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LOW COST 3D PRINTER

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ABSTRACT: This is on 3D printing which has become a notable topic in today's technological discussion. 3D printing is a form of additive manufacturing technology where a 3D object is created by laying down successive layers of printing material. It is a mechanized method where 3D objects are quickly made on a machine which is connected to a computer with the help of Arduino containing blue print of the objects. Here in this technology 3 steps are included such as Designing, Printing and Finishing. In 1st step we use any CAD software to create 3D design in 2nd step 3D printer creates an object using this design, and in 3rd step finished object is removed from printer. But it is mainly used commercially because of its high price. So this research is about how we can reduce the building cost of 3d printer without affecting the quality of its output. This will mainly benefit students as they can use it personally in various fields, and many people who cannot afford high cost 3D printer but are interested in the technology. 3D printer can be used in various fields such as medical, automotive, equipment and various businesses.

KEYWORDS: Cost Affective, 3D Printer, Easy to use, Future Technology

1. 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. 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 synthesized easier and faster. 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. Study showed the technology has developed rapidly and has proven its effectiveness, especially for design and small production.

2. METHODOLOGY

The first and the foremost step in the process is to create the CAD file. This 3D model will give an idea about the look of the final product. This digital file is the blueprint for the object to be created. The designer can select any

material and check the behaviour of the 3D model under different conditions. Most 3D printers need a .stl file to start the process. So using one of the many software available, convert the cad file into .stl file. There are many software available for conversion. After converting the CAD file to STL format the file is sent to the machine. Upon selecting the print option the file is automatically transferred.

Then the material that is to be used needs to be fed to the machine. Apart from this material, if we are using support material then it is also needed to be fed. This will hold the product until it is completely developed. The material (PLA) cartridges are inserted. A suitable base is inserted and the printing job is selected.

Once the material cartridges are loaded in the machine, the internal machine process starts. The printer blocks moves to the "start" position and creates a thin layer. Now the extrusion head moves in the XY direction to fill more layers of the object material. Once the motion in this direction is completed then it moves in z direction and fills it with object material. The movement in the z direction depends on the desired thickness of the object. Machine continuously print in XY direction in high speed. Now the machine prints in the Z direction. This is the step that differentiates 2D and 3D printing.

Once the printing process is completed the printer displays the "complete" command. The lid of the printer is opened, and the tray is taken out. If we have used supporting material then it needs to be separated from the object. But this removal process needs to be done carefully. The excess material is removed by spraying water with high force, or by putting it into a tank where soluble material are used to remove the excess material. It can also be cleaned by breaking and twisting the undesired material. After this step we have our desired object.

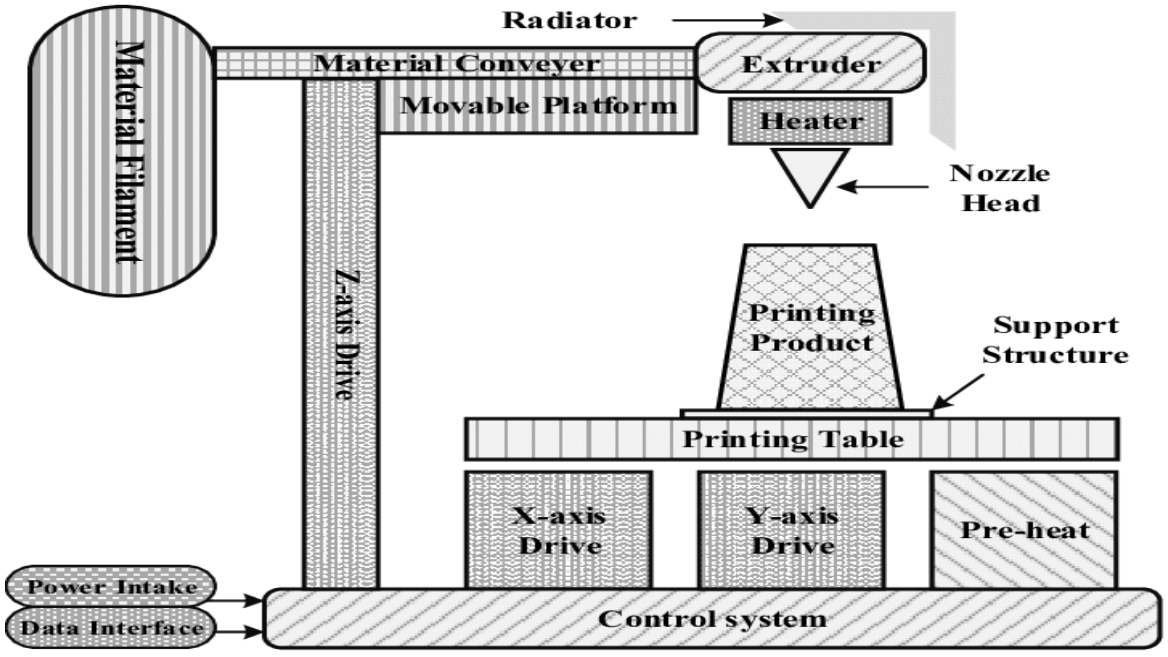

Figure 1: 3D printer

3. APPLICATIONS OF 3D PRINTING

3.1. Education

This low cost 3D printer can help students to prepare better for their future by allowing them to experiment new prototypes and models without the need of expensive tooling.

