

```
;HEADER
;Start_gcode
G21          ; Set to metric [change to G20 if you want Imperial]
G91          ; Force coordinates to be absolute relative to the origin
G1 Z10 F1000
G90          ; Force coordinates to be absolute relative to the origin
G28 X        ; Home X axis
G28 Y        ; Home Y axis
G28 Z        ; Home Z axis
M302 P1      ; Disable Cold Extrusion Checking
G92 E0        ; Reset extruder to [0] zero end of cleaning run
G91          ; Force coordinates to be absolute relative to the origin
G1 Z10 F1000
G90
T0
M117 Printing...
;ENDHEADER
;Layer # 1
G1 F700 E0
G0 X91.08 Y136.70 Z5.50 F4000
G0 X91.08 Y136.70 Z3.50 F4000
G1 X91.34 Y133.56 Z3.50 F700 E12.61
G1 X91.88 Y131.20 Z3.50 F700 E22.80
G1 X92.50 Y129.11 Z3.50 F700 E31.03
G1 X93.66 Y126.44 Z3.50 F700 E42.67
G1 X95.10 Y123.91 Z3.50 F700 E54.31
G1 X97.29 Y121.00 Z3.50 F700 E68.86
G1 X99.44 Y118.70 Z3.50 F700 E81.47
G1 X101.82 Y116.63 Z3.50 F700 E94.08
G1 X105.02 Y114.44 Z3.50 F700 E109.60
G1 X108.25 Y112.76 Z3.50 F700 E124.15
```

MAMBA



Mamba is a Grasshopper™ component focusing to be used on almost any kind of generic 3D printer both FDM(fused deposition modelling) & paste printers (ceramic-biomaterials with pressure or motor control), up to large-scale Robotic Fabricators using FFF technologies and running from Gcode or for simple path generator on them.

In addition it exposes functionality that is relevant to the transformation on machine instructions (G-code commands) of any polyline input.

Overview

At the core of this component is a compiled ghuser object made out of the clusterization of standart grasshopper components. So you would not need to install any external dependencies to run this plugin.

This should work with most major firmware(Marlin, Repetier, RepRap, etc) and G-code Reader. If you encounter any problems related to Gcode, let us know.

Depending of the geometry on input some components might become slow, so a CALCULATE button was added to avoid crashing on slider parameter changes on slow computers.

Available to be used to prepare out of the box with defect values for ceramic 3d printer for the in-house ceramic printer build in a 'Plug and Play' for vase geometries, or in a more controlled and experimental manner with Custom input.

This plugin has been tested for more than 3 years at IAAC - Fab Lab Barcelona by hundreds of students & staff helping to improve it and make as easy to use as possible. By providing a comprehensive, yet easy-to-use plugin, this plug-in can be used by both non-experts (for example, architects and designers familiar with Grasshopper's parametric toolbox) as well as advanced users (who can experiment with the different utilities and GCode assembler to input directly spatial 3 dimensional lines to generate print paths and vary te range of input parameters to customize their print design)

