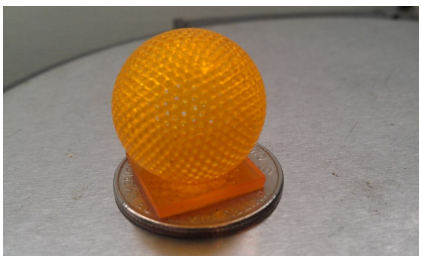
Creation Workshop

UV DLP Slicing and Control Software

User Manual

Beta Version Manual



Code Contributors:
Steve Hernandez
Martin Gugg

Creation Workshop has a new home and forums at www.EnvisionLabs.net

Revision History:

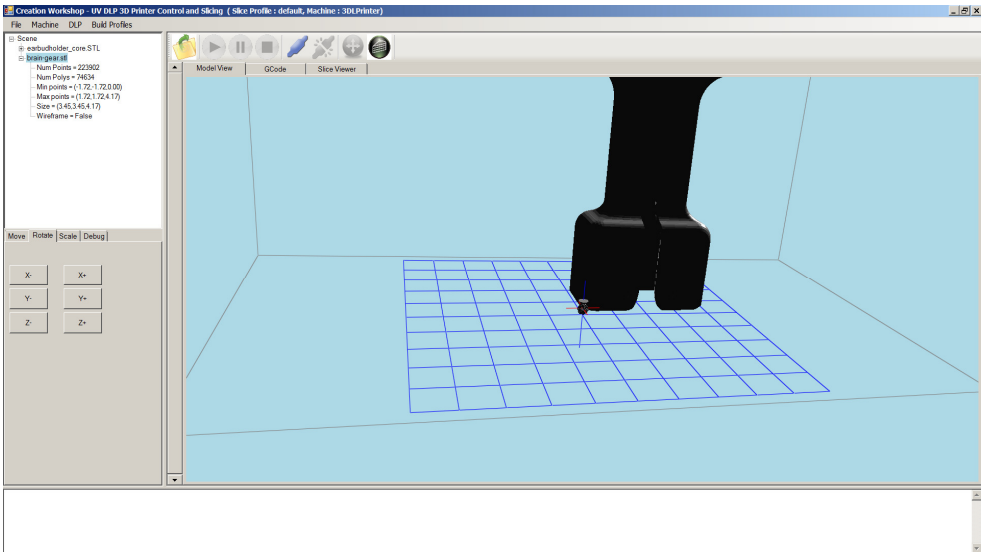
Date	Version	Author	Description
02/21/13	Alpha 1	Steve Hernandez	Initial notes, quick guide, and description
7/31/2013	Beta 10	Steve Hernandez	Current screen shots, added more description, re-wrote large portion to reflect current software.
10/22/2013	Beta 12	Steve Hernandez	Updated manual to reflect changes for version 12

Contents

Installation:

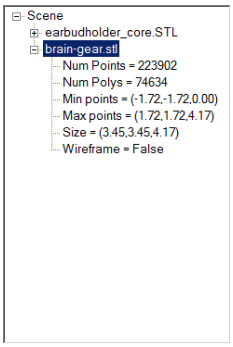
Installation of the application is fairly straightforward. Simply unzip the contents of the zip file into a directory of your choice. When the application is started for the first time, it will automatically create all necessary subdirectories and default machine and slicing profiles. *Note – be sure unzip into a new directory, and not overtop an old installation. Previous config files are NOT compatible.

Running the application:



Loading a Model

You can load a binary STL, OBJ, or 3DS model from disk by clicking on the 'Load' icon or choosing 'Load Model from the 'File'. Multiple models can be loaded and manipulated independently. After loading a model, it will appear in the Scene Graph.



The scene graph displays information about each model. The model that appears selected in the scene graph is the one affected by Move, Scale, and Rotate commands. You can select a model simply by clicking on it in the Scene Graph.

