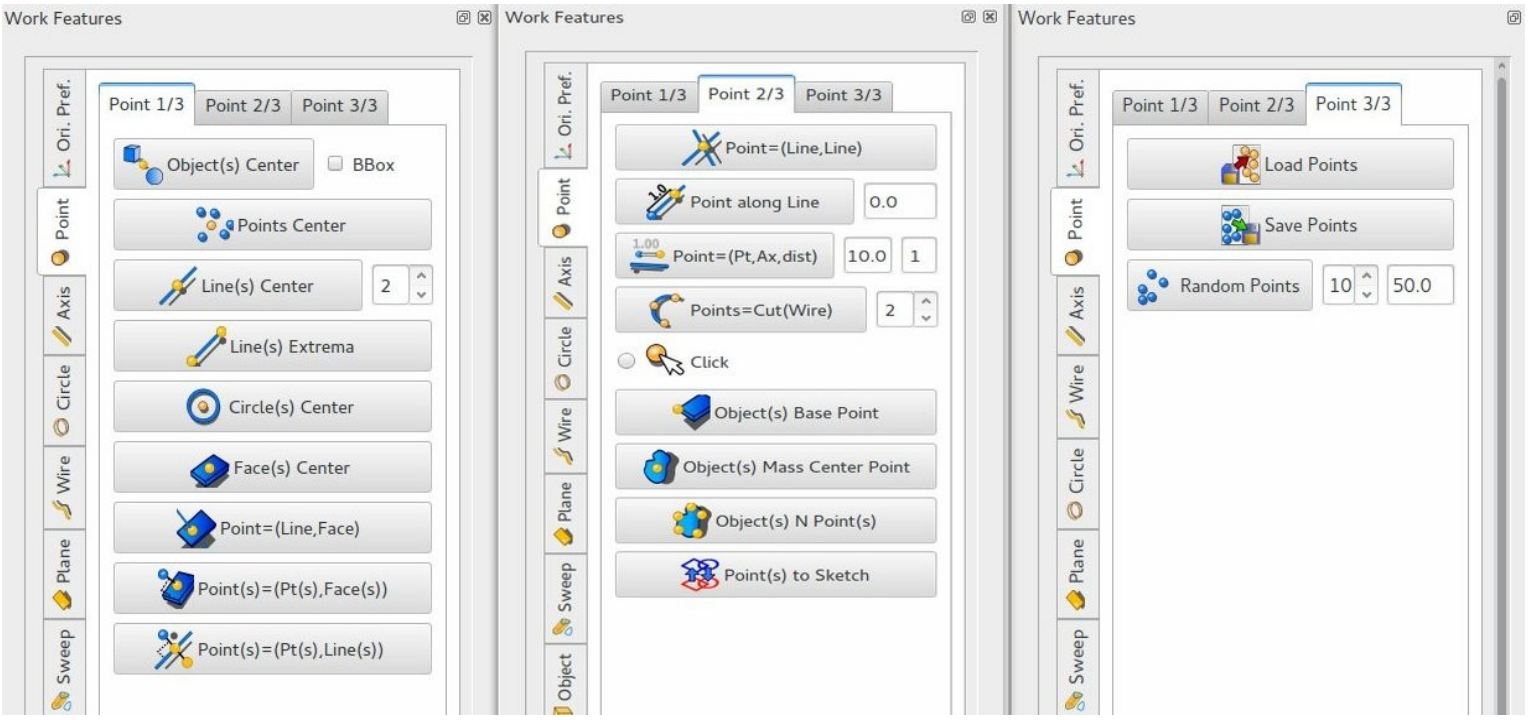
Ori. Pref.

This tab is dedicated to generate the origin point, axis and planes (X, Y, Z axis, XZ, XY, YZ planes) and to set some preferences.



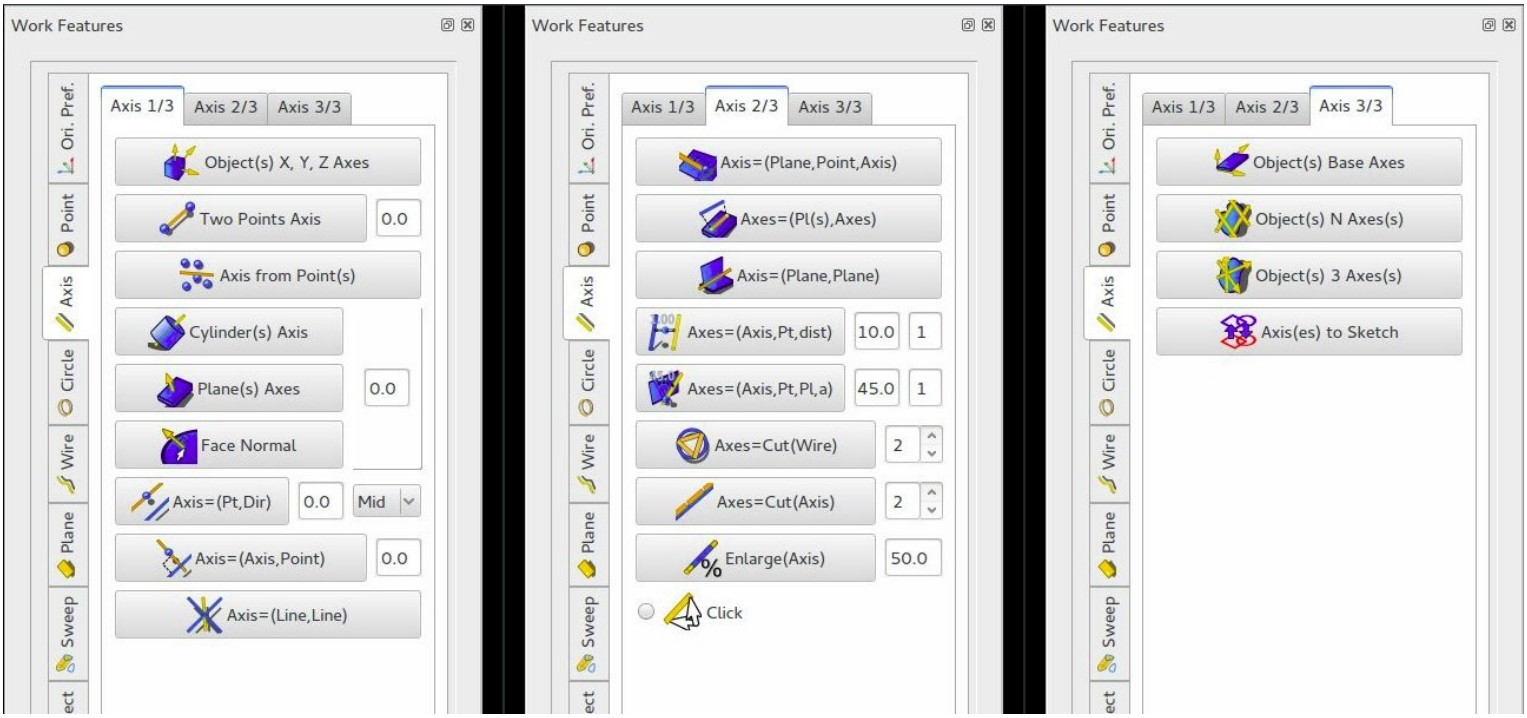
Point

All functions to generate Points. Last tab propose to save and load points in ASCII text files.



