Design And Fabrication of 3D Printer

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Abstract- *3D printing is called as desktop fabrication. It is a process of prototyping where by a structure is synthesized from a 3d model. The 3d model is stored in as a STL format and after that forwarded to a 3D printer. It can use a wide range of materials such as ABS, PLA, and composites as well.3D printing is a rapidly developing and cost optimized form of rapid prototyping. The 3D printer prints the CAD design layer by layer forming a real object. 3D printing process is derived from inkjet desktop printers in which multiple deposit jets and the printing material, layer by layer derived from the CAD 3D data.*

3D printing significantly challenges mass production processes in the future. This type of printing is predicted to influence industries, like automotive, medical, education, equipment, consumer products industries and various businesses.

I. INTRODUCTION

3D printing called as desktop fabrication. It is a rapid prototyping process whereby a real object can be created from a 3D design. A 3D printer machine uses a CAD model for rapid prototyping process. [1]

3D printing is called as desktop fabrication which is a process of prototyping where by a structure is synthesized from its 3d model. The 3d design is stored in as a STL format! And after that forwarded to the 3D printer. It can use a wide range of materials such as ABS,PLA, and composites as well.3D printing is one kind of rapidly developing and cost optimized form which is used for rapid prototyping.The 3D printer prints the CAD design layer by layer forming a# real object. 3D printing process is derived from inkjet desktop printers in which multiple deposit jets and the printing material, layer by layer derived from the CAD 3D data.3D printing is diversifying and accelerating our life, letting various qualities of products to be synthesised easier and faster [2].Three dimensional (3D) printing has the ability to impact the transmission of information in ways similar to the influence of such earlier technologies as photocopying. This identifies sources of information on 3D printing, its technology, required software and applications. Along 3D printing, companies are able to extract and innovate new ideologies and various design replications with no time or tool expense. 3D printing possibly challenges mass production processes in future. 3D printing influences many industries, such as automotive, architecture, education, medical, business and consumer industries [3].

MOTIVATION FOR THE PRESENT RESEARCH WORK:

Since over a century the visual world of printed scriptures has been dominated by the 2-D printing methods. Be that easy to read or comprehend but when it comes to imaging of definite and real life models it is sorely outsourced. Any 3-D model cannot be represented and displayed easily in a 2-D workplace. The only thing worth mentioning for likable perception is the rendering of the image. This ushered in the era of the much needed idea of "3-D" printing.

Basically the singular purpose for the division of 3-D printer was to prepare 3-D samples directly on the bed of the printer.

OBJECTIVE:

1. To study different methods of 3d printing and their applications.
2. To study the working procedure of each component of a 3d printer and the evolution of 3d printer.
3. To design and fabricate a 3d printer using tool kit.

II. APPLICATION OF 3D PRINTER

3-D printing was originally developed for rapid prototyping purposes, making less complicated physical samples. It allowed designers to identify and rectify design flaws quickly and cheaply, thereby speeding up the product development process and minimizing commercial risks. Here are some applications of a 3D printer described below:

Aerospace and Automotive sector

With the help of 3-D-printed components which are used for aircrafts and parts are 70% less weighing but identically tough as conventional parts, indicating cost reduction and carbon reduction and emissions of unwanted particle. It uses less raw constituents and manufactures parts which are less weight, complicated but possess more strength [4].

Medicine

Medical sector is one of the most promising areas of usage. It is being applied to face many medical situations, and develop medical research, also combining the field of "regenerative medicine". In 2012, using a 3-D printer, engineers and doctors at Hasselt successfully experimented the very first patient-specific instrument of prosthetic jaw transplant [4].

Rapid manufacturing:

Advancements in Rapid Prototyping have presented materials those are necessary for final manufacturing, leading to the possibility of manufactured finished components and parts [5].

Mass customization:

Many industries have provided services where people can recreate their desirables implementing simple web-based customizing software. This now enables customers to replicate cases of their mobiles. Nokia has displayed the 3D designs of their mobiles so that owners will be able to recreate their own phone case [5].

III. PROCESS OF 3D PRINTING

3D printing process can be described and defined in the following steps:

CAD Model Creation: Initially, the item to be 3D printed is designed utilizing ComputerAided Design (CAD) software. Solid modelers, for example, CATIA, and SOLID WORKS have a tendency to represent 3-D objects more precisely than wire-frame modelers, for example, AutoCAD. This procedure is comparative for the majority of the Rapid Prototyping building methods [6].

Conversion to STL Format: The different CAD models use different methods to present solid parts. To have consistency, the stereo lithography format has been followed as the standard of the 3D printing industry.