Selecting a Model

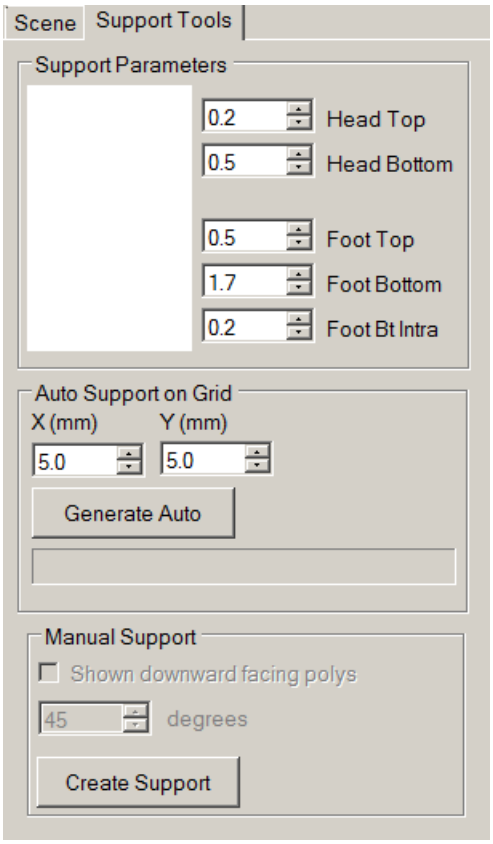
Selected models appear in green. When a model is loaded, it will be automatically selected. You can select a model by double clicking on the model in the 3d view. You can also select a model by clicking on the node in the scene graph.

Removing a Model

- You can remove a model by right-clicking on the name in the scene graph and selecting "Remove".

- You can also delete a model by selecting it and then pressing the “delete” key on your keyboard.

Working with Model Support tools



After a model is loaded into the scene and selected, you can automatically generate a ‘bed of nails’ support for the model. You can specify the grid spacing and the size of the generated supports. A single support can be generated for manipulation by clicking the ‘Create Support’ button.

Moving supports

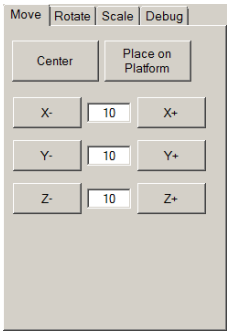
After a manual or automatic support has been generated, individual supports can be moved around the X/Y plane the same way models can be moved. Select the support by double clicking on it, and hold down the ‘Shift’ key on your keyboard and move the mouse. Supports will automatically scale vertically under the model they support.

Saving a Scene

After one or more models have been loaded and manipulated on the build platform, the entire scene can be saved as an STL model for later use. Simply click on the ‘File->Save Scene STL’ menu item to save the scene model.

Move a model

The position of a model on the build platform can be manipulated. Select the correct model on the scene graph, and use the controls on the 'Move' tab. The 'Center' button will center the model at (0,0,0). The 'Place on Platform' button will position the bottom of the model to rest on the bottom of the build platform. The 'X,Y,Z' buttons will allow you to move the model in the scene.

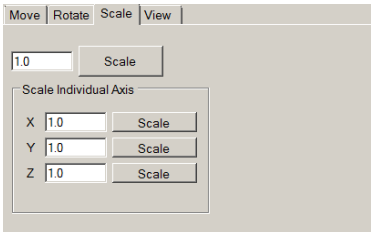


Moving a model with the mouse

You can also move a model manually by selecting it, then holding down the 'Shift' key on your keyboard. The model will slide along the X/Y ground plane, following the mouse location.

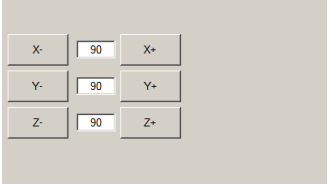
Scale a model

A model can be scaled by selecting it, and using the 'Scale' tab to enter in a new scaler value. Clicking on the Scale button will perform the scaling operation. Individual axis of the model can be scaled by entering in a scaler value.



