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# PORTABLE 3D PRINTER

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**Abstract**

The making of three dimensional object from a digital file involves a process Called Additive manufacturing. Using Additive process, an object is developed by laying down of consecutive layers of materials till the object is manufactured entirely. If we consider the cross section of the object then it is clear to us that every layer is prominent as a thin, sliced and horizontally placed. Additive manufacturing technology saves time and cost for developing 3D models by eliminating separate designing, printing and glue together individual printed parts. Hence forth we may develop a complete model in one single process using 3D printing which finally leads to increasing flexibility. 3D printing is an additive manufacturing technique in which 3D objects are printed with the help of CAD (computer-aided design) software.

**KEYWORDS:**3d printing, Rapid Prototyping, ABS, PLA

## 1. INTRODUCTION

3D printing refers to as additive manufacturing method basically used for making three dimensional objects. The object may be of any form. The method of making this object is known as additive manufacturing. In this additive method, an object is built from its base by adding multiple layers of materials to it. The additive method is taken from the subtractive process, where the material is removed from a block by using the methods such as drilling or sculpting. The material used in the development of 3D objects is mainly plastic, though in recent development there has been an additional development toward the alternative materials like metals of various composition and organic matter like carbon and its derivatives. 3D printing technology is used by manufacturers like automobiles, aerospace, dental, medical companies due to the accurate and efficient production of objects. The 3D printed objects will be lightweight and rapid prototyping of the objects can be done.

## 2. RELATED WORK

In this process the thermoplastics; which constitute ABS (Acrylonitrile butadiene styrene), wax and nylon were utilized. The introductory venture of the FDM procedure were to warmth up the thermoplastic constituent until it is at an intertwined state .Then, the 3D printer uses advanced demonstrating information from a CAD record to create the 3D item layer by layer, The printers join a much weaker bolster composite. The bolster material goes about as framework to the test item. This is valuable amid the building procedure when parts have overhangs that could not bolster it. The thermoplastic for the most part has a filamentous structure which benefits warmth exchange and serves to move with a print head that navigates in the x and y bearings. After

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every layer is printed, a cylinder navigates the stage beneath (z-hub) the separation of thickness of printed layer. There are numerous benefits of FDM innovation; it is anything but difficult to control, use, and fix. The expense of the machine and material are generally low.The joining of granular materials involves specifically fusing powder, layer by layer. The elemental constitution of the powder and binding process relies on the machine.One of the sorts of binding processes is Selective Laser Sintering, or SLS. It utilizes a highpowered laser to sinter the powder. Once the first layer is made, the whole granular plate, in which the powder (and the "print") is found, is cut down. As seen in Figure , this procedure is supplemented by the vertical development of a cylinder. Moreover, cylinders are additionally utilized as a part of a few printers to send the coupling powder up so that the moving instrument would continue working adequately and the sintering can proceed. A mirror is integrated to control the laser bar into the foreordained "cut" of the CAD model. When the greater part of the layers is appropriately sintered, the item is removed from the build chamber.

SHS is indistinguishable to SLS. Selective Heat Sintering utilized a thermal print head. This new strategy uses concentrated heat to fuse the binding powder.SLM is almost as same as SLS. A more powerful laser is generally used. It required more energy for the metal to be melted.Electron Beam Melting is some cases similar to SLM; an electron beam was used to melt the powder. Unlike models produced by SLM, EBM models are fully accurate, void-less, and extremely powerful.

## 3. IMPLEMENTATION

3D-printing is a type of manufacturing, that allows any user to create and print, basically any product they would like.This could mean that any household with a 3D-printer could print out any item. If they break the handle to their closet, they can print out a replacement part.The possibilities are endless, The medical industry has already begun printing out internal body parts, and this could literally save any persons life. If a person has a heart failure, a hospital could easily scan that person using X-ray, and 3D-print a new heart for this person.There are so many problems faced by communities like: heart failure ,A birds( with no legs), like wise so many animals facing the same problem And if a person has heart failure (there is no existence of a man with heart failure)If there is a 3-year old kid breaks a plate.To this day, 3D-printers are getting more affordable, which makes the product possible for home use.

