

Melted Extrusion Manufacturing(MEM)

Melted Extrusion Manufacturing (MEM) is a process for making three-dimensional objects layer by layer from thermoplastic materials directly from cad files. The Center of Laser Rapid forming, Tsinghua University, China has developed the desktop rapid prototyping (RP) system MEM-250-II, which is the first commercial machine of MEM in China.

MEM-250-II has built lots of models successfully. The models are as follows:



Figure: Some models built by MEM-250-II

Major factors of building models:

- The precision of STL format from CAD solid model
- Step-stair effect
- NC system
- Process plan and optimize
- Sprayer(the size of the nozzle, the flexibility, the rigidity etc.)
- The performance of thermoplastic materials
- Temperature control of the sprayer and circumstance

Improvements and expectation

In order to decrease step-stair effect, we sliced a STL model with 0.1~0.3mm of one layer. This also changed the speed of supplying filament and the size of nozzle.

Process plan and control is very important to MEM. We have done some study and work on program compiling, offsetting the contour, intelligentized net (sparse inner net and sufficient compact net), fast moving between two path (decrease nonlinear factors and make the joint better), pre-calculating the time of opening valve and closing valve

To improve the quality of a model, a good sprayer is also significant. We heighten the rigidity, which is very important in building model. Now we restrict the length of the nozzle to the size of a nozzle(we have some series nozzles of 0.3mm,0.4mm,0.5mm and 0.6mm). To the different nozzle, the speed of supplying filament is not same obviously.

Building a good model, ABS performance , temperature control and soleplate are taking one thing with another. Now we have invented a kind of soleplate, which can

make the model bend less. We also have improved ABS performance and temperature control , this makes building a model easier.

Developer's names, affiliation, emails and telephone numbers:

Yongnian Yan, Jian xu, Rendong Wu, Shaoyin Ye, Renji Zhang, Qingping Lu, Liangwei Wu, Jun Zhu, etc.

(CLRF) Center for Laser Rapid Forming, Beijing, China

Dept. Of Mech. Eng., Tsinghua University, Beijing, P.R.China, 100084

E-mail address: dmeyyn@mail.tsinghua.edu.cn (Prof. Yan)

xj266@mail.cic.tsinghua.edu.cn (Jian Xu)

Tel: (8610) 62788675, 62783565, Fax: (8610) 62788675