Rotate a model

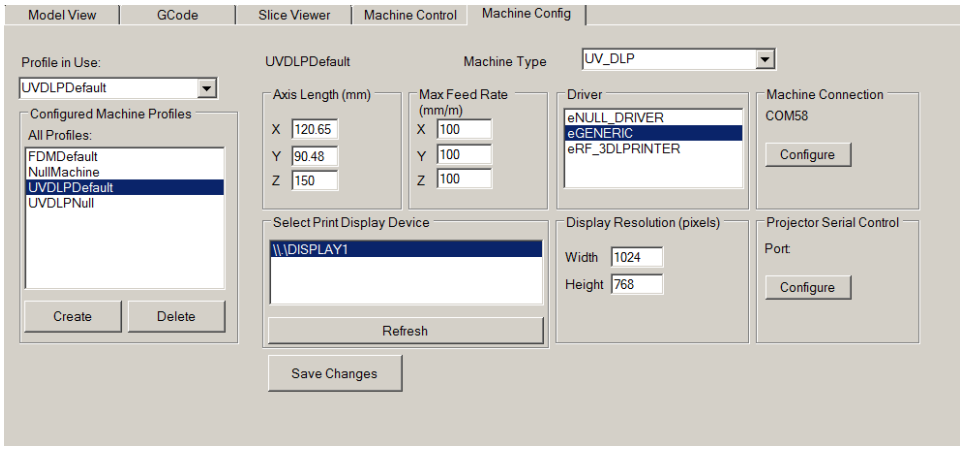
Rotating a model works in a similar way to moving a model. Simply select the model you want to work with via the Scene Graph, and use the X/Y/Z buttons to rotate the model by the specified degrees.



Setting up a UV Machine for Printing

This section covers the basics for setting up a Machine Profile to use with your 3d Printer. For a detailed guide on Hardware and troubleshooting, please refer to the 'Hardware Guide' manual.

When you ran 'Creation Workshop' for the first time, it created a default 3d UV DLP machine profile. You will need to configure this profile to meet the specifications of your 3d printer. To edit the current machine profile, select 'Machine Config' tab in the main window.



You can create new profiles from the left "Configured Machine Profiles" box. The currently selected profile is indicated in the "Profile in Use" drop-down box. In this display, you can create and configure multiple machines. (UV DLP, FDM, etc..)

For UV Printers, set the platform size for your machine in mm. This X/Y size refers to the projected size of the image on the surface of the build platform. For bottom-up machines, this will be on the surface of the bottom of the VAT, for top-down machines, this will be the surface of the resin. The Z size refers to the maximum Z printing height. This screen also allows you to select a display device the projected images will be displayed upon.

Selecting a display device:

This configuration screen also allows you to select the display device to use for your UV printer. Connected display devices should appear in this area. Clicking on a display device will automatically set the 'Display Resolution'. If your display device does not appear in this area, please check your display connection and click the 'Refresh' button.

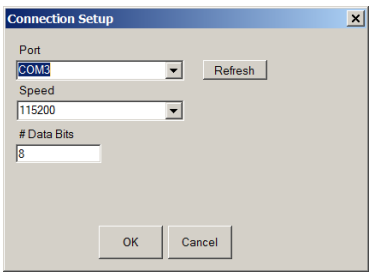
Machine Drivers:

You should also select the correct driver for your machine type. Most machines will use the 'eGeneric' driver to connect via serial port to a RAMPS-compatible controller board. Also in this screen, you can specify the feed rates to use on your axis's.

*NOTE- The eNULL_DRIVER can also be useful for testing purposes. This allows you to use a dummy virtual machine to perform a build. This can help you see how your GCode and build sequence performs prior to connecting to a live machine.

Selecting a Machine Connection COM Port

Once a Machine profile has been configured and selected, the 'Machine Connection' button can be selected to show the Connection setup screen.