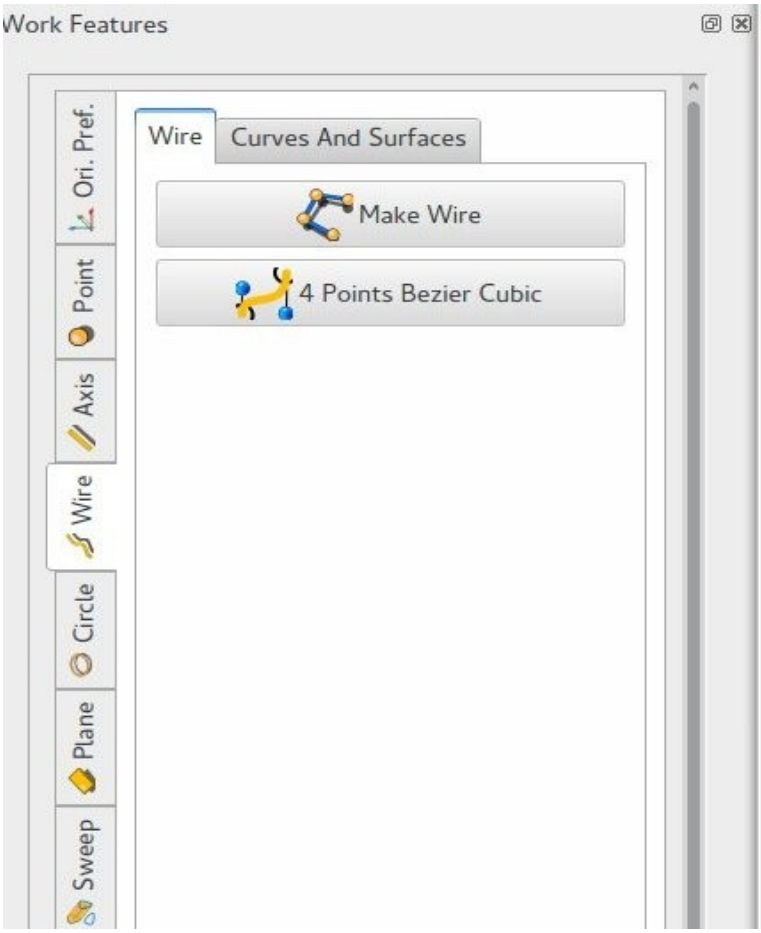
Axis

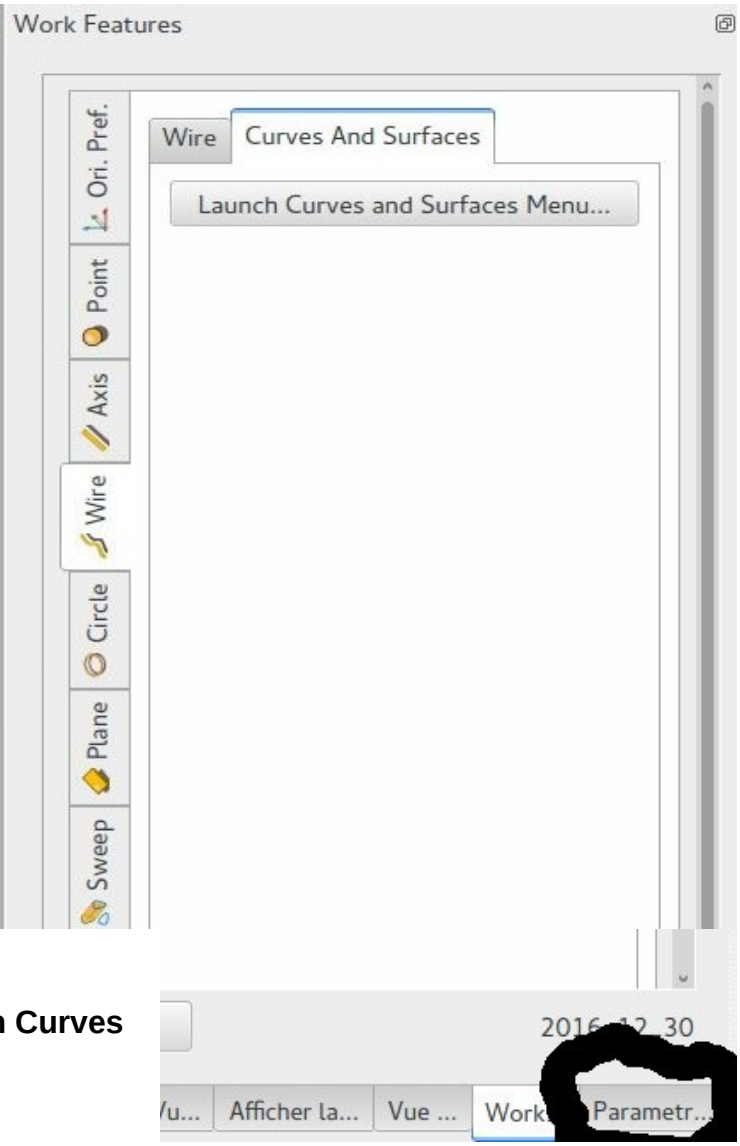
All functions to generate Axis.



Wire

All functions to generate Wire.





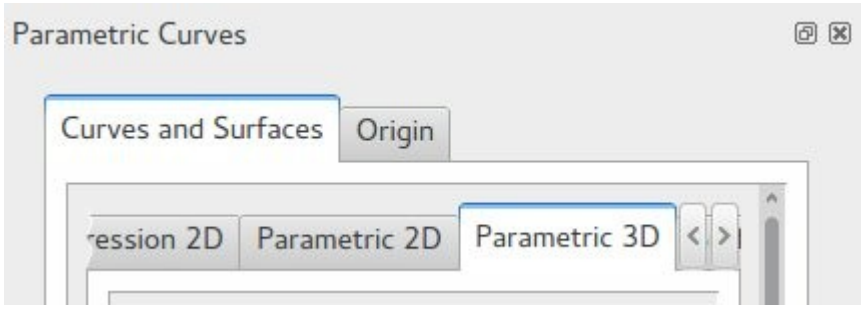
Especially in the last tab the new button :"**Launch Curves and Surfaces Menu"** will open a new tool for

Regression 2D,

Parametric curves 2D

Parametric curves 3D

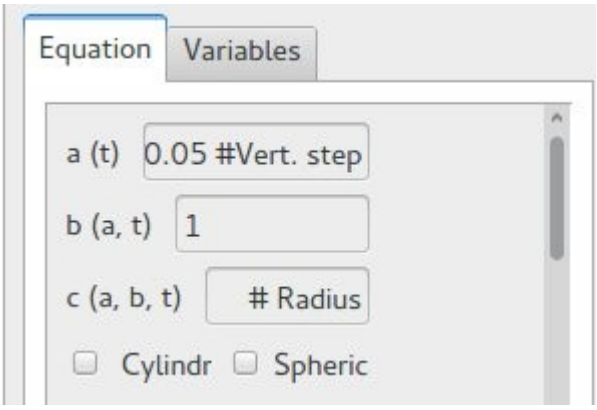
Parametric Surfaces

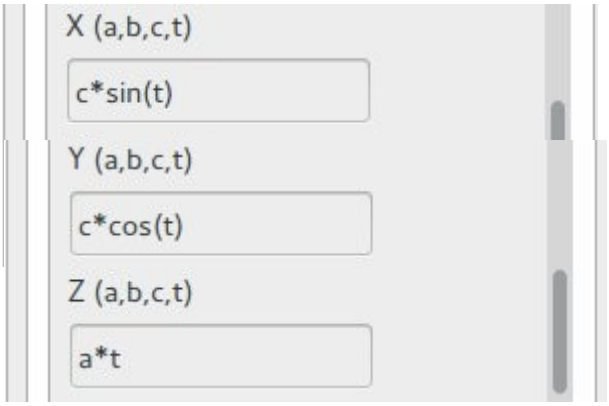


Origin tab will help you to select one (or several) point(s) as reference point(s). This point is used to "attach" the parametric object. If one select several points then several parametric curves will be generated regarding these references points.

The parametric curve and surface objects are defined by formula.

For example let us describe the “Cylindrical Helix”





the equation is defined by :

X(a,b,c,t) = c * sin (t)

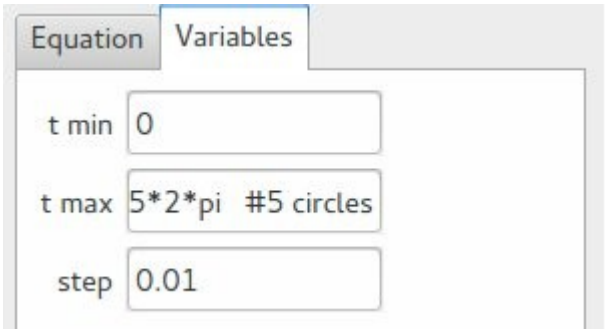
Y(a,b,c,t) = c * cos (t)

Z(a,b,c,t) = a * t

with a(t) = 0.05 for the vertical step and c(a,b,t) = 10 for the radius (here b is not used).

The variable t is defined for 5 circles:

from 0 to 2 pi (5 times) with a step of 0.01



In parameter fields instead of constant values, it is also possible to set list or ranges.

