

A Review of Fused Deposition Modelling Type 3D Printer for Digital Dentistry

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Abstract— Nowadays 3D printing has become a big boom. This technology is not only used in industries but also used in daily life. 3D printer is most advanced technologies of our age. Every year global market of 3D printer growth rate is high. This project aims to develop a 3D printer that not only counts for a cost effective output but a product that can be used by each and every one. According to evolving computer-aided manufacturing technology, ceramic materials such as zirconia can be used to create fixed dental prostheses for partial removable dental prostheses. Since 3D printing technology was introduced a few years ago, dental applications of this technique have gradually increased. This clinical report presents a complete-mouth rehabilitation using 3D printing and double-scanning method.

Keywords: 3D Printer, 3D Printing Technology

I. INTRODUCTION

The 3D printing process make a three-dimensional object with the help of computer-aided design (CAD) model, usually by successively adding material layer by layer, which is why it is also called additive manufacturing, unlike conventional machining, casting and forging processes, where material is removed from a stock item (subtractive manufacturing) or poured into a mould and shaped by means of dies, presses and hammers. The term "3D printing" covers a variety of processes in which material is joined or solidified under Computer Control to create a three-dimensional object, with material being added together (such as liquid molecules or powder grains being fused together), typically layer by layer. 3D printer was only consider for aesthetic look and proto typing. But now a days 3D printer is going to matures and manufacturing can be used. Metal 3D printers are under testing and it will use in future. The main benefit of 3D printer is we can print and complex body easily.

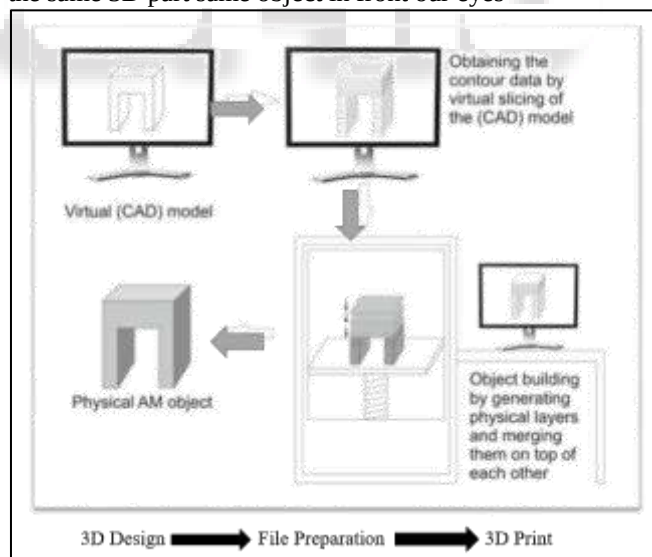
A. Why We Need of 3D Printing Technology?

- In school and colleges to understand the basics and concepts of different subjects.
- Using this prototyping technology, students will understand to produce realistic 3 dimensional mini-models and it improve imagination power
- Students can convert their designs into products: Text book oriented concepts could be utilized to create models in the class rooms.
- Due to 3D Printer we can learn modeling software like cad, cura.
- You can create your own ideas and easily print on printer.
- Children's toys can make easily at home so we can save money.
- We can sell 3D printer parts for proto type.

B. How 3D Printer Works?

The basic working principle of 3D printer is to print the part layer by layer as per your cad model and to finish it. the printer has a frame structure and three axis x y and z axis that moves left to right front to back and up and down . The printer has component called extruder which is responsible for feeding the plastic to print and melt the plastic. To print the plastic layer the movement of the extruder and stepper motor need to be controlled for that PWM generated by the Arduino is used, the g-code are used to drive the axis accordingly with help of CAD tools targeted objects are designed and converted into g codes with the help of software like Cura and being given to electronics that includes motor which is placed on the frame according to the frame design.

