

SIENCI LABS
DESKTOP CNC MILLING

Project outline for Sienci Labs' new desktop-based CAM
and g-code sending software "CAMLab"

Project Outline

To bring CAMLab through its Alpha stage of development, existing technologies will be leveraged in a two-stage process. Kiri:Moto and Universal Gcode Sender are both publicly available softwares which have their source code free for download and for commercial use. Currently, we recommend using these softwares in their untouched state. This involves navigation to an external website or download link, and in practice can be confusing to our customers who are learning CNC routing for the first time since they must jump between softwares.

Kiri:Moto will provide the CAM interface required, and UGS will act as the g-code sending interface. The intent behind CAMLab is to behave as a turnkey solution so that our customers can follow through the whole tool-chain of our machine under one roof. This is in contrast to our current customer experience where two separate softwares are required to accomplish the same goal.

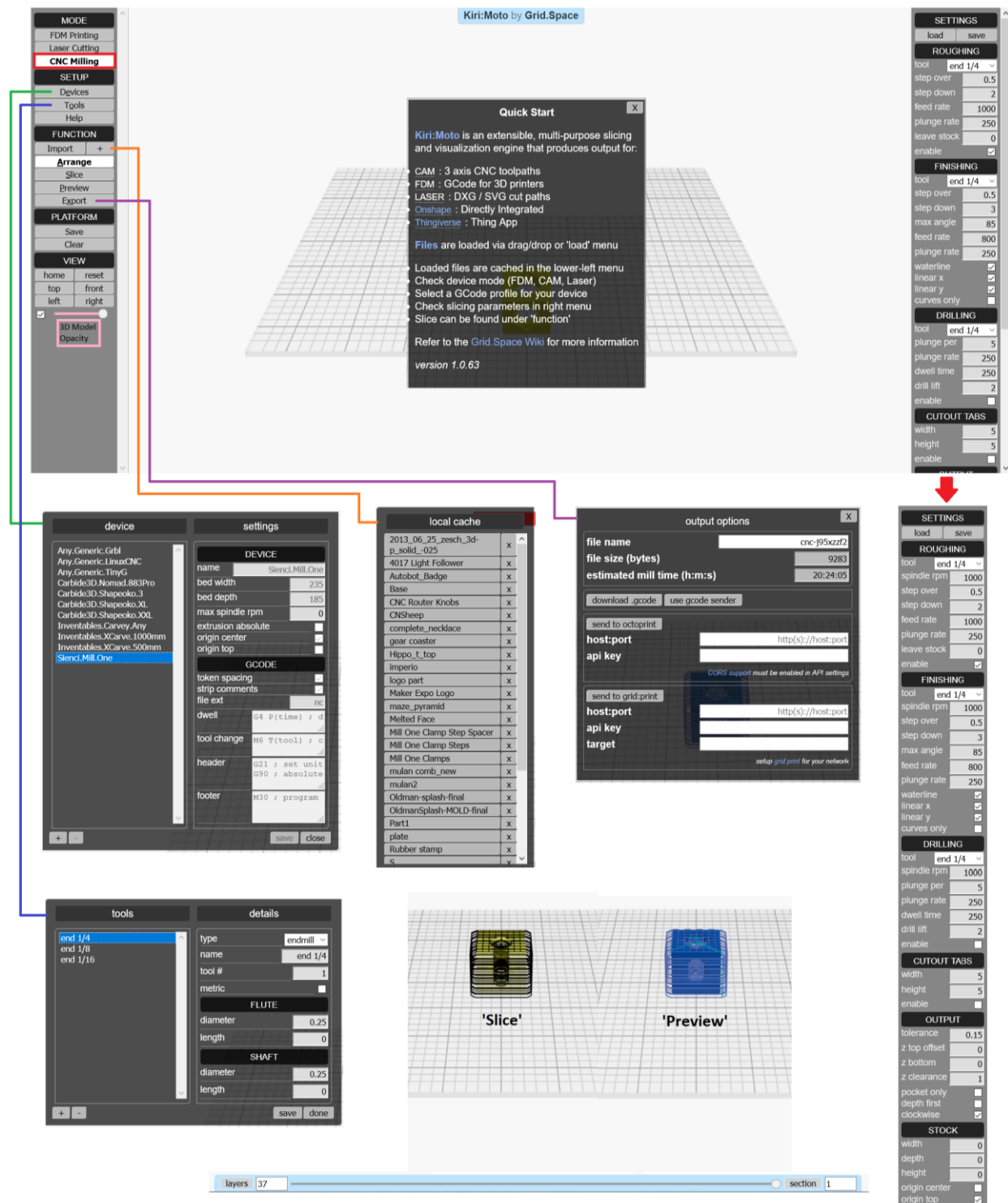
The development of the CAMLab Alpha will be executed in two stages. Stage 1 of this development will involve migrating Kiri:Moto from its web app form over to a cross-platform desktop GUI app. This will likely be accomplished via an external software framework such as [electron](#). Additionally, a focus will be placed on simplifying Kiri:Moto by removing unnecessary features before the migration begins. This will both simplify the software for our customer's use as well as make the process of introducing electron to Kiri:Moto go much smoother.

Estimated work time of this project is approximately 3 days. This time would go toward:

- 4-5 hrs to create the basic UI and buttons
- 4-5 hrs to port the backend logic of Kiri:Moto through electron
- 2-3 hrs for testing and to ensure proper work flow

Keeping in mind the scope of the project, its deliverables (outlined below), and the estimated work time to complete it, the proposed budget for this project will be approximately \$1,100 CAD. As a retainer, 35% of the project cost will be paid upfront with the remaining balance paid out upon completion of the project as outlined in the project deliverables.