The function 'range' from Python and 'np.arange' from numpy module can be used here:

range([start,] stop[, step])

start : Starting number of the sequence. The interval includes this value. The default value is 0

stop : Generate numbers up to, but not including this number.

step : Difference between each number in the sequence. The default value is 1.

np.arange([start,] stop[, step,]dtype=None)

Return evenly spaced values within a given interval.

start : Starting number of the sequence. The interval includes this value. The default value is 0

stop : End of interval. The interval does not include this value, except in some cases where step is not an integer and floating point round-off affects the length of out.

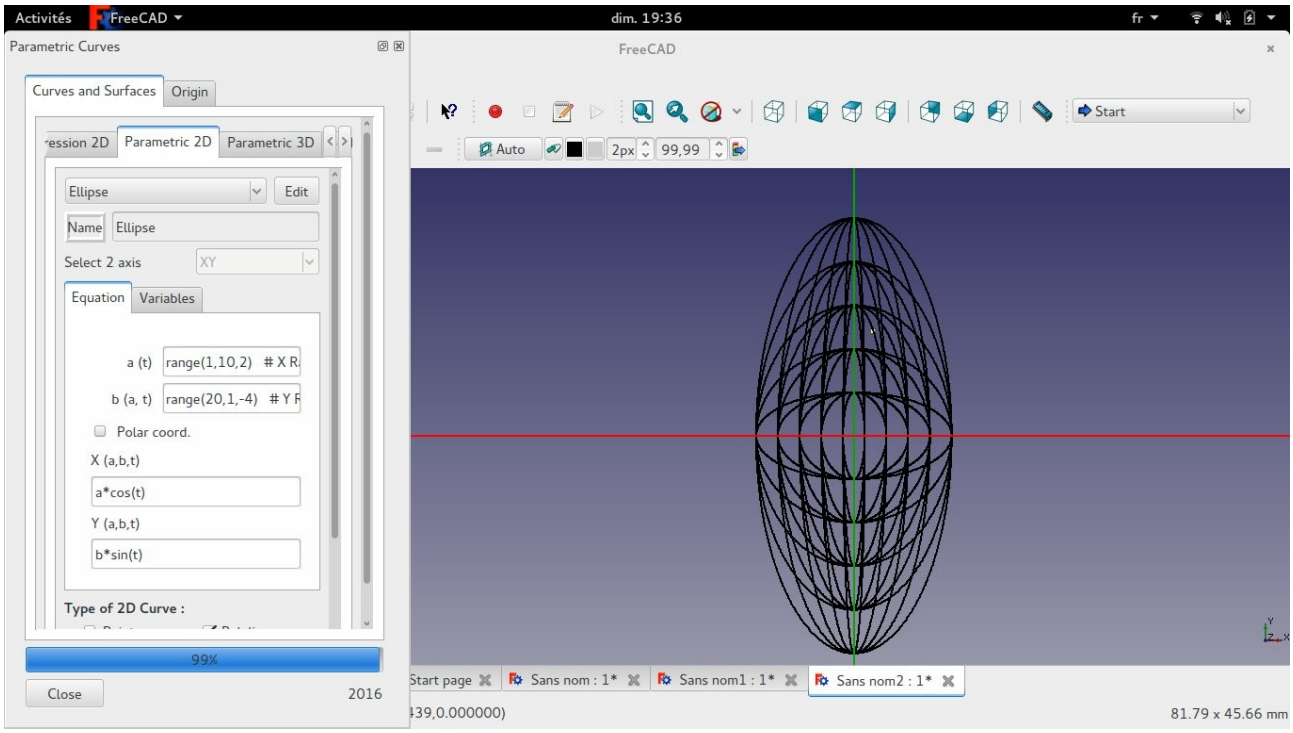
step : Difference between each number in the sequence. For any output out, this is the distance between two adjacent values. The default value is 1.

If step is specified, start must also be given.

dtype : The type of the output array. if dtype is not given, infer the data type from the other input

arguments.

Here are one result:



The function from Python math module can be used for parametric definition:

safe_list = ['acos', 'asin', 'atan', 'atan2', 'ceil', 'cos', 'cosh', 'degrees', 'e', 'exp', 'fabs', 'floor', 'fmod', 'frexp', 'hypot', 'ldexp', 'log', 'log10', 'modf', 'pi', 'pow', 'radians', 'sin', 'sinh', 'sqrt', 'tan', 'tanh']

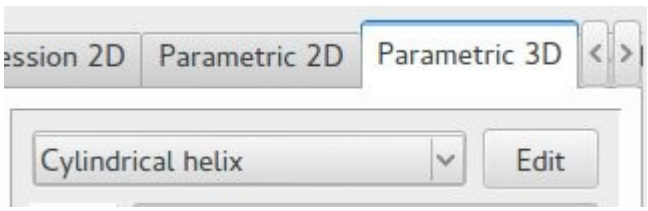
The type of curve/surface can be :

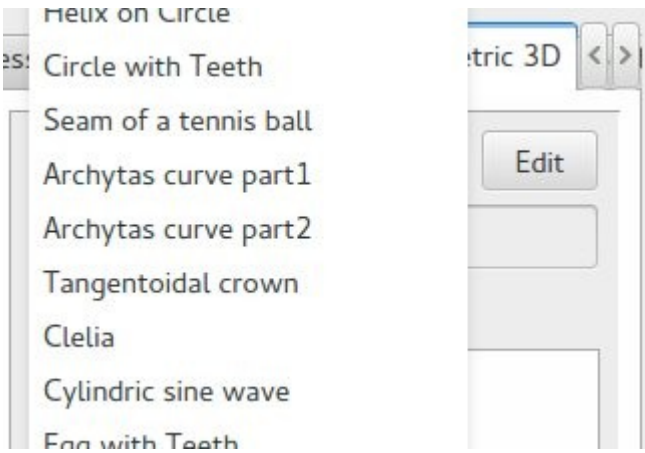
- Points
- Polygon
- Bezier
- Bspline
- Nurbs (for surface only)

Parametric curves 2D can be Cartesian or Polar.

Parametric curves 3D can be Cartesian, Cylindrical or Spheric.

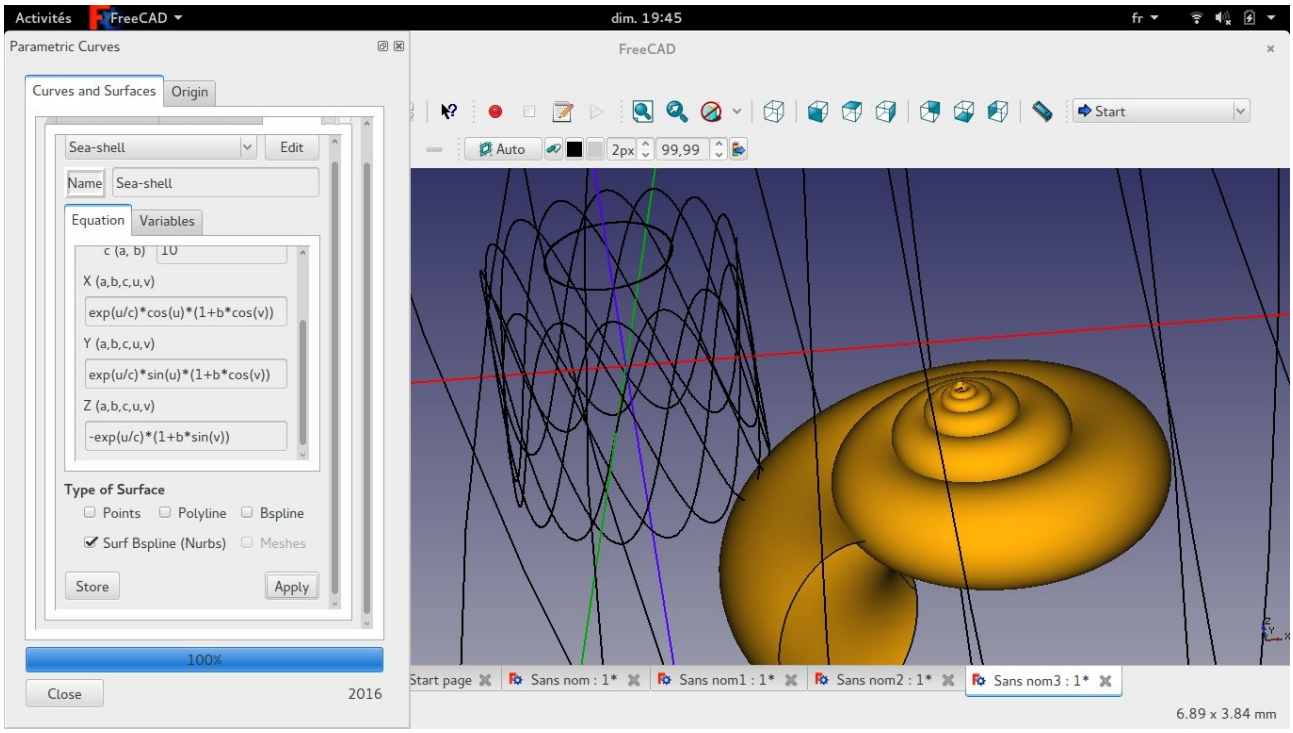
A set of predefined functions is available via a combo box.**:**