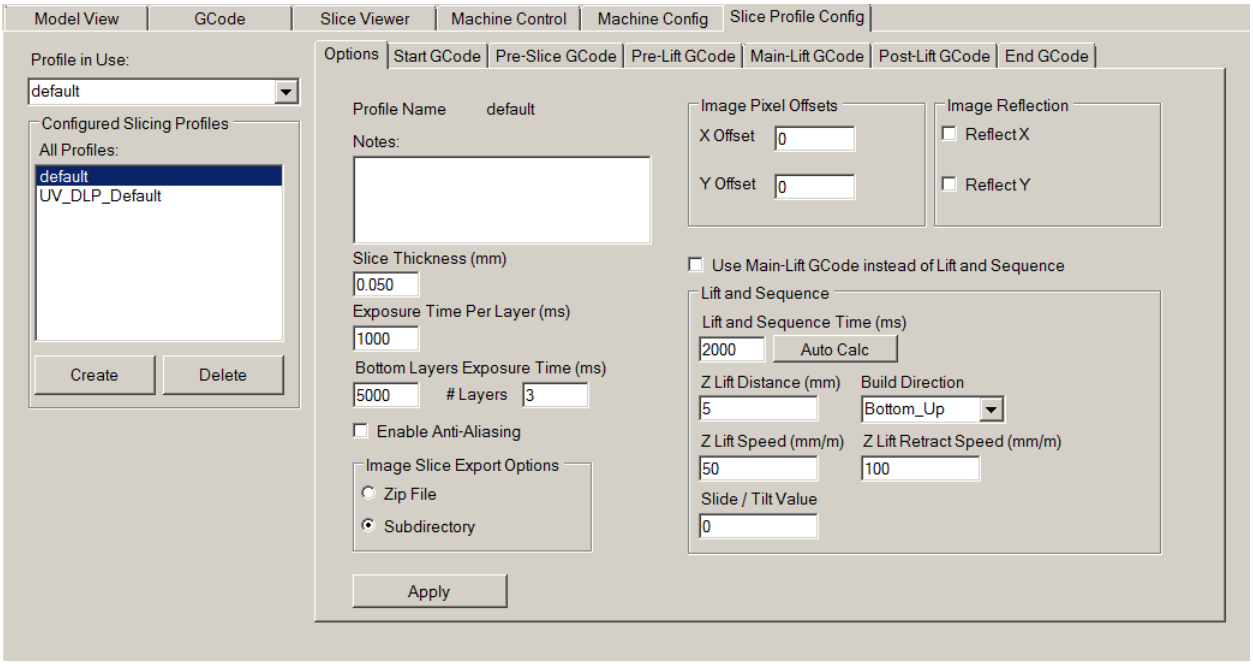
This screen allows you to choose the correct COM port and speed to communicate with the printers' controller card via serial connection.

*NOTE – The current version of the application will allow connections up to 115200 bps. Please ensure your controller firmware is configured for the speed chosen.

If your UV printer DLP projector has a serial port, you can additionally set up a serial connection to control various projector functions. Please refer to your DLP Projector manual to determine the correct serial port configuration.

Setting up a profile for Slicing and Building.

In order to slice a model into images, you must first set up a slicing profile. A default profile has been created the first time the application was started. You can create new slicing profiles and manage them in much the same way you can manage machine profiles. The 'Slice Profiles Config' tab item will allow you to create, delete, or edit a slicing and building profile.



Slice Thickness: This field is to set the thickness of each slice in mm. The default is .05mm (20 slices per mm)

Exposure Time per Layer: This time value specifies how long the projector will display an image slice on a per-layer basis.

Bottom Layer exposure time: In order to ensure the model is properly adhered to the bottom of a vat (for bottom-up machine types), a longer exposure time can be used for a specified number of bottom layers.

