Software Lab:

Modeling: ★★★☆☆
Mathematics: ★★★☆☆
Programming: ★★★★☆

Preprocessor for the Numerical Simulation of the Additive Manufacturing Process

Setting

In the past few years Additive Manufacturing (also known as 3D-printing) has emerged as one of the most promising techniques for creating solid structures of virtually any shape on the basis of digital models. This is achieved by successively generating layers of material of different shapes. These layers are generated by adding raw material and converting it to its final state with the help of an external energy source (laser beam).

The process starts with a 3D model which is transformed into a STL (STereoLithography) file format. Then, the part is decomposed into thin layers [1], also known as slices. For each of these slices, a set of scanning vectors, which defines the traveling path for the laser, is generated. Finally, this digital information, which is mostly in G-Code format, is sent to the 3D-printing machine which then builds the product layer-by-layer.

In order to numerically simulate this process the laser should be modelled in a preprocessing step.

Task

Create a preprocessor in AdhoC++, which can

- parse externally created G-Codes
- create slices and laser path from STL files
- visualize the laser path in Paraview
- create a simulation setup
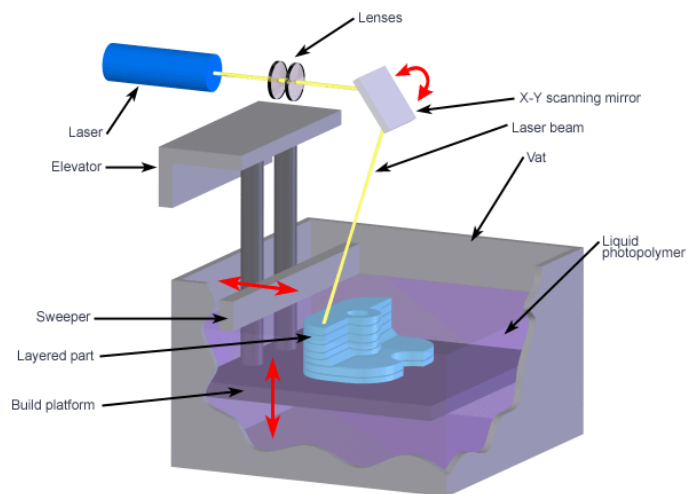
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References

[1] E. Munir, Slicing 3D Model in STL Format and Laser Path Generation, *International Journal of Innovation and Technology Methods in Applied Mechanics and Engineering*, vol. 4, no. 4, pp. 410-413, August 2013.