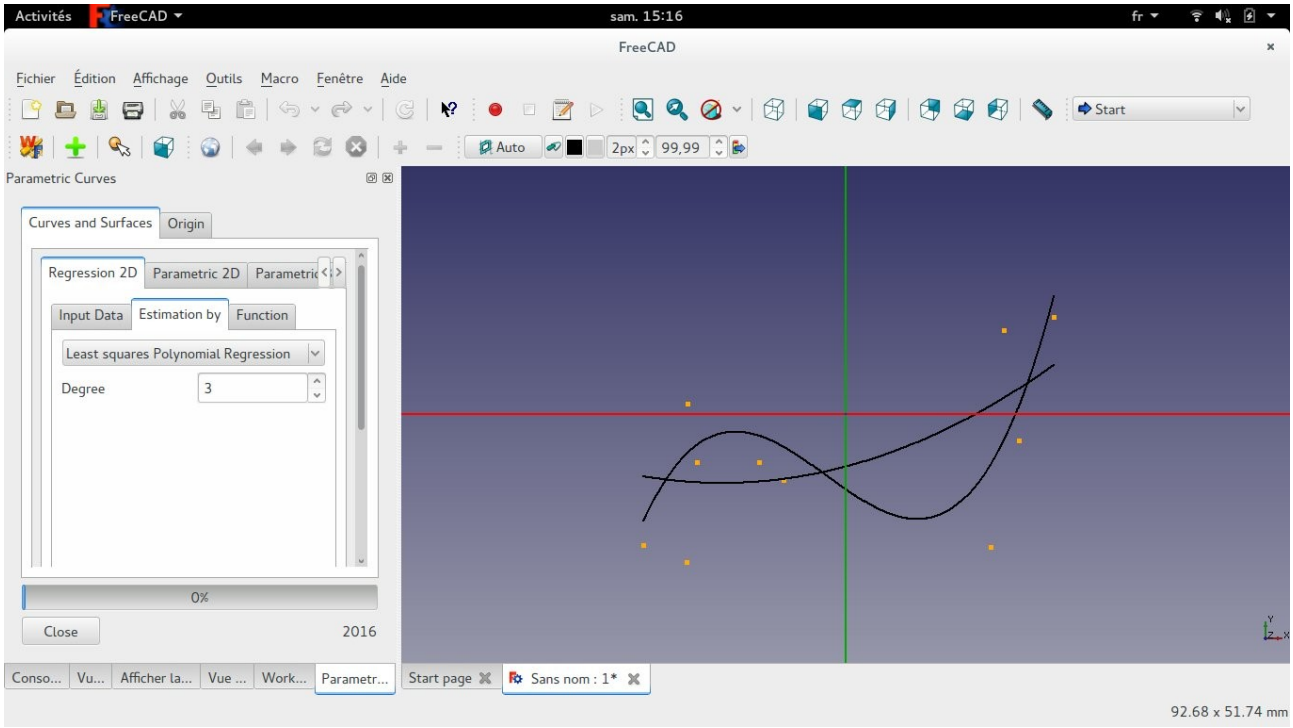




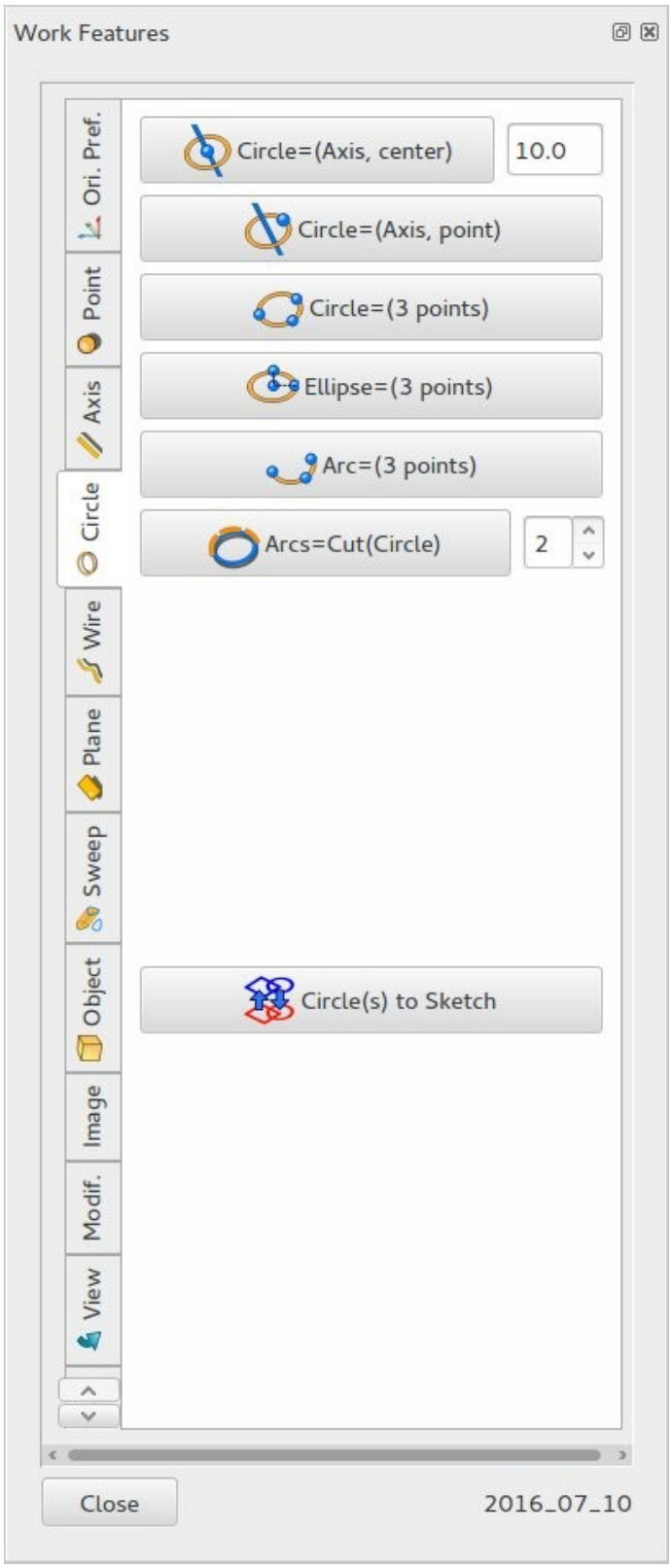
With possible saving of your parametric functions into a file in the home directory.

Here a flavor of this new tool:

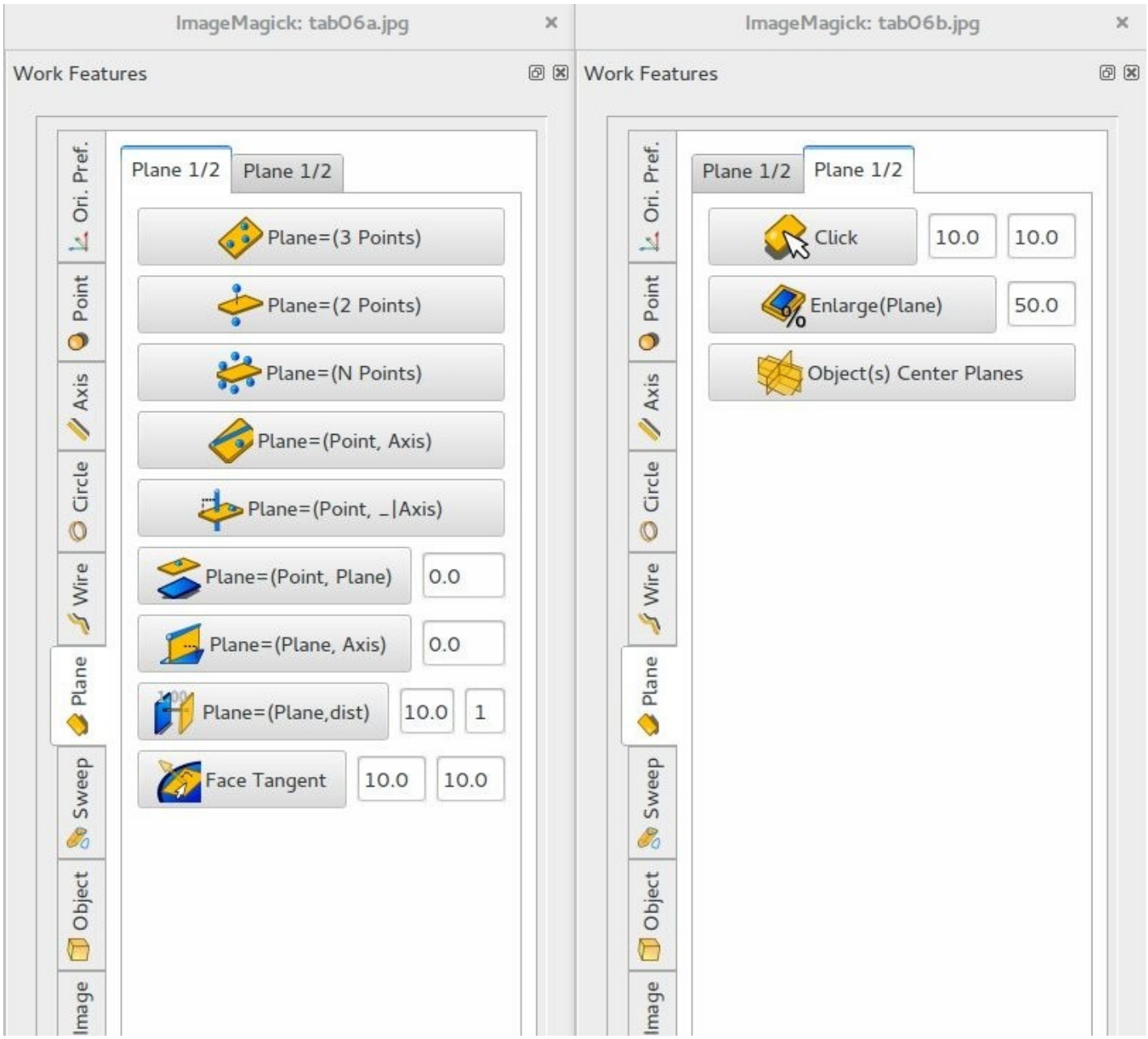




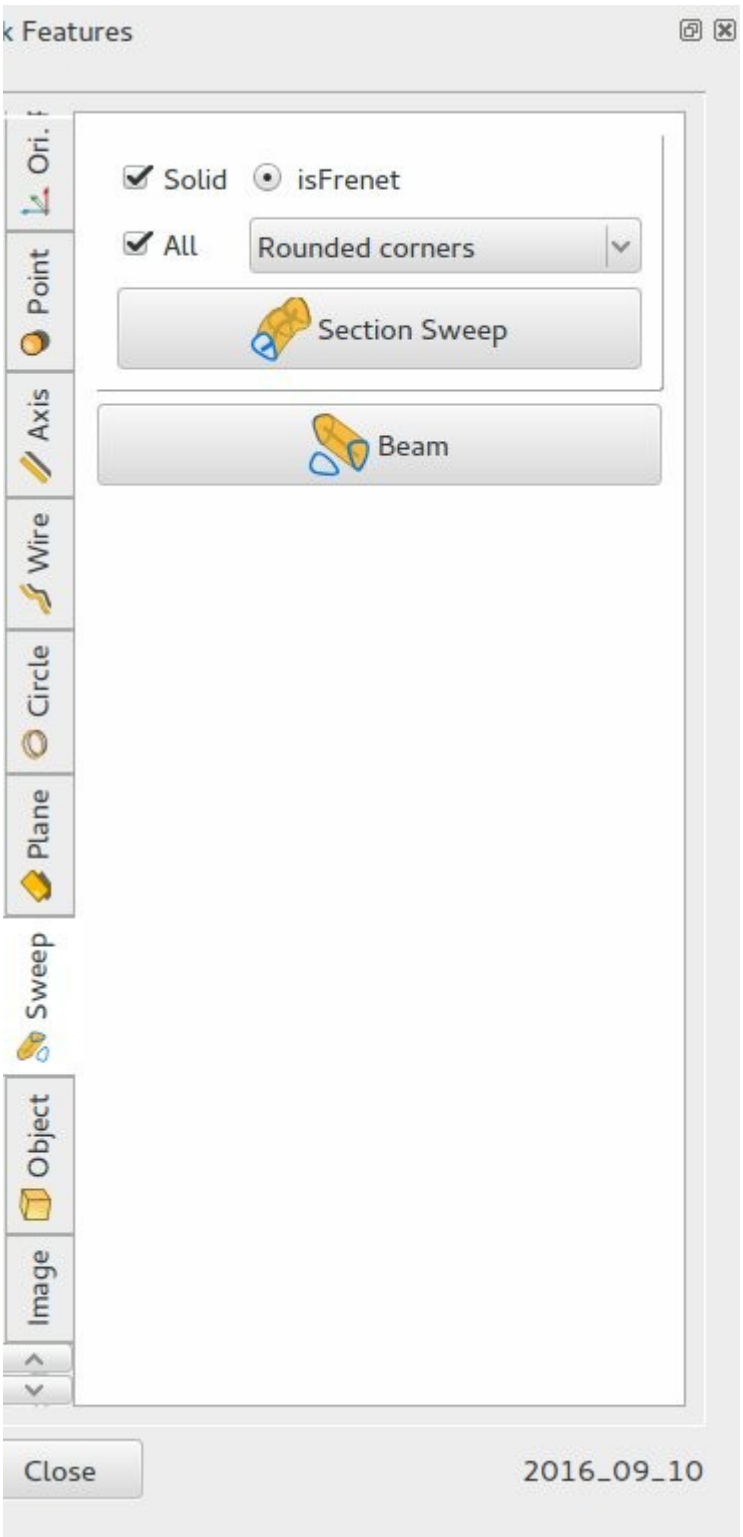
Circle


Work Features
Ori. Pref.
Point
Axis
Circle
Wire
Plane
Sweep
Object
Image
Modif.
View
Circle=(Axis, center)
10.0
Circle=(Axis, point)
Circle=(3 points)
Ellipse=(3 points)
Arc=(3 points)
Arcs=Cut(Circle)
2
Circle(s) to Sketch
Close
2016_07_10