Installation

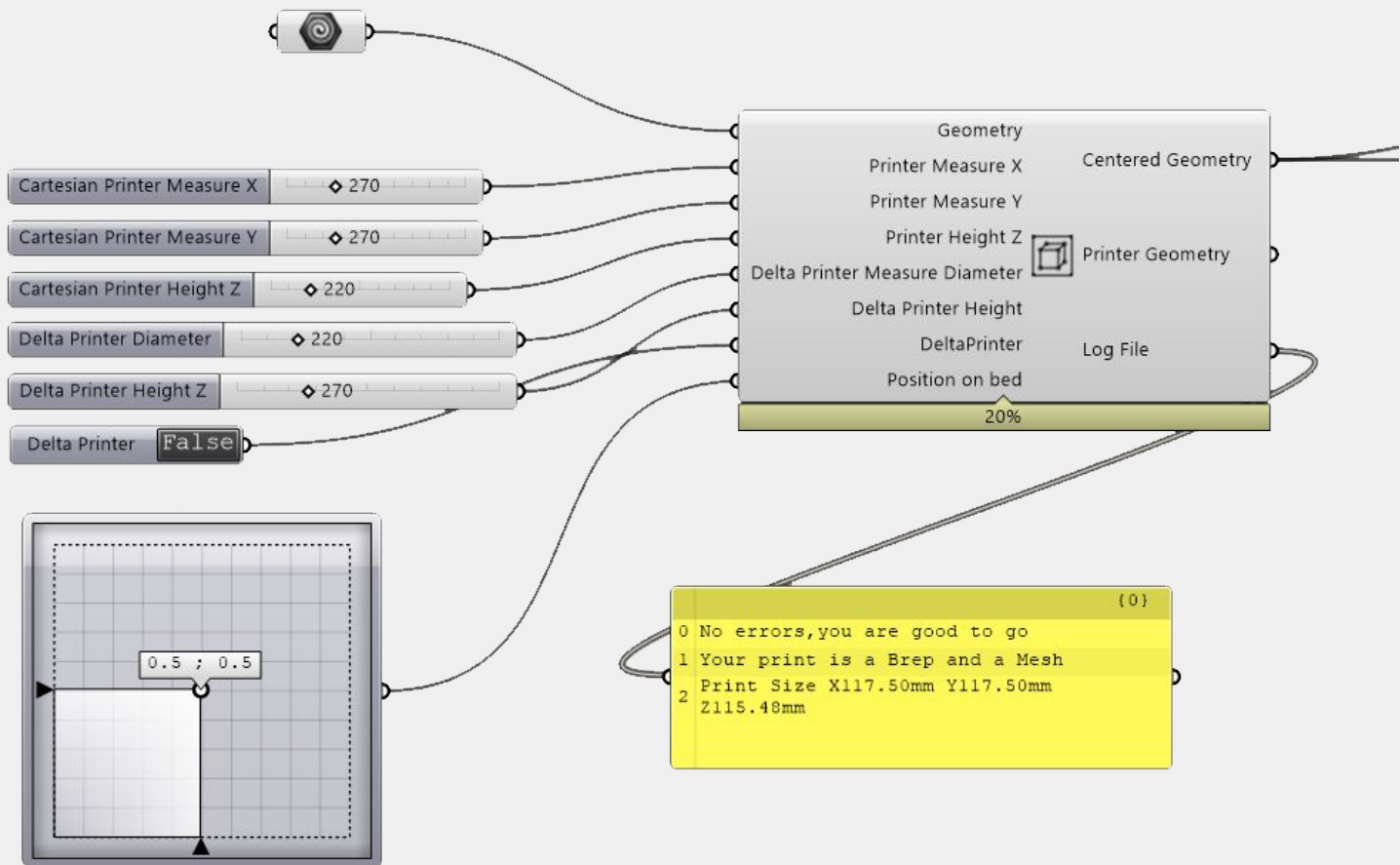
In Grasshopper, choose File > Special Folders > Components folder. Save the gha file there.

Right-click the file > Properties > make sure there is no "blocked" text

Restart Rhino and Grasshopper



3D Printer Configuration Component



This component is used to define the geometry input and characteristics (size of the bed, height, shape of the base) of the printer.

The default printer is the *Ender Pro 3 & 5* but the component is configured for a Delta Printer as well by activating the Delta Printer toggle.