Slice the STL File: A preprocessing computer program is done which readies the STL format going to be built. Numerous programs are there, which permit the user to tweak the model. The preprocessing program cuts the Stereo lithography model into numerous layers from 0.01 mm to 0.7 mm thickness, in view of the building method. The program likewise makes an auxiliary structure to help the model amidst of building. Sophisticated structures are bound to use auxiliary support [7].

Layer by Layer Construction: The fourth step is the actual construction of the part. Using one of various techniques RP machines build one layer at a time from polymers, or powdered metal [7].

DESIGN, SPECIFICATION AND FABRICATION OF 3D PRINTER

IV. EXPERIMENT AND METHODOLOGY:

Our objective was to study, design and fabrication of a 3d printer. We studied the history, different printing methods and overview of the past research in the previous chapter. This chapter includes design and fabrication of the same mentioned earlier. First we ordered the whole tool-kit including all the parts and components those are used to manufacture a 3d printer. It took a while to procure the whole kit. In the meanwhile a CAD model of a 3d printer has been created using solidworks. First we designed all the parts required for the assembly and dimensions were strictly taken from internet as we didn't have the kit or manual to find out the original dimensions. Then all the parts are assembled in the solidworks workbench to create the 3d printer assembly. Here are the real life pictures, designed model of individual parts and their working process.

Assembled 3d printer:

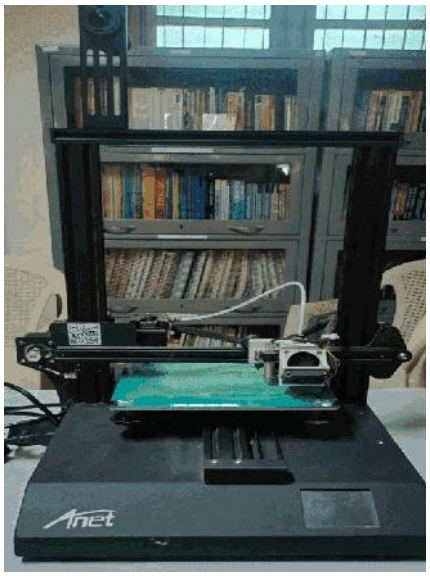

FIG.17 (A) fully assembled working 3D printer

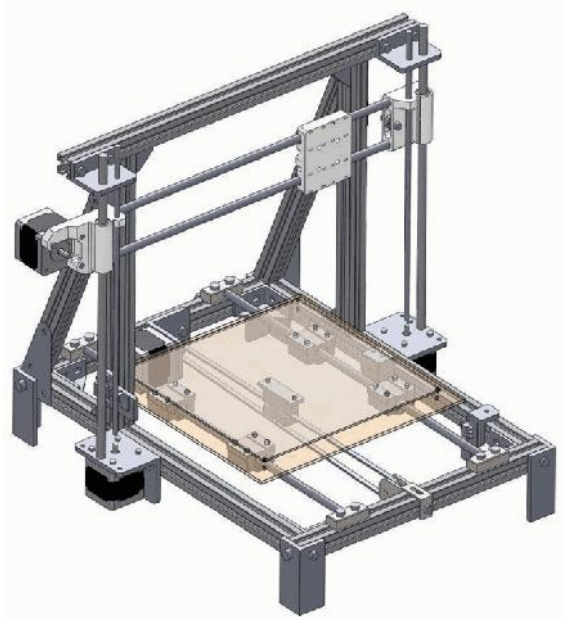

FIG.17 (B) CAD model of 3D printer

V. RESULTS OBTAINED

After the procurement of the whole tool kit, a detailed study of all the components is made so as to gain knowledge about the working procedure and connection of each part. Then the 3d printer is structured using manual, with the help of internet and some research students. Electronics parts are connected very carefully so as to avoid any kind of accidents. After building the 3d printer it is put into working condition and some products are manufactured.

Here is an image of a working 3-D printer manufacturing a product sample:

Fig-64: WORKING OF 3D PRINTER

VI. CONCLUSION AND RECOMMENDATION

CONCLUSION:

Not all technical information about 3D printing could be shared in this introduction of the subject. Documenting the technology, very much a work-in-progress, must also recognize that not all authors agree on the likelihood of 3D printing gaining wider dissemination into the homes of individuals [41]. Also, as a still emerging technology, 3D printing is not without its problems, such as slow printing speeds [40]. Nevertheless, as prices are decreasing, the number of 3D printers sold worldwide has been growing steadily.

RECOMMENDATION:

The following recommendations can be considered for the improvement in the field of 3D printing.

- Desktop 3D printing assembling innovation could be possible at home; the workplace, a healing facility or a school, conveying assembling to non-producers the way PCs conveyed processing to non-customary situations.
- Later on, it might be workable for the military to print new parts right on the war zone as opposed to needing to depend on constrained extras and supply chain management.

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