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Design and fabrication of 3D printer and hand writing machine

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ABSTRACT

The introduction of 3D printing has changed the traditional manufacturing methods in the industries. It creates a revolution in the manufacturing sectors. Even, though it is expensive, these are used to built prototypes and in simple part making. First a product or a part is tested by creating a prototype, analyze it and then only they start to make the real part production. It reduces the material wastage. We can also use these along with some other process by changing the software and hardware. It has enormous applications in automotive, aviation, aerospace, medical, and in crafting.

Keywords: 3D Printing, Rapid Prototyping, ABS, PLA

INTRODUCTION

3D printing as known as desktop fabrication. 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 ink jet 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.

LITERATURE SURVEY

[1] Andreas Gebhardt, Miranda Fateri - tells 3D printing technology could revolutionize and reshape the world. Advances in 3D printing

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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.

[2] Medhavi Kamrana, Abhishek Saxena - studied Charles W. (Chuck) Hull's first working robotic 3D printer in 1984. 3D printing has changed the manufacturing industries since late 1980's. In 2009 only the "desktop" 3D printers were came to the public. Later, S. Scott and Lisa Crump has patented the Fused Deposition Modeling (FDM) in 1989. This technology also called FFF (Fused Filament Fabrication). When all companies begin to develop 3D printers, the patents are expired in 2005. Then, this technology became the basis of the RepRap movement.

[3] JABBAR QASIM AL-MALIKI, ALAA JABBAR QASIM AL-MALIKI - investigates the processes and technologies of 3D printing. It tells the method to produce the layer to create a part. Melting or softening material method is used by Selective Laser Sintering (SLS) and Fused Deposition Modeling (FDM) are the most common technologies used for printing. Another method is by curing a photo reactive resin with a UV laser or light source by one layer at a time. It is commonly used in Stereolithography (SLA).

[4] Vinod G. Gokhare, Dr. D. N. Raut, Dr. D. K. Shinde - they investigated on various materials used in 3D printing and their properties. They also shows the materials used in manufacturing of 3D printed objects and tells the way of selecting suitable materials for a 3D printer. Each material has some technical specifications on the basis a material is selected for a printer.

[5] A. Ramya, Saileelavanapalli - explains the technologies in 3D printing, different methods of fabrication and state of the material used. They shows us each capabilities of 3D printing

techniques and ink jet printing types also its capabilities too.

[6] Hessel H. H. Maalderink, Fabien B. J. Bruning, Mathijs M. R. de Schipper, John J. J. VanderWreeff, Wijnand W. C. Germs, Joris J. C. Remmers & Erwin R. Meinders - they demonstrates that 3D printing of integrated electronic components is possible by combining a SLA process with pick-and-place method. A conductive paste is used in combination with photopolymer mixture to get standard components. Thus, standard SMD components were fully embedded.

SPECIFICATION OF DIFFERENT COMPONENTS

Electronics

- 1 x Ramps board (RAMPS + Mega 2560 + A4988 + NEMA stepper Drivers quantity 4 nos.)
- x End stops including connecting cables
- 1 x Heat Bed
- 5 x NEMA 17 Stepper motor (5.5 Kg-cm)
- 1 X Power Supply (220 Volt, assured 12 Volt ; 29 Ampere supply)

Hardware

- Smooth and threaded rods
- Linear bearing , ball bearing , coupling , belt , GT pulley , GT 2 belt
- Screw Nut, washers,
- Metal Frame

Plastic Parts

- Printed Plastic parts to build PRUSA i3.

Hot End

- Magma Hot end kit (Thermistor & resistor included) 40 mm Fan & its Holder.

Software

- PRINTRUN-WIN-SLIC (Open source)

EXPERIMENTAL SETUP

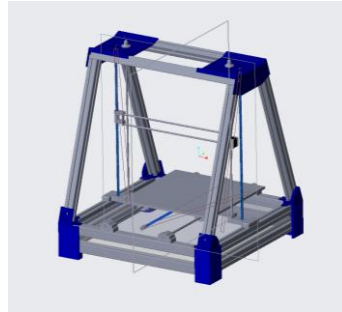


Fig.1 Experimental Setup

The 3D printers basically depend on the construction and principle of CNC machine. Most of the 3D printers are expensive, but there are some recent trends in 3D printer which causes reduction in the price of 3D printer. Mostly 3D printers are used for more in hobbies rather than

industrial application. Companies have also realized the potential of a consumer market for 3D printers and as such have been aggressively courting enthusiasts with cheaper and better models.

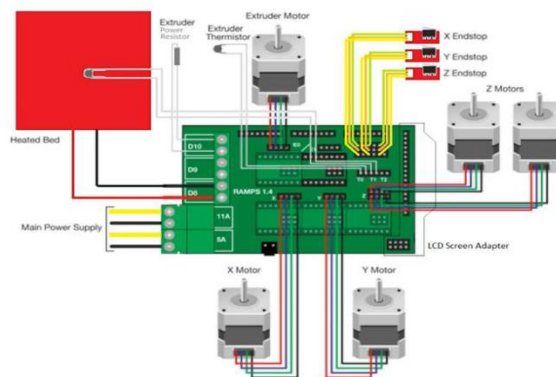


Fig. 2 Circuit

The first step is to collect all the requirements for the project. The basic equipment require is stepper motor. The base for the stepper motor.

PROCESS OF 3D PRINTING

CAD Model Creation

Initially, the item to be 3D printed is designed utilizing Computer-Aided 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.

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.

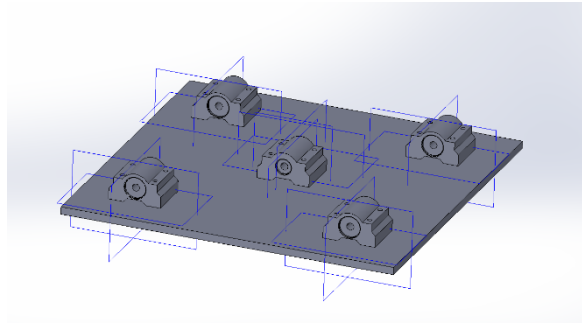
Slice the STL File

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.

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.



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RESULT

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.

CONCLUSION

It's easy to imagine a future where items manufactured in China will be complemented with 3D printed customization in stores. Recent innovations using 3D printers like within the biotech industry provide insight into both the significant market advantages of high-value 3D-printed products and the significant initial costs to realize those advantages. Once printers become common place in the home, one can conceive printing custom glasses and plates for a dinner party. 3D printers when used to only available in science fiction stories is now a real tangible product that used to create products.

In medicine, hospitals are already printing structural body components. In labs they are working on printing out organs, though it will be a while before this becomes common.

Due to the price it's access to world is very limited but through this project there will be an increase in the access of 3D printers. We made our own 3D printer with a price of just 6000 Rs. If we can imagine it, we can also create it. The only limit is our imagination.

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