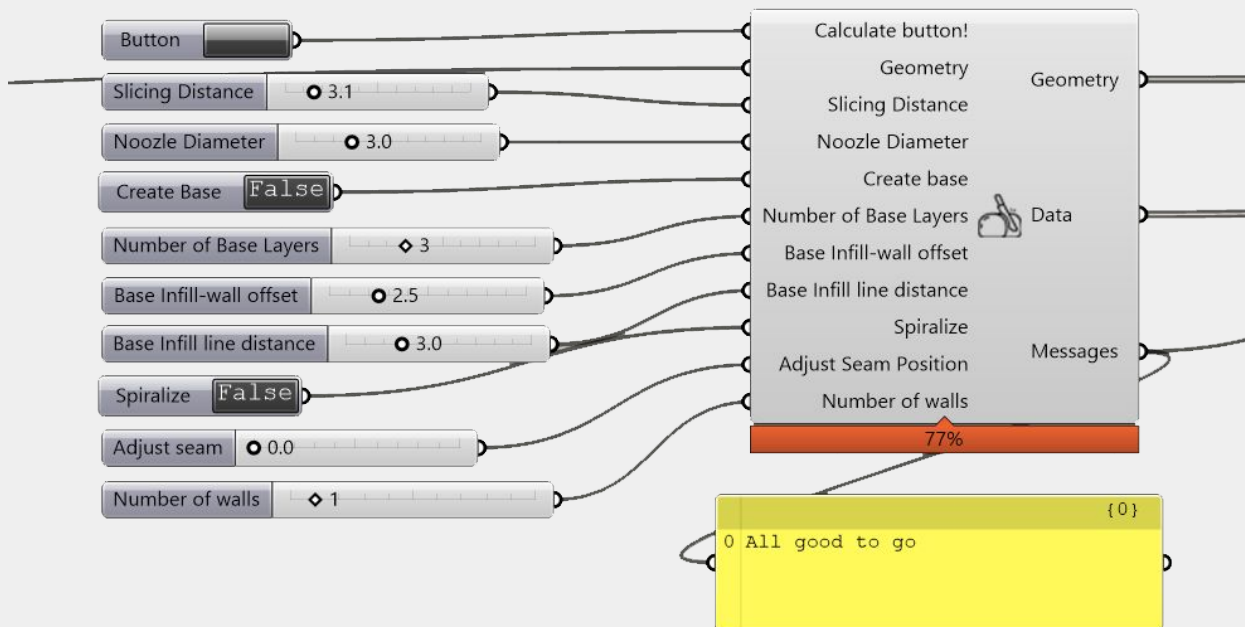
The MD Slider allows you to locate your geometry along the bed surface defined on the measurement of the machine.

[GEOMETRY INPUT]: Allows to reference external geometries or connect geometries created in grasshopper as long as they fit in the volume created by the measurement input. Both Brep and mesh inputs are accepted but inherently works faster and more reliable with Brep

[...]



Slicer Component



This component is used to generate the sliced geometry that will then be converted into G-code.

[Calculate Button] Click on it to recalculate the modified data or geometry(boolean toggle)

[Slicing Distance] Defines the distance between the layers depending on the material (number)

[Nozzle Diameter] Nozzle of the extruder piece (mm) (number slider)

[Create Base] Creates a base for the input geometry (boolean switch)

[Base infill- wall offset] Defines the distance between the outline(wall) of the base and the inner grid. Should be adjusted according to the diameter of the nozzle and the properties of the material (usually 70% diameter or nozzle) (number)

[Base infill line distance] Defines the distance between the infill grid . Should be adjusted according to the thickness of the nozzle and the properties of the material.(usually 70% diameter or nozzle) (number)

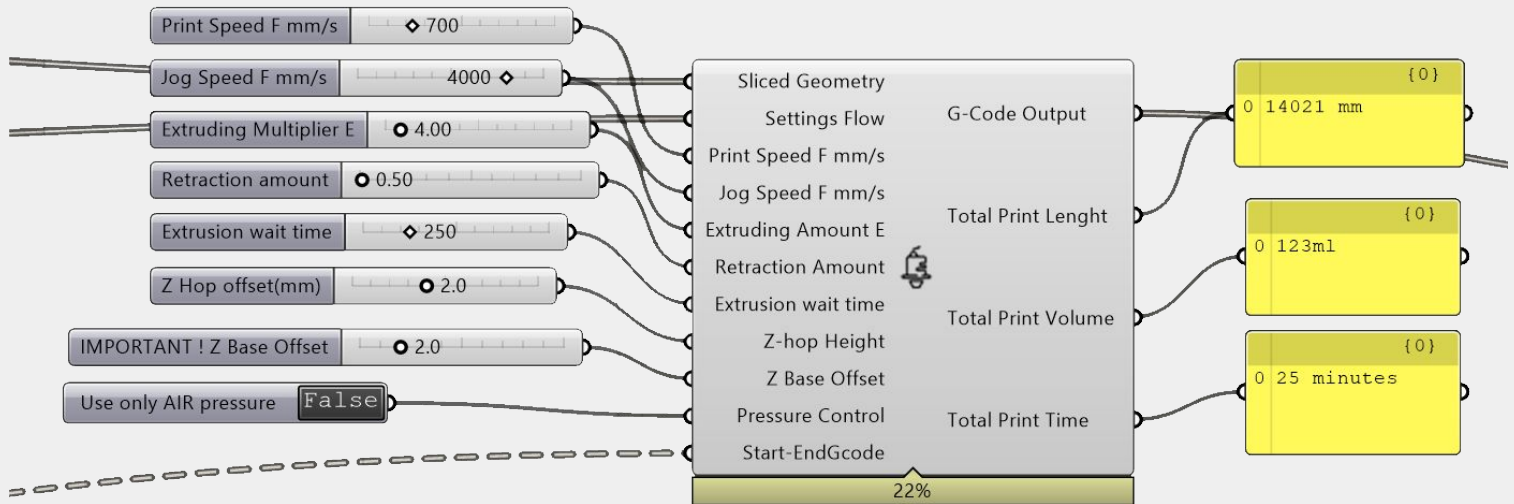
[Spiralize] The toggle gives the option to print in a spiralize mode, ONLY WORKS IN SINGLE WALL CONFIGURATION (boolean switch)