Commands given to the stepper motor works and through the help of extruder which is also running through the motor melts the plastic accordingly on the print plate. The plastic material used in this project is bio degradable plastic materials. After the part is finished the final part is taken out. In this way the process started with the designing object specifically a 3D part and ended with the generating the same 3D part same object in front our eyes



II. MATERIALS USED IN 3D PRINTING:

A. ABS:

Acrylonitrile butadiene styrene or 'lego' plastic – a very common choice for 3D printing

B. PLA:

Poly lactic acid – Is available in soft and hard grades, is becoming very popular and may overtake ABS in the near future

C. PVA:

Polyvinyl alcohol – This is used as a dissolvable support material or for special applications.

D. PC:

Polycarbonate – Polycarbonate requires high-temperature nozzle design and is in the proof-of-concept stage.

E. SOFT PLA:

Polylactic acid – Is rubbery and flexible, available in limited colours and sources.



III. THE APPLICATIONS OF 3D PRINTING IN MANUFACTURING TECHNOLOGY.

A. Prototype:

If power plants, bridges have to build, first of all their prototype model are made on 3D printer. The main purpose of making prototype model on 3D printer is only for a static purpose. How power plants and bridges will look after they are built.

B. Aerospace industry:

In aerospace industry, 3D printing technology has potential to make lightweight parts, improved and complex geometries, which can reduce energy requirement and resources. Now 3D printing technology has been widely applied to produce the spare parts of some aerospace components such as engines and small complicated parts. Engine parts can be easily damaged and it can require replacement. Therefore, 3D printer parts can be used.

C. Food:

In food industry most of the recipes are repeated by using this technology we can make recipes fast and tasty without any error as well as variety of recipes easily made on food printing system.

D. Education:

The education system plays an important role in helping people to achieve their goals. 3D printing can improve the learning experience by helping student's interaction with the subject content. Affordable 3D printers in schools may be used for various applications which can help students in finding their field of interest easier and faster, also it helps to improve their imagination skill. Presently there are different types of educational projects in order to attract students to the various fields by giving them the opportunity to create and manufacture their own designs using 3D printing technology.

E. Construction:

Nowadays 3D printers are used in building construction. Main advantages are require less time to construction, also less labour costs, and less waste produced. It is also a potential way of building extra-terrestrial structures on the Moon or other planets where environmental conditions are less conducive to human labour-intensive building practices.

F. Medical:

3D printing is not only used in industries but also in hospitals. We can easily make human skull, arms, teeth's on printer and it can easily be replaced.

G. Automotive Industry:

In cars and bikes so much plastic parts are used and these plastic parts are made in moulding process. Now we can use this plastic parts made on 3D printer with less cost. Any complex plastic body can easily be made on 3D Printer.

IV. ADVANTAGES & DISADVANTAGES

A. Advantages

- CNC production is long lead time and expensive so 3D printer can easily replace.
- Plastic parts that made on 3D printer cost is low as compared to other production method.
- We can easily manufacture of complex bodies.

B. Disadvantages

- Part making on 3D printer is slow so high energy consumption.
- Cost of 3D printer is high.
- Maximum Plastic parts made on 3D printer and its affecting on environment.
- Strength of 3D printer parts is less as compared to other machines.

V. FUTURE SCOPE OF 3D PRINTER:

- 3D printing will be used for mass production.
- Due to more use of 3D printer software will mature and easy to handle.
- 3D printer will compulsory use in education system.
- Not only in industry but doctors and hospitals will also accept this technology.
- 3D printer will be used in daily life.
- The 3D printing growth in market will be higher.
- Metal 3D printer will be used in industry.

VI. CONCLUSIONS:

3D printer is increasingly used not only in the production environment, but in education. There are currently world changing applications for 3D printers being developed for the future and we are successfully developing which will be used as a lab equipment. At present, 3D printing technology is beginning in the manufacturing industries, it offers many benefits to the people, company and government. 3D printing technology could revolutionize and change the world. The applications of 3D printing are increasing as more and more research is carried out. The field is definitely a game changer and it will be used in daily life.

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