

International Journal of Engineering Sciences & Research Technology

(A Peer Reviewed Online Journal)

Impact Factor: 5.164



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ABSTRACT

This is a paper on 3D printing which has become a notable topic in today's technological discussion. In this paper, we will look at additive manufacturing or 3D printing. We will firstly define what we mean by this term and what is so significant about it. Then we shall see about the process of 3D printing and the materials used in the manufacture of 3D printed objects. We shall also see the advantages of 3D printing as compared to conventional methods of manufacturing. We shall observe the numerous applications it is being out to use today. [2]

KEYWORDS: 3D printing, 3D printers, stereo lithography (STL), additive manufacturing, etc.

1. INTRODUCTION

3D printing, additionally referred to as additive manufacturing, may be a method of basically making a three-dimensional object from a package model. The thing may be of just about any form. The method of making these objects is largely additive. Within the additive method, an object to be written is built from the base-up by in turn adding it to layers of the development material. The additive method may be contrasted with the subtractive process, where material is removed from a block by methods such as sculpting or drilling. The main material utilized in the development of 3D objects is plastic, though recently, there has additionally been a slew of innovation toward using alternative materials like metals of various sorts and additionally organic matter like carbon and its varied derivatives. [2]

**2. DEFINITION**

3D printing is a hard term to define. Officially it is just one of the many new and upcoming manufacturing techniques and is used as a synonym for rapid manufacturing, digital manufacturing, direct digital manufacturing, rapid prototyping, desktop manufacturing, freeform fabrication or 'fabbing'. Each one of these terms has a distinct meaning but they are all competing for our attention to become the official term to describe any process whereby the information in a digital file describing an object virtually is used to rapidly make a real object, usually by one single machine and usually in limited production runs. [1]

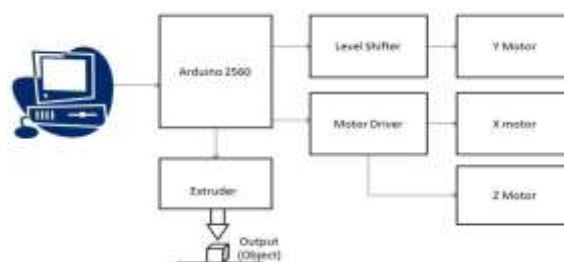
3. LITERATURE SURVEY

3D printing was known as "rapid prototyping". Charles Hull, of 3D Systems Corporation, created the first working 3D printer in 1984. Later in the 80's, Selective Laser Sintering (SLS) technology was developed by Dr. Deckard at the University of Texas at Austin during a project sponsored by Defence Advanced Research

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Projects Agency (DARPA). In the 1990s, the technology was further improved with the development of a method that used ultraviolet light to solidify photopolymer, a viscous liquid material. In the late 20th century, 3D printers were extremely expensive and could only be used to print a limited number of products. The majority of the printers were owned by scientists and electronics enthusiasts for research and display. Although it was still in limited development, the printing technology was a combination of modelling both science and construction technology, using some of the newest technological advancements of the time. Consequently, 3D printing began to lead a worldwide manufacturing revolution. In the past, surface design was mainly dependent on the production process. However developments in the field of 3D printing have allowed for the design of products to no longer be limited by complex shapes or colours. [5]

4. BLOCK DIAGRAM



We can easily explain 3D printer with the help of block diagram. The block diagram shows software part, which is represented by desktop. The software .sh file is written on Arduino 2560 which is connected with three dimension motor and extruder. Depending on design of output product, the Arduino 2650 locate the three dimension motor and give signal to extruder to locate its position. Finally extruder deposits the polymer on the surface.

5. WORKING OF 3D PRINTING

3D Modelling

The first process involved in 3D printing is the production of the 3D model with the help of computer aided design (CAD) software or via 3D scanner. The manual modelling process of preparing geometric data for 3D computer graphics is similar to method sculpting.

It is the process of analyzing and collecting data on shape and appearance of an object. Based on this data, 3D models of scanned objects can be produced. Both manual and automatic creation of 3D printed models is very difficult for average consumers. As a result, several markets placed most popular are shapeways; thingiverse, my mini factory and threading have been emerged over the last few years among world.