[Adjust Seam] Value between 0.0 to 1.0 (number)

[Number of Walls] Creates additional walls to the geometry input (Does not work in Spiralize mode) (number)



G-Code Assembly Component



This component is used to generate the G-Code of the Sliced Geometry

[Sliced geometry] Input of the desired geometry Polyline input)

[Settings Flow] Inherits the values from slicer to calculate volumes,etc (Connects to slicer or leave disconnected)

[Print Speed] Speed while printing in mm per sec (number slider)

[Jog Speed] Speed while doing an air travelling move a.k.a no print moves(number slider)

[Extruding Multiplier E] Total amount of extrusion on steps/mm multiplier, this number needs to be adjusted depending on material & machine (number slider)

[Retraction amount] Total amount of retraction on steps/mm, this number needs to be adjusted depending on material & machine(number slider)

[Extrusion wait time] Wait time in milliseconds before executing an air travelling move and restart the print to accommodate from pressure built up time(number slider)

[Z Hop Offset(mm)] Vertical height move between prints in air movements (number slider)

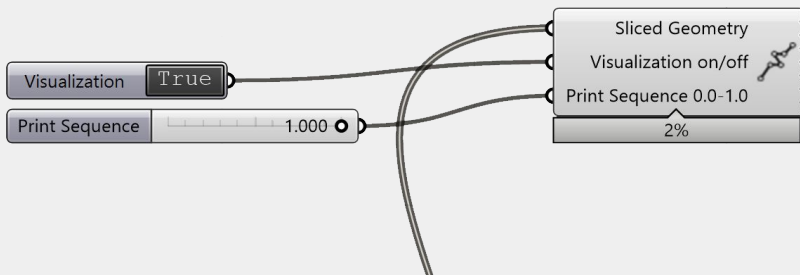
[Z Base Offset] Value to adjust the print Z0 in case you are printing on top of another material on top of the base or the nozzle is longer (number slider)

[Pressure Control] In case electro solenoid for air pressure print activation for print/air travelling moves (boolean switch)

[Start-End Gcode] Connects the configuration input from custom or configurable start-end gcode components (panel)



Utilities- Path Visualization

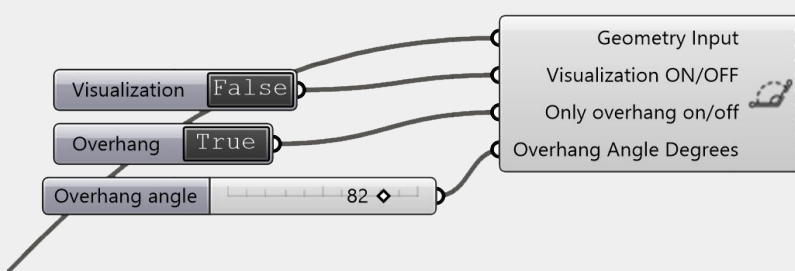


This definition can be used to visualize the output sliced geometry from the Full Slicer Component.

[Visualization] The toggle gives the option see the path of printing in color(boolean switch)

[Print Sequence] Value between 0.0 to 1.0 (number) to see the print from init =0 to end=1.0

Utilities- Overhang Visualization



This definition can be used to visualize the overhang geometry output from the 3d Printer Configuration Component or just any geometry as input.