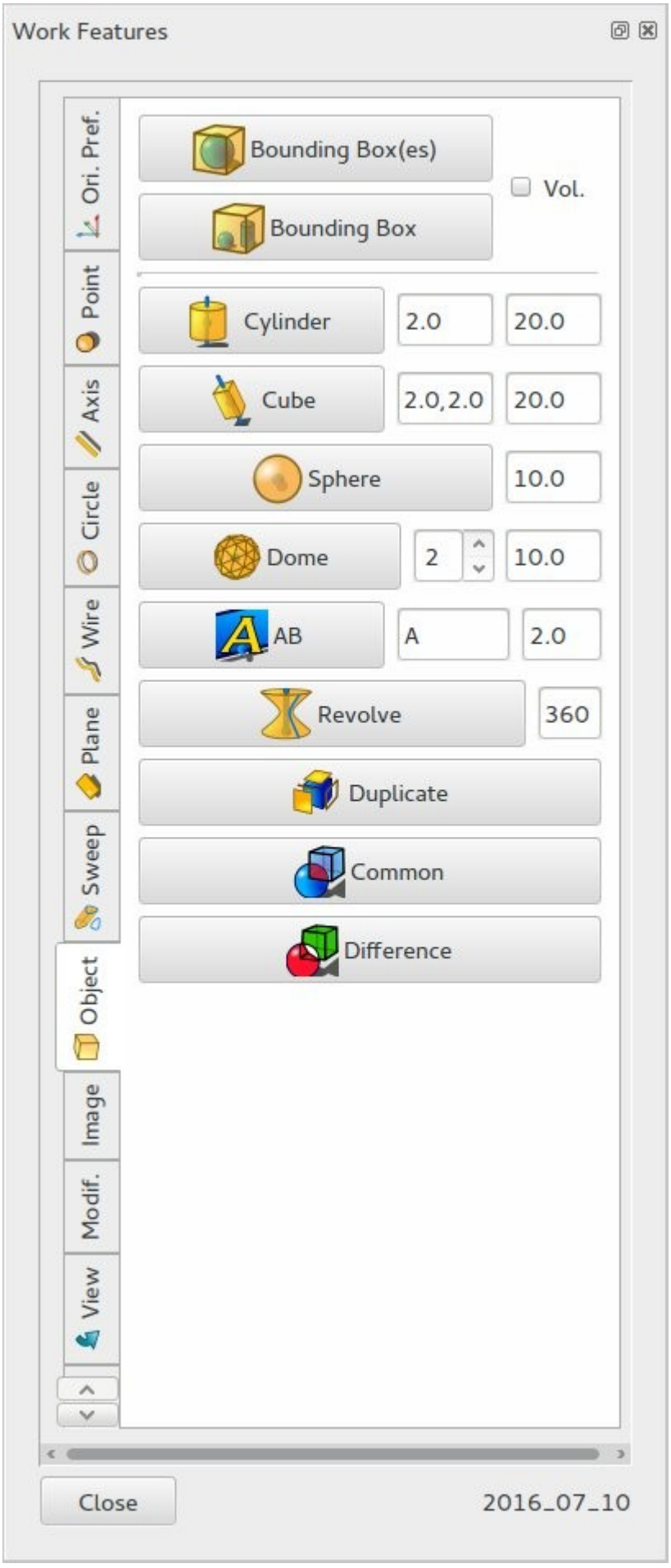
Plane


ImageMagick: tab06a.jpg
Work Features
Ori. Pref.
Point
Axis
Circle
Wire
Plane
Sweep
Object
Image
Plane 1/2
Plane 1/2
Plane=(3 Points)
Plane=(2 Points)
Plane=(N Points)
Plane=(Point, Axis)
Plane=(Point, _|Axis)
Plane=(Point, Plane)
0.0
Plane=(Plane, Axis)
0.0
Plane=(Plane,dist)
10.0
1
Face Tangent
10.0
10.0
ImageMagick: tab06b.jpg
Work Features
Ori. Pref.
Point
Axis
Circle
Wire
Plane
Sweep
Object
Image
Plane 1/2
Plane 1/2
Click
10.0
10.0
Enlarge(Plane)
50.0
Object(s) Center Planes

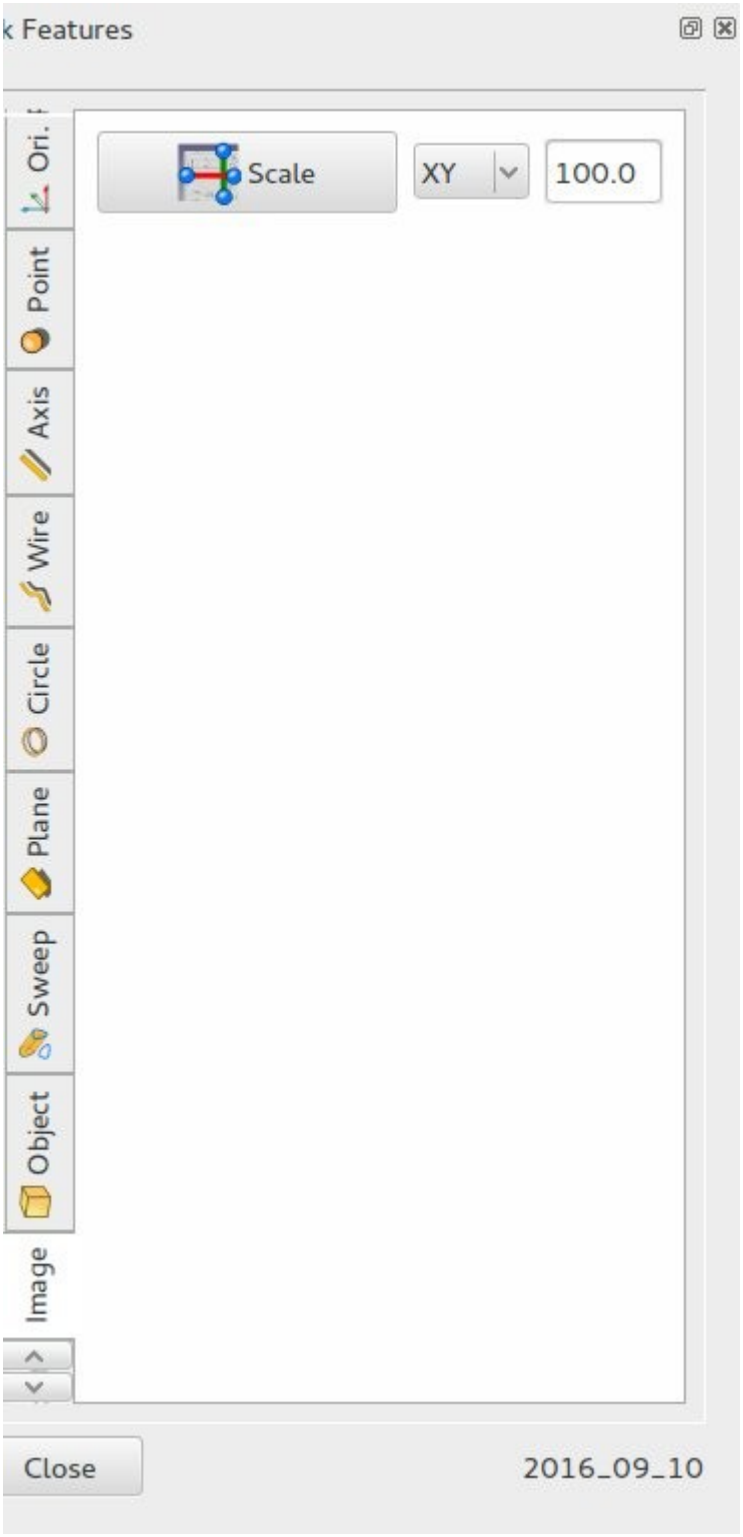
Sweep


k Features
Ori.
Point
Axis
Wire
Circle
Plane
Sweep
Object
Image
Solid
isFrenet
All
Rounded corners
Section Sweep
Beam
Close
2016_09_10