3D printing bridges the gap from ideas and images on a page or screen, allowing for the creation of those ideas or images in the physical 3 dimensional world.

3D printing helps students to explore engineering, design and architectural principles. They can create exact duplicate models of historical monuments and many other items of various filed to study and research in classrooms without damaging the original item.

3.2. Prototyping and Manufacturing

3D printing was first developed as a means of faster prototyping. With the traditional prototype method it might cost thousands of rupees and take more time to produce a single mould.

Traditional manufacturing is cost effective at larger volumes but for prototyping and research it is not beneficial. In situation where the product is not going to be mass produced 3D printing technology will helps to reduce the time required in traditional methods from days to hours and also at much lower price.

Many small business are profited as they can offer customised product according to the customer's need, mobile cases for example.

3.2.1 Medicine

In the last several years there have been many 3D printing applications in the world of medicine.

3D printed prosthetics exemplify 3D printing's versatility. It is difficult and expensive to produce prosthetics that fit a patient. With 3D printing, measured prosthetics can be modelled and printed at significantly lower cost.

Children in need of a prosthetic formerly had to wait to get one to be sure they would not outgrow it. Now, a new prosthetic can be 3D printed for them every few months.

Bio printing allows for the 3D printing of artificial organs, helping solve organ failure issues in patients faster, important to both the patient and his/her family and to healthcare systems.

3.2.2 Art and jewelry

3D printers allow jewelry makers to experiment with designs which are not possible with traditional jewelry making methods. 3D printing also allows the production of individual, unique pieces of jewelry or customized pieces at a much lower cost, using 3D printing materials such as PLA (polylactic acid filament), gold or platinum. 3D printing technology is inspiring many artist from all over the world to create and experiment new designs and art.

4. Benefits

3D printing has following advantages

1. Time: Printing of 3D object can be done directly, differing from traditional manufacturing where you had to join different component to have a final product. 3D printing allows businesses to construct working models in very less time.
2. Flexible: 3D printing can be done with huge range of printing material available in market. This makes it easy to create construction models or prototype for a wide variety of projects in different fields.
3. Lower Cost: 3D printing technology allows user to make prototypes or models at a much lower cost as compared to traditional methods.
4. Durability: The objects do not absorb moisture or warp over time making them last for longer.
5. Easy to use: 3D printer is very easy to use. We just have to select a 3d image, give the print command and printing will start.

5. CONCLUSION

If the cost of 3D printing is decreased, the number of 3D printers sold worldwide will grow progressively. The main aim of our project was to reduce cost of 3D printer by replacing costly parts with the parts we made from scrap and many other changes are done which successfully helps us in achieving our goal. Also the applications of 3D printing are increasing as more and more research is carried out. So this technology is surely having a great demand in coming future and with low cost it will definitely be a game changer with lots of prospects to look out for.

REFERENCES

[1] Sachinanda Hota, 'Study, Design and Fabrication Of a 3D Printer'. In 'Department of Mechanical Engineering National Institute of Technology Rourkela -769008'.

[2] Dongkeon Lee, Takashi Miyoshi, Yasuhiro Takaya and Taeho Ha, "3D Micro fabrication of Photosensitive Resin Reinforced with Ceramic Nanoparticles Using LCD Microstreolithography", Journal of Laser Micro/Nano engineering Vol.1, No.2, 2006.

[3] Gabriel Gaala, Melissa Mendesa, Tiago P. de Almeida, "Simplified fabrication of integrated microfluidic devices using fused deposition modeling 3D printing" Science Direct.

[4] Siddharth Bhandari, B Regina, "3D Printing and Its Applications", International Journal of Computer Science and Information Technology Research ISSN 2348-120X.

[5] Frank van der Klift, Yoichiro Koga, Akira Todoroki, "3D Printing of Continuous Carbon Fibre Reinforced Thermo-Plastic (CFRTP) Tensile Test Specimens", Open Journal of Composite Materials, 2016, 6, 1827.

[6]. VINOD G. SURANGE, PUNIT V. GHARAT: "3D Printing Process Using Fused Deposition Modelling." //SJCET, Palghar (MH), e-ISSN:2395-0056.

[7]. L.G. BLOK, M.L. LONGANA, H.YU, B.K.S. WOODS: "An Investigation Into 3D Printing of Fabre Reinforced Thermoplastic Composites."//(ACCIS), Bristol, BS8 1TR, UK 22(2018) 176-186.

[9]. MARY B. HALLI, NARAYANA SWAMY R: "Design and Implementation of Arduino Based 3D Printing Using FDM Technique."//T. John Institute of Technology, Karnataka, India.eISSN:2319-1163.