A high-fidelity wireframe of the current Kiri:Moto interface shows navigation layout and functionality of the current software:



Of the currently implemented features, the following will be changed:

- remove 'FDM Printing' and 'Laser Cutting' modes
- remove 'Devices' button, only machine of concern is the Sienci Mill One
 - The setting for the Mill One will be implemented into the software as constants including:
 - Bed width = 235mm
 - Bed depth = 185mm
 - Origin center = true
 - Origin top = true
 - Token spacing = true
 - Strip comments = true
 - File ext = nc
 - Dwell = G4 P{time}
 - Tool change = M6 T{tool}
 - Header = G21
G90
 - Footer = M30
- include larger selection of existing tools
 - Remove "tool #" option
 - currently the selection of end mills includes:
 - end 1/4:
 - type = end mill
 - metric = false
 - flute dia = 0.25
 - flute length = 0 (infinitely long)
 - shaft dia = 0.25
 - shaft length = 0
 - end 1/8:
 - type = end mill
 - metric = false
 - flute dia = 0.125
 - flute length = 0
 - shaft dia = 0.125
 - shaft length = 0
 - end 1/16:
 - type = end mill
 - metric = false
 - flute dia = 0.0625
 - flute length = 0
 - shaft dia = 0.0625
 - shaft length = 0
 - The 5 new end mills to be added to the library will include:
 - end 2mm:
 - type = end mill

- metric = true
 - flute dia = 2
 - flute length = 0
 - shaft dia = 6.35
 - shaft length = 0
- end 3mm:
 - type = end mill
 - metric = true
 - flute dia = 3
 - flute length = 0
 - shaft dia = 6.35
 - shaft length = 0
- ball 1/4:
 - type = ball mill
 - metric = false
 - flute dia = 0.25
 - flute length = 0
 - shaft dia = 0.25
 - shaft length = 0
- ball 1/8:
 - type = ball mill
 - metric = false
 - flute dia = 0.125
 - flute length = 0
 - shaft dia = 0.125
 - shaft length = 0
- ball 1/16:
 - type = ball mill
 - metric = false
 - flute dia = 0.0625
 - flute length = 0
 - shaft dia = 0.0625
 - shaft length = 0
- re-link 'Help' button to our website troubleshooting webpage
- limit local cache storage ('+' button) to 10 files
- combine 'Slice' and 'Preview' buttons into single action; i.e. currently the only difference between the two is that 'Preview' shows movement of the end mill between cutting patterns whereas 'Slice' only shows the cutting patterns. Retain 'Slice' button aesthetic and add end mill movement in.
- remove export window: transfer compiled g-code to UGS window instead
- remove 'Platform' tab
- remove 'View' tab
- add origin which is located at model's zero-point and indicates positive x, y, and z-axes in red, green and blue respectively
- remove 'Invert mouse scroll zoom' checkbox

- remove model 'Opacity' bar, opacity will be set in the back-end for each function
- remove 'tolerance' setting
- move 'enable' checkboxes to cutting type title
- Make the endmill selection automatically apply to all cutting operations tabs
- Orientation arrow added onto platform
- Origin locator to indicate start of job

Important/Useful Links:

- <https://drive.google.com/open?id=0B5eduyAtbnADV2YtbDB4WHctOHc> (higher quality wireframe PNG)
- <https://grid.space/kiri> (cloud host of Kiri:Moto)
- <https://github.com/GridSpace> (Kiri:Moto git)
- <https://github.com/GridSpace/apps/wiki> (Kiri:Moto wiki)
- <https://electron.atom.io/> (Electron software framework)

Stage 1 Deliverables

CAMLab Alpha will be the start to a new and simplified all-in-one software toolchain which will allow for the operation of our machines through a single interface. A strong note to make is that 95% of Stage 1 is meant to solely involve the deletion of excess existing features, re-skinning, and electron implementation. The deliverables that would indicate the completion of the first Stage in the Alpha development (and are, for the most part, already features in Kiri:Moto) are as follows:

- 3D model can be imported
- Previous models can be imported (cache)
- A help button will clarify CAM software functionality
- Model can be manipulated via rotation and scaling in all axes (both uniformly and non-uniformly)
- Inputs are available for:
 - End mill type and size
 - A library of 8 end mills will be available for selection
 - Additionally, the user may create a custom end mill profile if their end mill is not already in the library
 - Material size (length, width and height)
 - A togglable unit button will allow to switch between mm and inches
 - Origin location indicated
 - Toggle center or front left
 - Toggle bottom or top
 - Specifying some alterations to default cutting operations
 - Pocket only
 - Depth first
 - Clockwise
 - Z-axis alterations
 - Z top offset
 - Safe height
- Settings can also be saved and loaded for various cutting operations which allow for the specification of:
 - End mill
 - Step over
 - Step down
 - Feed rate
 - Plunge rate
 - Leave stock
 - Max angle
 - Waterline
 - Linear x
 - Linear y
 - Curves only
 - Plunge per
 - Dwell time

- Drill lift
 - Width
 - Height
 - These cutting operation tabs (roughing, finishing, drilling, and cutout tabs) can be enabled/disabled by the user and these values can be locally saved as a milling preset and recalled in the future
- Model can be Sliced/previewed for the milling operation
 - A slider will allow the user to navigate through each cutting layer
 - The cutting operations displayed will be togglable
 - Can toggle between seeing the progression of the cut or seeing a single layer at a time
- Gcode can be exported to the desired folder on the user's computer
 - Until Stage 2 development begins, the "SEND" button in CAMLab will act as a gcode exporting button, allowing the user to save the exported file with a given name and save location
- Visually and functionally similar to the provided wireframe