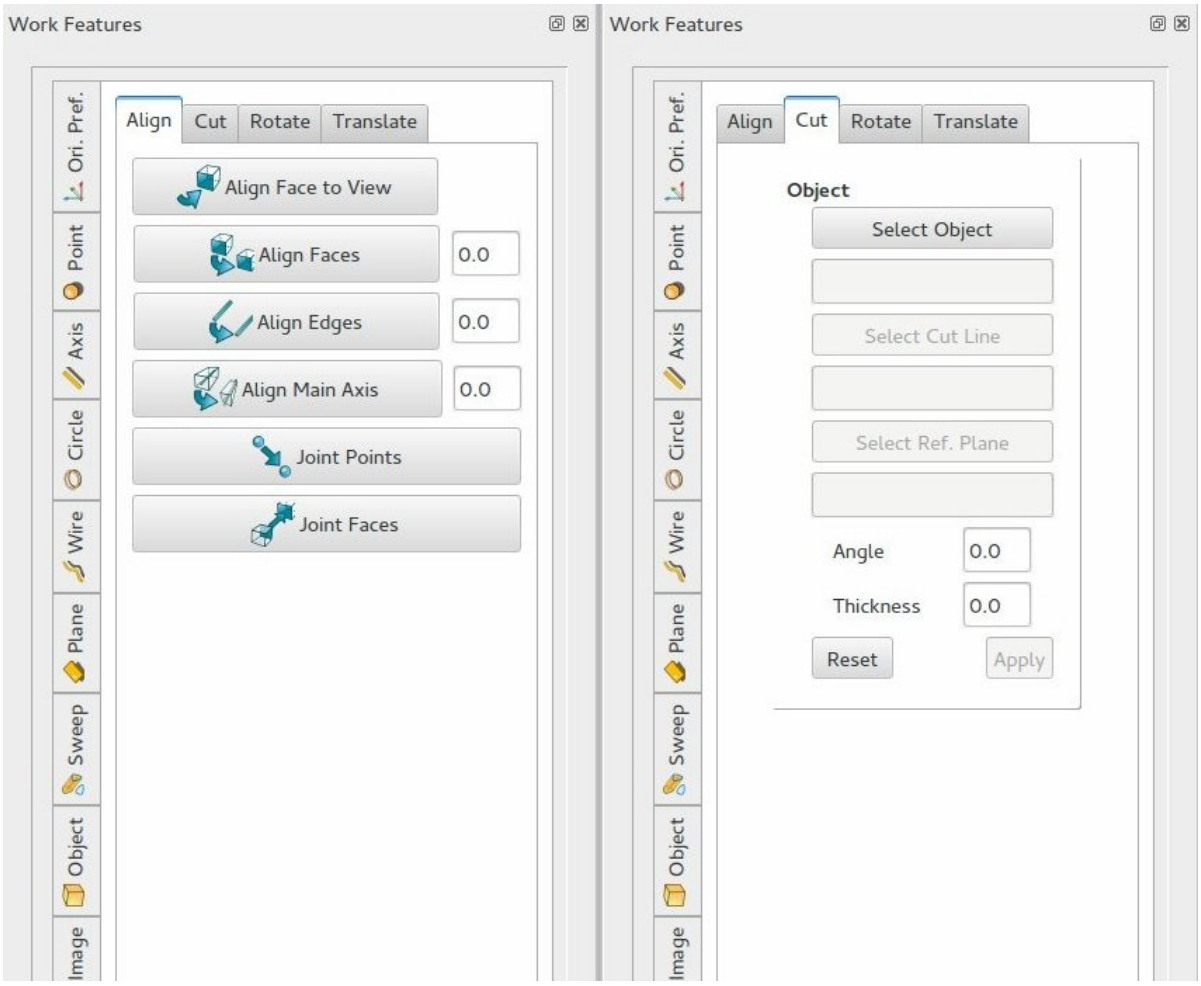
Object

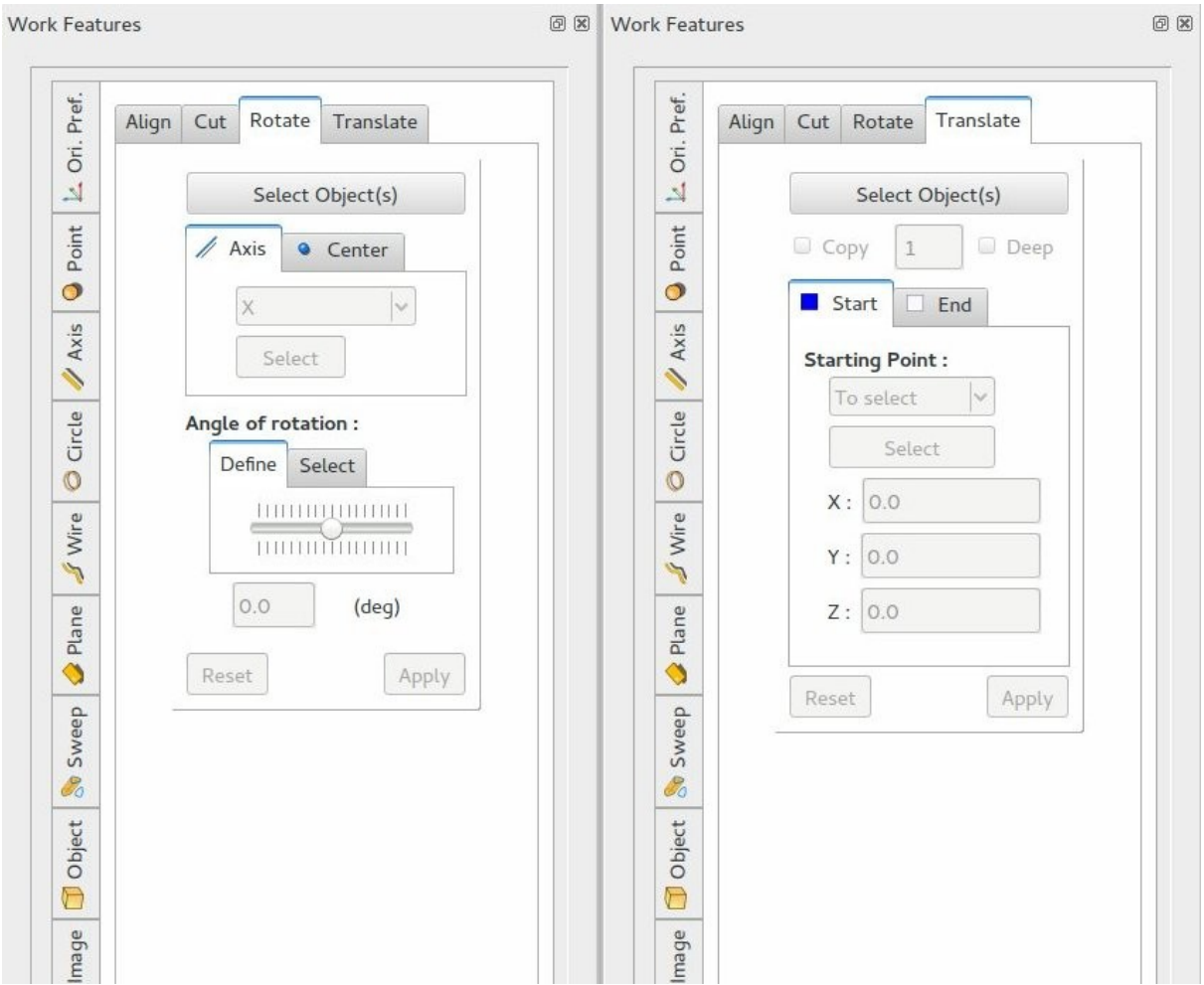

Work Features
Ori. Pref.
Point
Axis
Circle
Wire
Plane
Sweep
Object
Image
Modif.
View
Bounding Box(es)
Vol.
Bounding Box
Cylinder
2.0
20.0
Cube
2.0,2.0
20.0
Sphere
10.0
Dome
2
10.0
AB
A
2.0
Revolve
360
Duplicate
Common
Difference
Close
2016_07_10

Image

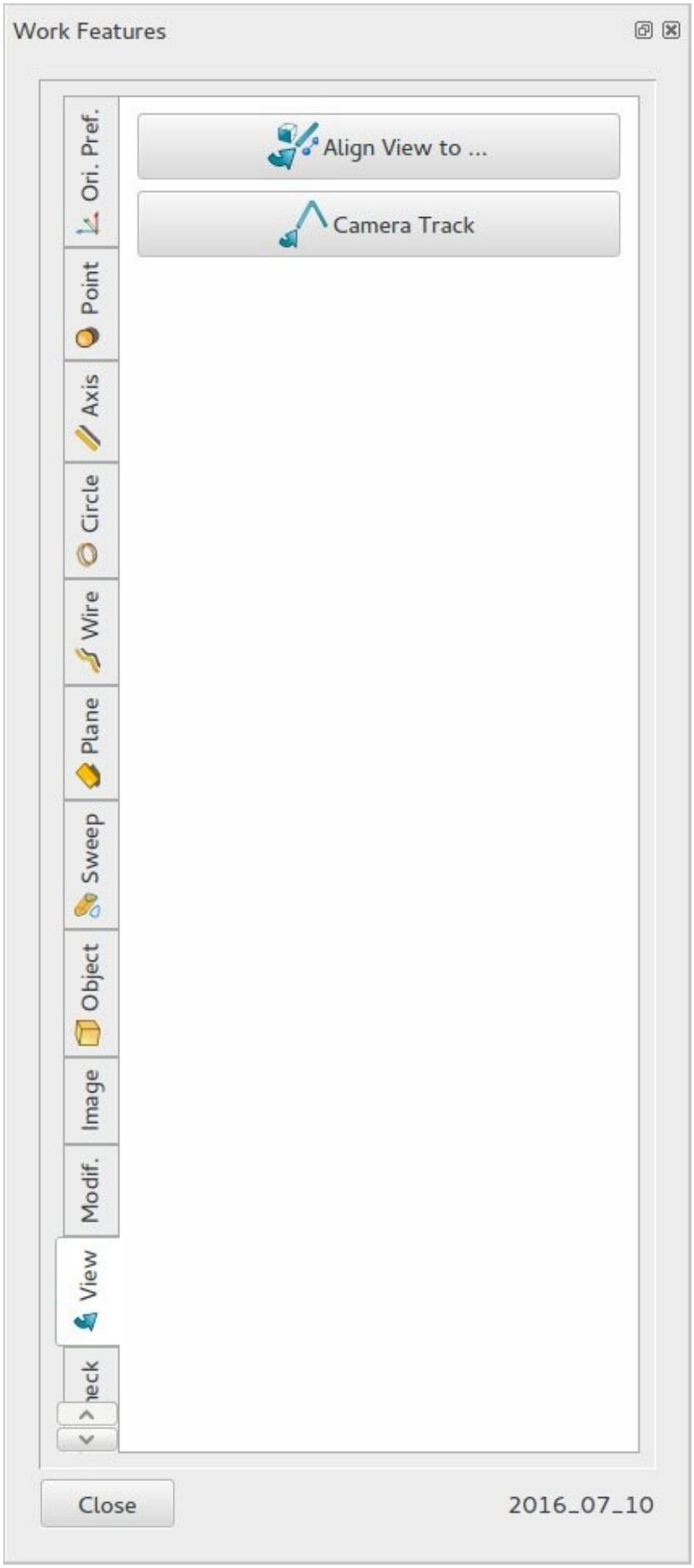

k Features
Ori.
Point
Axis
Wire
Circle
Plane
Sweep
Object
Image
Scale
XY
100.0
Close
2016_09_10

Modif.

