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# A Review on Research and Analysis of 3D Printer

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**ABSTRACT-** 3D printing is an additive manufacturing technology where 3D objects are printed with the help of CAD (computer-aided design) software's. There are many Different processes available in 3D printing technology such as (1) EBM (electron beam machining), (2) DLP (digital light processing), (3) FDM (fused deposition method), (4) LOM (laminated object manufacturing), (5) SLS (selective laser sintering), etc. This is a research paper on 3D printing and the reason to make prototype so fan objects in a manufacturing industries with the help of various materials used in 3D printing and their properties, become a notable topic in technological aspects.

In this project, we have focused on the design and fabrication of a portable 3D printer of bed volume (220 x 220 x 250 mm) which can be constructed economically. We has been using 4 axis mechanisms where 3 axes are x-y-z and therefore the fourth axis is an extruder.

The process used by us is FDM technology, during which different materials like PLA (polylactic acid), ABS (acrylonitrile butadiene styrene), HIPS (high impact polystyrene), etc are used.

**KEYWORDS-** 3D Printing, Fused deposition molding (FDM), Additive Manufacturing Technology (AM), Portable Machine, Engineering and Technology.

## I. INTRODUCTION

A 3D printing is an additive manufacturing technology during which 3D objects are printed by using CAD (computer aided design) software like FUSION360, solidworks, CATIA, etc. This 3D prototype objects and parts are created by the addition of multiple layers of material.

It can also called as rapid prototyping of an object. It is a mechanized method in which 3D prototype objects are quickly generated as per the required size by the machine connected to a computer containing model files of any object. The main reason to use 3D printer is for 90% of material utilization, increase product life, lighter and stronger. 3D printing is efficiently utilized in various fields such as construction, aerospace, medical automobile, and in manufacturing of many households' products.

Now, rapid prototyping of any object has a wide range of applications in various fields like human activity, engineering, research, medical industry, military, construction, architecture, fashion, education, the computer industry and manyothers. The plastic extrusion technology most widely associated with the term '3D printing' was invented in 1990 by Stratus's by name fused deposition modeling (FDM). The salesof 3D printing machines has been grown widely and their price has been droppedgradually,afterthetstartofthe21stcentury.Bythe early 2010s, the terms additive manufacturing (AM) and 3D printing evolved senses in which they were alternate umbrella terms for AM technologies, one being used officially by industrial AM end use part producers, AM machine manufacturers, and global technical standards organizations, and the other used in popular vernacular by consumer - maker communities and the media. Both terms describes the simple fact that the technologies all share the common theme of sequential-layer material addition or joining throughout a 3D work envelope under automated control.

The other terms which has been used as AM synonyms included rapid manufacturing, desktop manufacturing and agile tooling on-demand manufacturing. In the 2010s were the primary decade during which metal endues parts like engine

brackets and enormous nuts would be grown (either before or rather than machining) in job production rather than legally being machined from bar stock or plate.

## II. RELATED WORK

This study aims to investigate issue of quality and quality control (QC) in three dimensional (3D) printing by reviewing past work and current practices. Possible future development are also discussed.

Design / methodology / approach

After a discussion of the major quality dimensions of 3D printed objects the applications of some QC techniques at various stages of the product life cycle (including product design, process planning, incoming QC, in process QC and outgoing QC) are introduced.

## III. TECHNOLOGY USED

There are different processes available in 3D printing technology, they are as follows:

1. FDM (fused deposition method)
2. SLS (selective lasersintering)
3. EBM (electron beammachining)
4. LOM (laminated objectmanufacturing)
5. DLP (digital light processing),etc.

There are different methods of 3D printing, but the most widely used is Fused Deposition Modelling (FDM) method. Here we are using FDM technology for our project.

FDM printers use a thermoplastic filament, which is heated to its melting point and extruded layer by layer, to make a 3D object.

In FDM technology different materials like PLA (polylactic acid), ABS (acrylonitrile butadiene styrene), HIPS (high impact polystyrene), etc are used to 3D print.