 # Bottom Layers: This specifies the number of 'bottom layers' that receive the longer exposure time.

Blanking time between layers: This is a time delay that allows the machine to perform a 'Lift/tilt/slide' . You may have to experiment with this value to determine a proper timing for your machine.

Lift and Sequence Time:

This time specifies in milliseconds how long the lift and retract sequence takes. You can use the "Auto Calc" button to generate a time estimate for the lift and retract. This value may need to be modified based on the speed of your machine.

Lift Distance: This is the distance that the printer will raise and lower the Z axis after the exposure has taken place.

Z Lift Speed:

When a layer is printed on a bottom up machine, a large amount of force may be required to separate the slide from the vat. This speed indicates how fast to perform the lift, a slower speed may be required to help vat separation.

Z Lift Retract speed:

After the lift occurs, this speed indicates how fast the z axis should travel back to the initial start position.

Slide/Tilt Value: for machine with a slide or tilt mechanism connected to the X axis, this value specifies how much to more in conjunction with the Lift.

X/Y Pixel Offset: This X/Y value allows you to offset the rendered image by a pixel amount.

Build Direction: Top down or Bottom up. This value determines which direction the Lift occurs. For a bottom up machine, this is used to peel the model from the bottom of the build vat, sometimes in conjunction with a tilt/slide. For a Top-down machine, this makes the lift operation dip into the resin.

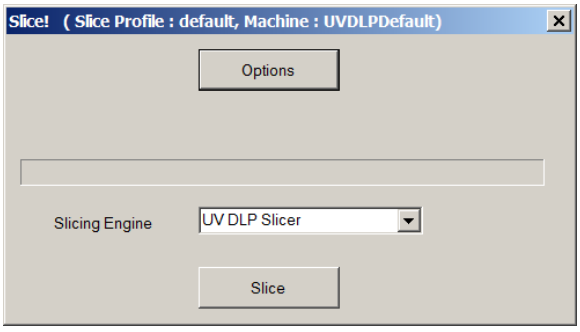
Image Slice Export Options

This allows you to control how the generated image slices and gcode files are saved. You have the option of exporting to Zip file or to a subdirectory.

Slicing a Model

Once you have loaded one or more models, configured your machine profile, and configured your build & slicing profile, you can slice a model.

 Choose the Slice Icon from the toolbar to bring up the Slicing Screen.



You can click the 'Options' button to set the properties of the currently selected build and slicing profile.

For generating images for a UV DLP machine, choose the 'UV DLP Slicer' as the slicing engine. If you are slicing a model for FDM, choose the "Slic3r" option.

Click the 'Slice' button to begin slicing. You can stop slicing by pressing the 'Cancel' button.

Connecting to a machine

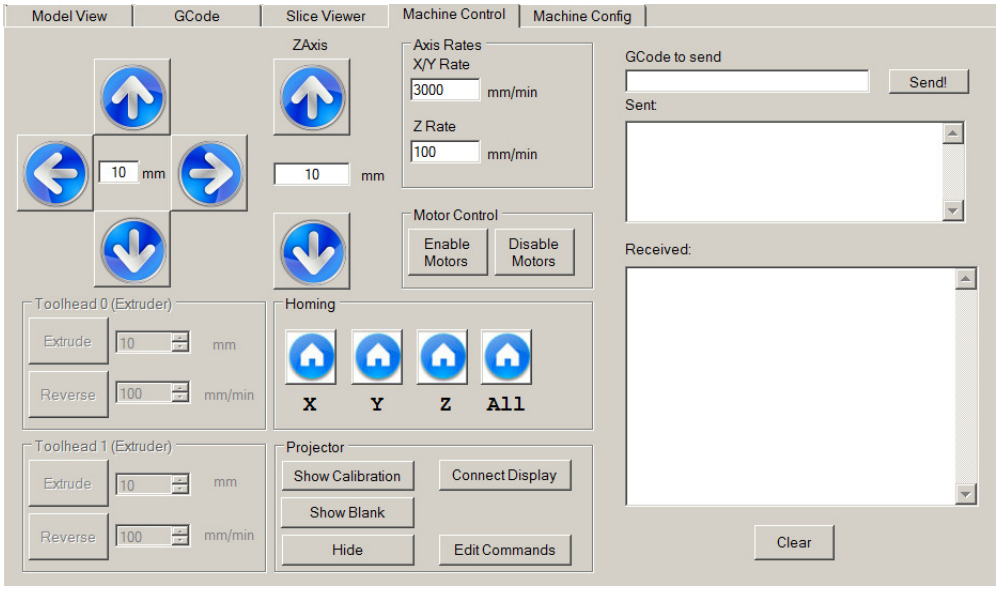
You can connect to your 3d printer with the ‘Connect’ toolbar item.