To study different methods of 3d printing and their applications, To study the working procedure of each component of a 3d printer and the evolution of 3d printer.To design and fabricate a 3d printer using tool kit.Three-dimensional (3D) printing is an additive manufacturing process that creates a physical object from a digital design. The process works by laying down thin layers of material in the form of liquid or powdered plastic, metal or cement, and then fusing the layers together.The design of the model has to be done in software where the actual model with the required dimensions is developed so that it can be used to print the model. To develop and fabricate thmodel there are many process and parameters involved mainly design of the model. The design

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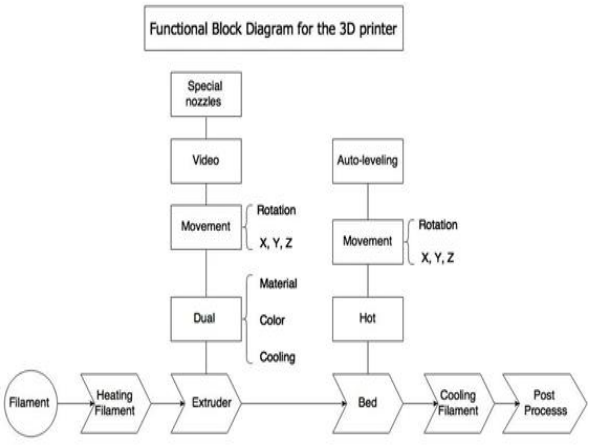
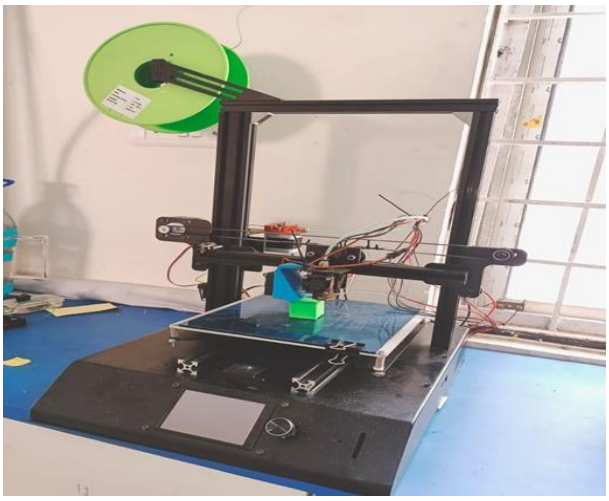
process started by keeping the print volume as a basic design parameter. As the objective of the project is the construction of economical and sizable 3D Printer, a print volume of 200 x 180 x 150 mm3 is selected. The 3 – Dimensional motion is achieved by synchronization of movements in X, Y and Z directions. Hence mechanism of our 3D Printer is Z plus core XY. This mechanism uses 4 stepper motors, two for Y-axis movement (to and fro movement), one for Z-axis movement (Vertical movement) and one for Extruder filament. This mechanism uses the single motor to control lead screws to which the print bed is connected to the movement in Z – direction. The lead screws are driven by the motor which in turn moves the bed in the vertical direction. Two motors have been used here because the print volume is large, there will be a disruption in the movement if only a single motor is used. The conceptual design has been initially visualized in Sketch-up software.

**BlockDiagram:**




## 4. EXPERIMENTAL RESULTS

The manufacturing of a 3D Printer involves the usage of various design techniques and several smaller parts are assembled to manufacture the machine. The 3D Printer manufactured by us, gave us the following results and final specifications.



## 5. CONCLUSION

The outcome of this paper was to build a portable 3D Printer which has been successfully completed . The design of the frame is made robust and compact using aluminum sections. The material selection of the various elements is economical. Using a single motor for vertical movement along with a proximity sensor makes bed leveling easy and the bed movement is monitored with resolution in microns. The drawback in few of the 3D Printer which uses bed movement in Y axis has distortion of the printed layer at high rates of printing. To overcome this drawback, a new mechanism has been developed which uses bed movement in Z. The control of the mechanism becomes easy because of less number of motors and good synchronization can be achieved using this new 3D printer technique.

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ISSN- 2394-5125 VOL 9, ISSUE 05, 2022

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