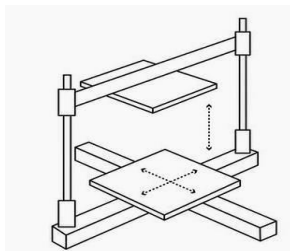
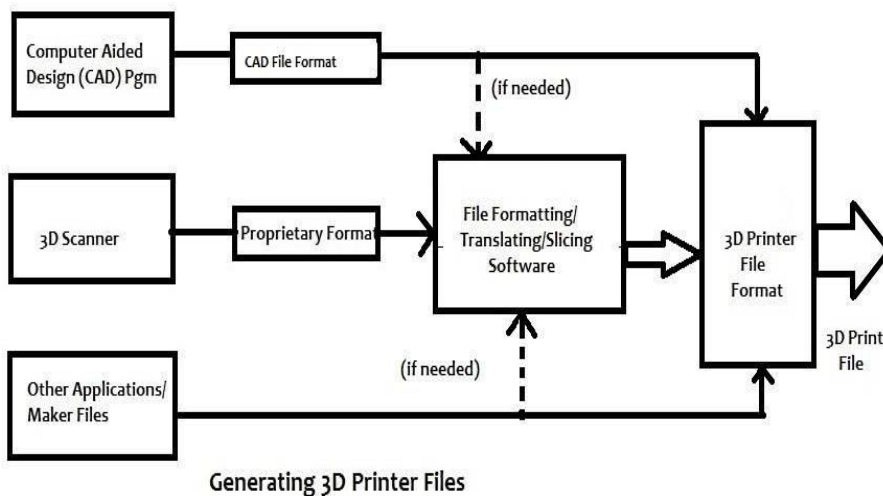
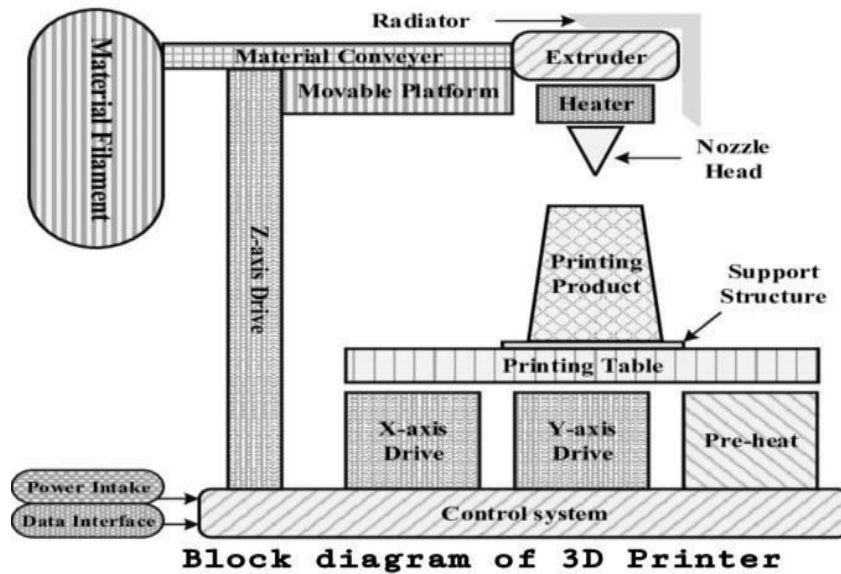


Figure 1.1: - Cartesian configuration.

**Cartesian configuration:** - Cartesian 3D printers are just about named after the coordinate system the X Y and Z axis which is used to determine where and how to move three dimensionally and therefore the Cartesian 3D printers which have a heated bed which moves only within the Z axis. The extruder sits on the X-axis and Y-axis, where it can move in three directions on a gantry.

**IV. WORKING OF 3DPRINTER**



The Printing process is as follows:

- 1] Material Filament is the material that is used for printing, material like PLA (Polylactic Acid), ABS (Acrylonitrile butadiene styrene),etc.
- 2] Power Intake and Data Interface is provided to control system.
- 3] When we provide Data Interface to the control system in the form of g-code (geometric code) then control system give command for preheating to printing table and heater.
- 4] Material Filament is extracted by extruder via material conveyer then it is passed on to heater and starts melting and melted material gets out from nozzle head.
- 5] As we provide g-code, movable platform starts moving according to x, y and z axis.

There are three different methods for generating 3d printing files:

- 1] Using Computer Aided Design(CAD):-
  - We use CAD for designing the model.
  - The model is saved in CAD file format that is.stl (standard triangular language
  - Then we have to use file formatting software to convert the CAD file format to g-code.



- After this the g-code is applied to printer and printing process starts.
- 2] Using 3D scanner:-
  - Using scanner machine the object is scanned and generated a .stl (standard triangular language) file in CAD.
  - G-code is generated of this .stl file in slicer.
  - After this the g-code is applied to printer and printing process starts.
- 3] Using other Applications:-

We can also generate 3D model using other applications

## V. COMPARISON WITH OTHER 3D PRINTER TECHNOLOGIES

**PORTABLE DEVICE:** Our 3d printer is a portable 3d printer which is the biggest advantage of 3d printer. It can easily carry and move as compared to other printers.

**SPEED:** The printing speed is much faster than the other 3d printers. Rapid Prototyping is one of the biggest advantages of 3D printing technology. Rapid Prototyping is basically the ability to design, manufacture, and test a customized part in as little time as possible.

**COST:** As compared to the industry based 3d printing technology, which is more costly than our portable 3d printer. For small scale production and applications, 3D printing is the most cost-effective manufacturing process.

**DESIGN STRUCTURE:** The main structure body of the printer is much lighter and compact as compared to industrial printers.

**OPERATING SYSTEM:** Due to its design structure and the digital display it is very easy to operate the 3d printer. Operator can easily understand the functions of the 3d printer.

## VI. CONCLUSION

Generally it is accepted that the 3D printing will become a revolutionary force in the manufacturing field, where positive or negative despite concerns over counterfeiting, many of the companies are already using the 3D printing technology. 3D printing is spreading broadly in an assortment of utilizations, from the essential residential use to entangled mechanical applications with the diminishing expense and expanding productivity in market. A few specialists contend that these printers will be the drive of a coming upset that will change the entire essence of the industry and that it will be a fundamental piece of each home as per the abatement in cost.

Usage of PLA tends to develop the social responsibility of the printer as PLA being bio degradable helps to reduce environment waste related to 3D printing process, this makes the 3D printing is eco-friendly.

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