

Suggestions on the Methodology of Parameters in Fused Deposition Modeling Processes

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ABSTRACT: The Manufacturing technology is really moving towards unpredictable change over the century. Nowadays, product cycle life in the evolution stage itself is totally reduced to the minimum most level from years to months. This gives new product development strategies likely to be in sequential development that is each individual component production time to reduce from months to weeks. The research and development team focus only on automation to go in line with the fast phase growth. The current trend in the manufacturing industry is Additive Manufacturing (AM). It's been evolving in much high rate, the complex products are developed within the days and even this can be improved from one product to other product in the design phase itself instead of product testing phase. This paper focus only on Fused Deposition Modeling (FDM), one of the simplest AM process. Enormous researches envisaged that it has potential growth in the near future. So all the parameters related FDM is being analyzed clearly to give detailed study with some optimization solutions for it.

Keywords: Rapid Prototyping, Additive Manufacturing, FDM

I. INTRODUCTION

The manufacturing industries through-out the years know well about subtractive manufacturing methods. The idea is evolved many decades before that the additive manufacturing in place. The common issue in the additive manufacturing is that it consumes more time and next is the product cost goes higher when manufactured in minimum number of quantities.

In concern to these issues, this paper gives a clear overview about the process parameters along with its associates and as well as a clear status of the current trends in it. Some suggestions that can be incorporated for the development of the process element are being discussed in this content.

The associates of this process are being listed out below:

- CAD file
- File conversion
- Printing unit
- Filament or Material supply unit
- Melting unit
- Pre-processing
- Post-processing
- Material depended

1.1 Cad file

The CAD file is the minimum requirement to start with the additive manufacturing. The final product should be drawn with accurate dimensions or scanned through the final product to give the component that could be printed. These are existing methods available since the beginning of the AM era. If the model is drawn with complete details require heal lot of time. The other scanning method may miss out the same details of the final product. In both the cases, there is the possibility of making error.

1.2 File Format

The file has to been converted to the machine readable format that is been successful achieved all over the world by **.stl (Standard Tellesation Language)**. Still its need to be improved further some recent improvements are the material texture, color and materials all built into its data. [1]

1.3 Printing Unit

The printing unit nowadays directly moves across the product to build it layer by layer. This can assume more time, obviously supporting parameters also need to work a lot to get the final product. For example, electricity, wear and fear of the printing unit.

1.4 Filament Or Material Supply Unit

The material to be supplied for AM process may be filament powder or sheets. In most cases, we never have the complete control, because mostly it is gravity assisted or random supply of material. [2]

1.5 Melting Unit

The melting unit generally fuses the material based on the melting temperature of the material. It generally fuses into the pool to mix with the bottom layer to form the subsequent layer. In most of the cases the melting is controlled only by the melting temperature of it.

1.6 Pre-Processing Unit & Post-Processing Unit

The pre-processing existing in the system is not effectively adopted. The only system is the material processing is always been added to the system nowadays.

1.7 Material Dependency

The AM machine works mostly based on the material. Some of the AM machines designed only based on the material. The system development itself is based on materials properties based on manufacturability.

II. Objectives

The major objectives of this work are based on the primary industries requirements of the AM processes and are as follows,

1. To reduce the printing time
2. To reduce the printer size in case of printing bigger objects

III. Technical Solutions

CAD File - Comparatively to minimize the error in this process is while scanning it. The designer could provide with same space to tune the component to print with higher accuracy. That facility is not available till date.

File Format - The present requirement is develop a format to know the strength or functional based identification. For example, if we print ABS material for both support and the main product it should print the weaker supporting structure and stronger main structure. This even should slice the product itself with different dimensions.

Printing Unit - We need a system with flexible printing head as well as tip. So that the entire printing process can be speeded up considerable. [7] [8]

Filament Supply unit - The supply of material is being controlled as per the requirement. For example, in powder based processes the powder should be spread only on the required region instead of whole printable area.

Melting unit - The material melting should be done based on the product requirement. For example, incase metal melting only the product strong part should be melted at optimum level, supporting structure should be supplying lesser supply of heat. [3]

Pre and Post Processing - Once the system should be made in such a way that, once the raw material is sent in, it should turn out into a final product. It means the final probable output should be the end product. Nowadays systems are ready for product with multiple stages of development which consumes lot of time.

Material dependency - The present requirements are single printer or system should print multiple materials. At least two different materials should be printed by a single printer. Once it is develop and come into picture, probably the AM industry will move towards next level. [4]

General View - The overall process industry required is to accomplish is the parameters mentioned should be effectively implemented. The coordination of all the parameters should be matched to achieve it. As we know, all the processes are interlinked with each other, for example if we need to change the rate of material dispensing it effects the entire process starting from the slicing of CAD file. So, our research scope is spread widely to coordinate all the parameters. [5] [6]

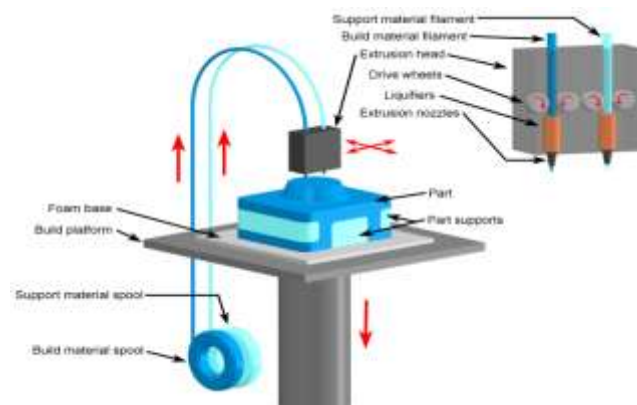


Fig – 1 Schematic view of FDM

IV. Conclusion

This paper covers the different aspect of the AM machines, also what is required to take it into next level. Some of the probable solutions also been discussed. The development in the system is always required to take it to higher level of research. Due to reduction in the production cycle time it still more effectiveness is required to proceed with the advanced technologies. Addressed the issue with varies dimensions also work with effective and proper improvement in the system always played vital role.

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