Please ensure that you’re properly configured your machine profile as well as setting up the correct COM port before connecting.

Manually controlling your machine.

Once successfully connected to a machine, you can use the Machine Control screen to control various portions of your machine. Here, you have access to homing, movement, sending arbitrary GCode. You can use the projector controls to show a blank screen, calibration, etc..

FDM based printer can also control the extruder.



The Build Process

In order to build the model, you need to be connected to a machine (obviously).

Once you have sliced a model and connected to a machine, you can click the “Start Build” button to start the build process. If you have a secondary monitor (or projector) connected to your system, a full-screen window will appear that displays the individual image slices. If you are using only a single monitor, this screen will appear over your primary display (probably not what you want)

For testing purposes and to get an idea of what the build process does, use the null driver in your machine configuration, or set up an additional machine configuration just for testing.

How the build process works

This program uses information from the sliced model, along with generated GCode to control both the printer hardware and projector simultaneously. Special comment lines are generated inside the GCode file that tells the build manager to perform special action:

(Pre-Slice GCode)
(<Slice> 2)
(<Delay> 5000)
(<Slice> Blank)
(Pre-lift GCode)
G1 Z5.00000 F100 (Lift)
G1 Z-4.95000 F100 (End Lift)
(Post-lift GCode)
(<Delay> 2000)

You might recognize the G1 as a movement command. The (<Slice> 2) line tells the build manager to display slice 2, and the (<Delay> 5000) line tells the build manager to pause for 5000 milliseconds (5 seconds). The next G1 movement command will not be sent to the machine until AFTER the slice and delay commands have executed. This differs from most GCode build systems that will send as many commands as possible to the device. You should note that the build process uses relative movement mode instead of absolute mode.

Use of custom GCode:
When the slicing profile is created, 5 GCode files are created in a sub-directory of the same name:
start.gcode
preslice.gcode
prelift.gcode
postlift.gcode
end.gcode

The contents of the start.gcode file are inserted at the beginning of the generated gcode file. Likewise, the end.gcode is inserted at the end of file for any shut down commands. You can see the relative insertion positions of the pre-slic, pre-lift and post-lift gcode

You can modify the contents of these files to suit your machines individual needs to add additional commands such as a shutter control, or Slide/Tilt mechanism.
If you make changes to any of these files, you will need to re-slice the model.

Terminology:

Some common terms used:

3D UV DLP:

This refers to a 3d printer that uses Ultra-Violet cured resin in conjunction with a Digital Light Projector.

VAT: This is the holding tank for UV Resin. For Bottom-up machines, this will have a transparent bottom to allow a DLP to project an image onto the surface.

Future Efforts:

Right now, this software can be used to slice a model and control a 3d UV DLP printer. It can also control FDM printers with the use of Slic3r to generate gcode. In the near future, the intent is add support for powder-based printers.

Final Words:

This project has taken quite a bit of time and effort. I would love to see this application become a part of the community tools for printer control. Please take the time to report any bugs, give any constructive feedback and design recommendations to:

Pacmanfan321@gmail.com

If you appreciate this program, please also consider donating to me via @ www.paypal.com !