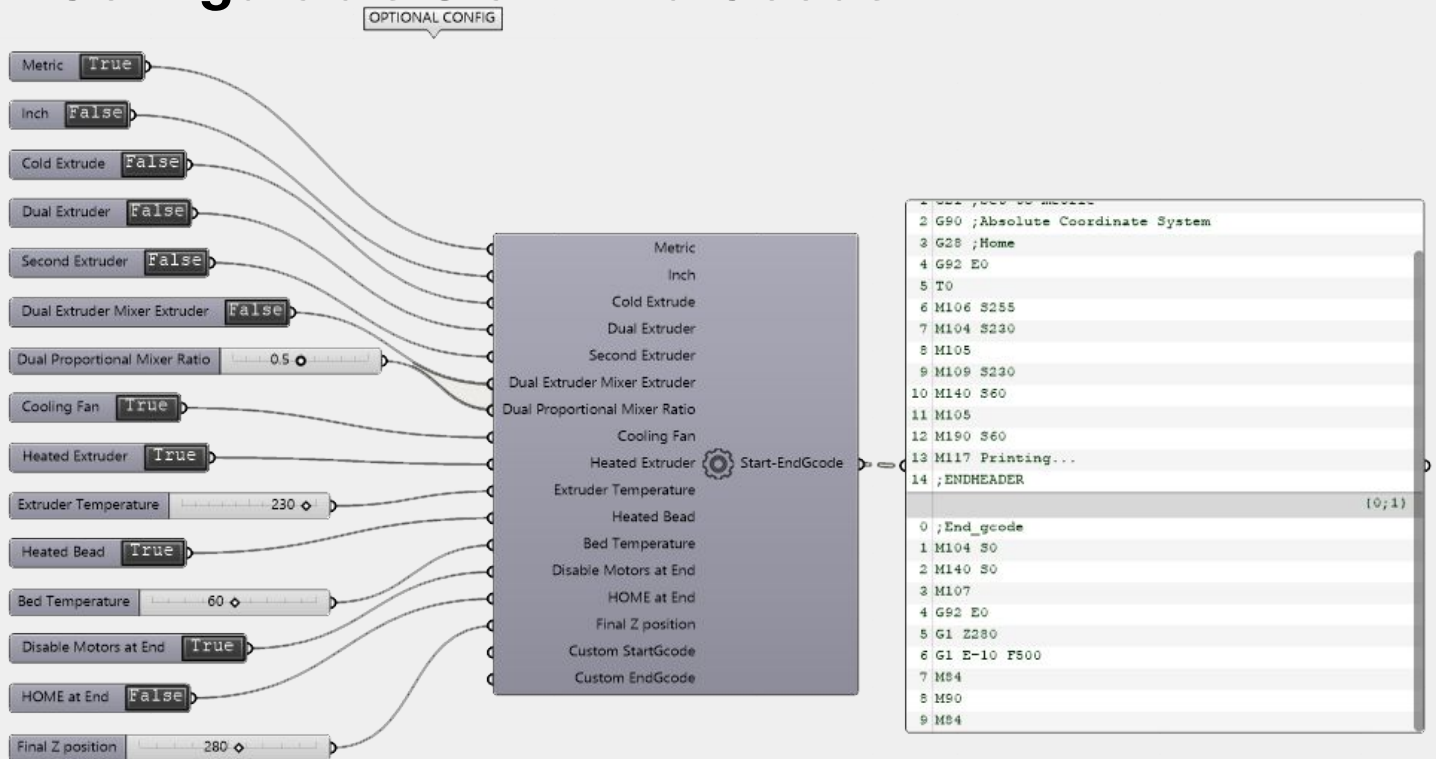
[Visualization] The toggle gives the option see the overhang of printing in color (boolean switch)

[Overhang] The toggle gives the only see the overhang areas (boolean switch)

[Overhang Angle] Value between 0 to 90 (number) to accommodate for the máx overhang angle of your material/setup



Configurable Start-End Gcode



This definition is connected to the **G-Code Assembly Component** and configures the start/end gcode for your machine/setup with a present commodity of booleans and sliders. It allows you to also input custom start & end gcode together with the predefined options

[Metric] Sets the gcode in MM (boolean switch)

[Inch] Sets the gcode in INCH (boolean switch)

[Cold extrude] Allows to move extruder at room temperature. Mandatory activation for past printing. (boolean switch)

[Dual extruder] Single nozzle but dual extruder motors for different materials (boolean switch)

[Second extruder] Multi-hotend machine setups T1-T2 (boolean switch)

[Extruder mixer] This allows dual extruder motors simultaneously (boolean switch)

[Proportional mixer] 0.0 only extruder 1 ---1.0 only extruder 2 ,mixer ratio (slider)