There is several 3D modelling software's such as Google Sketch up, 3D crafter, Blender, etc.

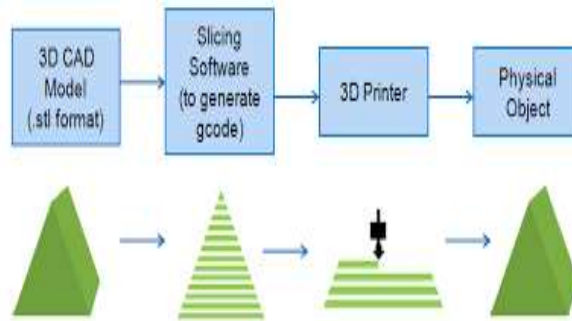
Printing

The next step is to convert it into STL file. But before conversion it must be processed by piece of software called as 'Slicer'. This convert 3D model into a series of thin layer and produces G-code file from STL file containing instruction to printer. There are many slicer program including Slic3r, KISSlicer and Cura. The 3D printer follows the G-code to add down a layer of liquid, powder of sheet material to build a model. These layers which correspond to virtual cross-section from CAD model are focussed or joined to build a final shape of model. Its main advantage is that it can create any geometric shape model construction by existing method require several hours to days depending on the method used. But due to advanced system, it reduces time to very few hours. It depends on machine used, size and quantity of models being produced.

Finishing

Although the printer-produced resolution is sufficient for many applications, printing a slightly oversized version of the object in standard resolution and then removing material as a higher resolution process can achieve greater precision. As with the Accucraft iD-20 and other machines press release. International

Manufacturing Technology shows some additive manufacturing techniques are capable of using multiple materials in the course of constructing parts.



6. ADVANTAGES

- Small batches of customised products are economically attractive relative to traditional mass production methods.
- Direct production from 3DCAD models mean that no tools and moulds are required, so there is no switch over costs.
- Designs in the form of digital files can be easily shared, facilitating the modification and customisation of components and products.
- The additive nature of the process gives material savings, as does the ability to reuse waste material not used during manufacture.
- Tovel, complex structures, such as free-form enclosed structures and channels, and lattices are achievable
- Final parts have very low porosity. [4]

7. APPLICATIONS

- Scientists have successfully been able to print ears, skin, kidney, blood vessels and bones using 3D printers. Already, 3D printers are capable of printing prosthetic limbs for people with disabilities.
- Houses can be 3D printed in future.
- NASA has been developing technologies to print wood from the printers using 3Dbio printing technology.
- The company replace factory workers with 3Dprinters; it might be able to streamline the process of manufacturing.
- Speaking of astronauts, by far the most ambitious of these 3D printed futures is where we set up an entire moon base by printing out the construction blocks to be used to construct the base. [3]

8. CONCLUSION

3D printing technology could revolutionize and re-shape the world. Advances in 3D printing technology can significantly change and improve the way we manufacture products and produce goods worldwide. An object is scanned or designed with computer aided design software, then sliced up into thin layers, which can then be printed out to form a solid three-dimensional product. As previously described, the importance of an invention can be appraised by determining which of the human needs it fulfils. It will provide companies and individuals fast and easy manufacturing in any size or scale limited only by their imagination. One of the main advantages of the industrialization revolution was that parts could be made nearly identically which meant they could be easily replaced without individual tailoring. 3D printing, on the other hand, can enable fast, reliable, and



repeatable means of producing tailor-made products which can still be made inexpensively due to automation of processes and distribution of manufacturing needs. If the last industrial revolution brought us mass production and the advent of economies of scale - the digital 3D printing revolution could bring mass manufacturing back a full circle - to an era of mass personalization, and a return to individual craftsmanship.[2]

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Patil, A. M., Mr, Deshpande, N. U., Miss, & Patil, V. A., Prof. (2018). REVIEW PAPER ON 3 DIMENSIONAL PRINTING TECHNOLOGY. *INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY*, 7(12), 410-413.

