The General Function of MAPS

MAPS serves as a process planning to define the machine code to drive a multi-axis deposition machine. It takes a solid model as an input from any CAD software and generate “slicing” layers and 2D toolpath; then feed such information to a CNC machine to build the desired shape, as illustrated in Figure 1. Thus the major functions of MAPS include CAD model loading, multi-axis slicing, 2D path planning and post-processor (translating the 2D path into a specific machine code) etc.

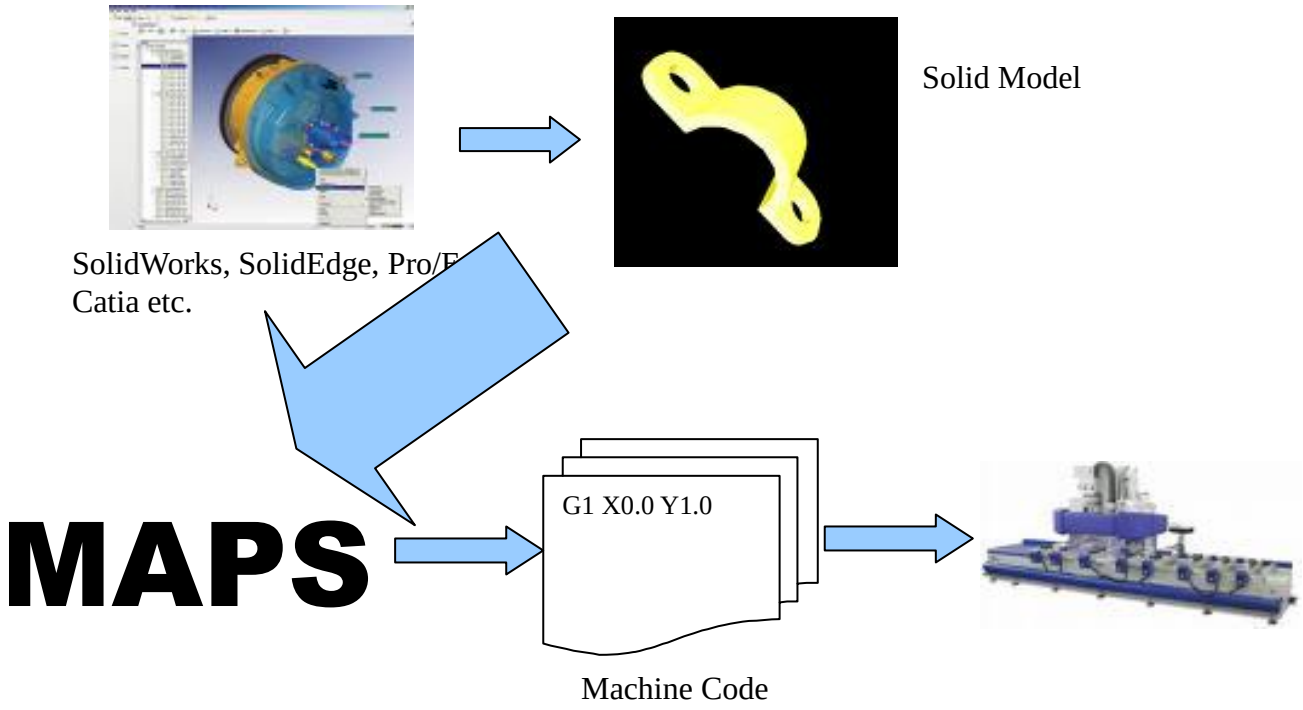

Figure 1. The function of MAPS

Requirement for GUI

GUI allows a user to view an input shape with different options such as rotation, pan, various view etc. The user can input the slicing parameters and approach, review the slicing result. Also GUI allows user to select 2D path planning strategy. Users can view the slicing result through GUI.

GUI allows user to construct a machine environment to generate the machine code and perform the simulation of generated toolpath. GUI displays the necessary information such as building time, collision testing result etc.

GUI reports the progress of slicing, 2D path planning etc

Major Function List

All functions are categorized into several major functions (All functions listed here in GUI can be transferred to an icon or GUI design)

1. File management (CAD model loading)

File management includes loading different file format input or import such as IGES, STEP, and BREPS etc. IGES, STEP or BREPS are different geometry exchanging formats.

Button or icon: File loading in different format

2. Slicing process

2.1 Base surface selection:
This function is to select a base surface of an input geometry and transform the geometry so that the select surface is the bottom surface
2.2 Multi-axis slicing:
Multi-axis slicing requires users to input some important process-related parameters, such as maximum layer thickness, minimum layer thickness, allowed error. Also, users are expected to be provided with options such as automatic or semi-automatic or manual operation.

Button or icon: Base surface selection, multi-axis slicing,
Dialog: Process parameters input, mode option (automatic, manual)

3. 2D path planning
2D path planning provides user option to generate toolpath of the deposition process for each slice, including offset, zigzag and hybrid. The selection can be automation and manual.

Button or icon: 2D path planning,
Dialog: Process parameters input, mode option (offset, zigzag, hybrid)

4. Surface machining code
This function provides user an option to perform hybrid manufacturing process which includes the machining operation.

Button or icon: Hybrid process, machining code only,
Dialog: Process parameters input

5. Post-processing
This function provides user options to upload or input the machine environment and its kinetics and MAPS generate machine code. Also this function allows users to output the code.

Button or icon: Machine input, start animation
Dialog: Kinetics definition

6. Simulator (or Animation tool)
This function provides users a capability to animate the generated machine code in a simulated environment to dry run the code for the sake of safety.

Button or icon: Start simulator, pause, stop, fast forward, backward