[CustomStart Gcode] Connect the gcode of the start sequence of your machine (panel)

[Cooling fan] If hotend blower fan is available & wants to be used (boolean switch)

[Heated extruder] If the nozzle is heated (boolean switch)

[Extruder Temperature] Print temperature (number slider)



[Heated bed] Thermal bed option(boolean switch)

[Bed temperature] Bed temperature configuration (number slider)

[Disable motors at end] Switch off all motor, possible Z fallout. Usually only active in Cartesian machines (boolean switch)

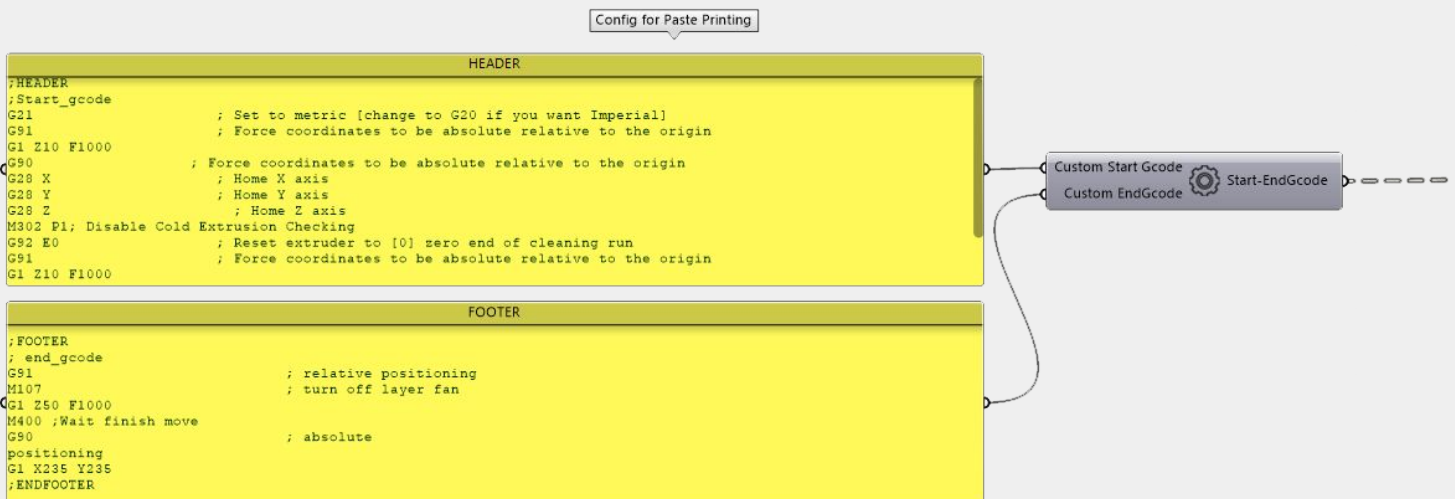
[Home at end] Home all axis.Warning! Possible collision depending on machine,usually only active in deltabots (boolean switch)

[Final z position] Z position in mm for the z to raise (number slider)

[Custom Start Gcode] Connect the gcode of the start sequence of your machine (panel)

[Custom End Gcode] Connect the gcode of the end sequence of your machine (panel)

Custom Start-End Gcode



This definition is connected to the **G-Code Assembly Component** and configures the start/end gcode for your machine/setup. It works by connecting the G-code content panel for both start & end. Warning! Panel needs to be in multiline data mode and no empty data in the panel!

[Custom Start Gcode] Connect the gcode of the start sequence of your machine (panel)

[Custom End Gcode] Connect the gcode of the end sequence of your machine (panel)



Credits

This plugin was created for FabLab Barcelona and IAAC(Institute for Advanced Architecture of Catalonia) after 3 years of internal development.

- -Ashkan Foroughi Dehnavi for his heavy work on the print path gcode generator building lot of utilities and improving deeply the inner core of this tool.
- -Josep Marti for aide in testing roughly all versions of it.
- -Alex Dubor for his initial script reference on gcode parsing.
- -Daphne Gerodimou for all the huge work on documenting this plugin and visuals.
- -Santi Fuentemilla & Guillem Camprodon for supporting this development.
- -Park Hyun for optimizing gcode parsing scripts.

- Eduardo Chamorro Martin

Disclaimer

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