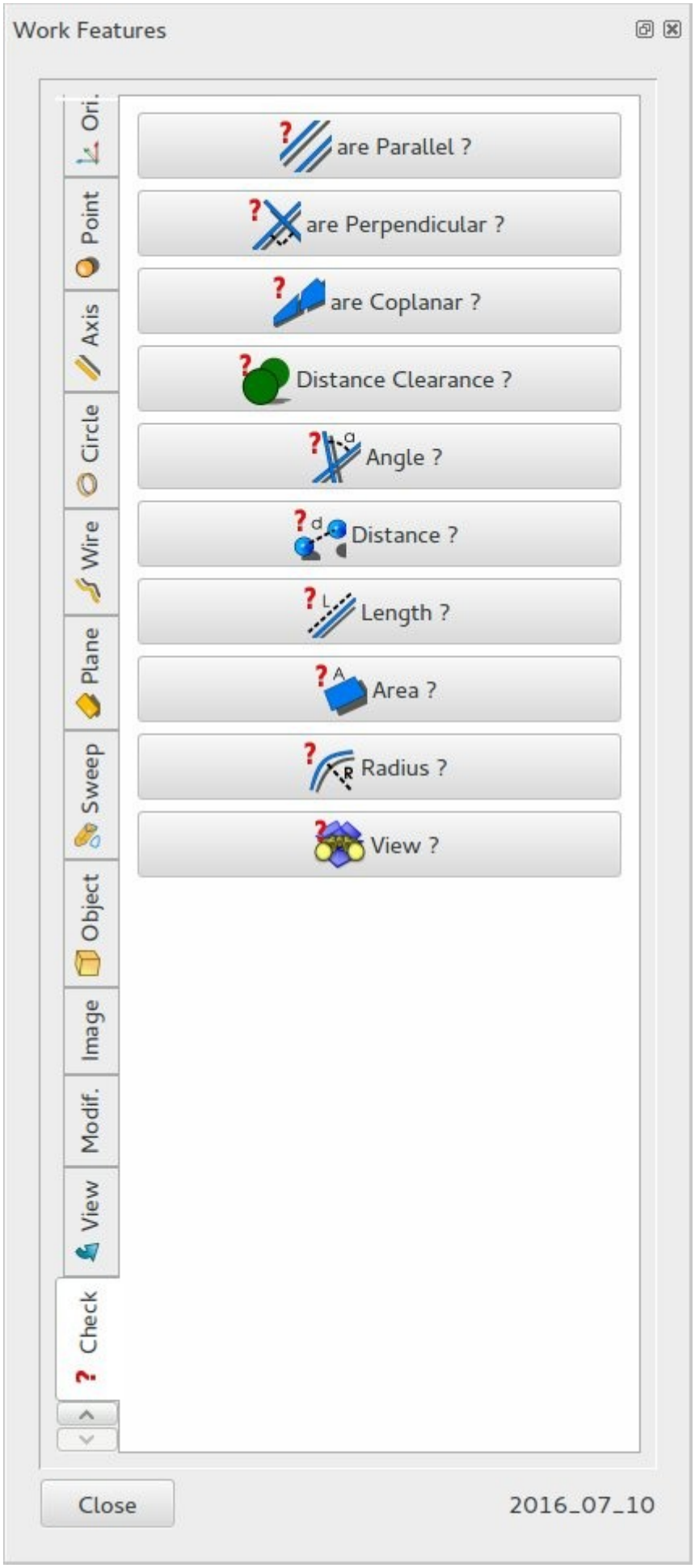

Work Features
Ori. Pref.
Point
Axis
Circle
Wire
Plane
Sweep
Object
Image
Align
Cut
Rotate
Translate
Align Face to View
Align Faces
0.0
Align Edges
0.0
Align Main Axis
0.0
Joint Points
Joint Faces
Work Features
Ori. Pref.
Point
Axis
Circle
Wire
Plane
Sweep
Object
Image
Align
Cut
Rotate
Translate
Object
Select Object
Select Cut Line
Select Ref. Plane
Angle
0.0
Thickness
0.0
Reset
Apply


Work Features
Ori. Pref.
Point
Axis
Circle
Wire
Plane
Sweep
Object
Image
Align
Cut
Rotate
Translate
Select Object(s)
Axis
Center
X
Select
Angle of rotation :
Define
Select
0.0
(deg)
Reset
Apply
Work Features
Ori. Pref.
Point
Axis
Circle
Wire
Plane
Sweep
Object
Image
Align
Cut
Rotate
Translate
Select Object(s)
Copy
1
Deep
Start
End
Starting Point :
To select
Select
X :
0.0
Y :
0.0
Z :
0.0
Reset
Apply

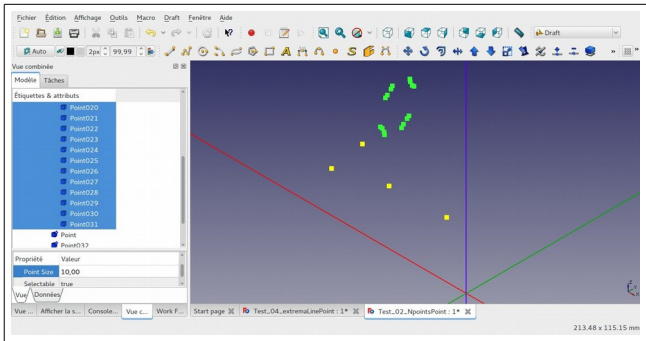
View

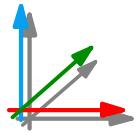
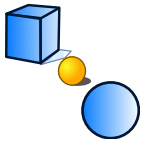
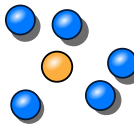
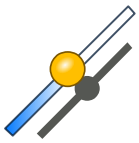
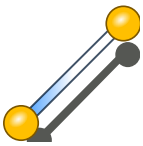

Work Features
Ori. Pref.
Point
Axis
Circle
Wire
Plane
Sweep
Object
Image
Modif.
View
Align View to ...
Camera Track
Close
2016_07_10

Check


Work Features
Ori.
Point
Axis
Circle
Wire
Plane
Sweep
Object
Image
Modif.
View
Check
are Parallel ?
are Perpendicular ?
are Coplanar ?
Distance Clearance ?
Angle ?
Distance ?
Length ?
Area ?
Radius ?
View ?
Close
2016_07_10

To be continued…


Fichier Édition Affichage Outils Macro Draft Fenêtre Aide
Draft
Vue combinée
Modèle Tâches
Étiquettes & attributs
Point020
Point021
Point022
Point023
Point024
Point025
Point026
Point027
Point028
Point029
Point030
Point031
Point
Propriété Valeur
Point Size 10.00
Selectable true
Vue Données
Start page
Test_04_extremaLinePoint : 1*
Test_02_NpointsPoint : 1*
213.48 x 115.15 mm

		Vertex	Edges	Wires	Faces	Objects
	**plot_originObject()**	0	and 0		and 0	and 0
	**plot_centerObjectPoint()**	0	and 0		and 0	and >0
	**plot_NpointsPoint()**	>=2	and 0		and 0	and 0
	**plot_centerLinePoint()**	>=2	or >0		or >0	or >0
	**plot_extremaLinePoint()**	0	and (>0		or >0	or >0)
	plot_centerCirclePoint()					