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Implementation of 3D Printer

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Abstract: 3D printing has turned into a remarkable point in today's innovative exchange. Here, we will look at additive manufacturing or 3D printing. We will firstly characterize what we mean by this term and what is so noteworthy about it. We will dive a bit into the history. At that point, we should see about the procedure of 3D printing and the materials utilized as a part of the production of 3D printed objects. We might likewise see the focal points and burdens of 3D printing. We should watch the various applications it is being out to utilize today. At last, the future capability of this innovation is illustrated.

Keywords: 3D printing, 3D printers, polymers, Stereolithography, Additive manufacturing.

I. INTRODUCTION

A 3D printer is an additive manufacturing technique where 3D objects and parts are made by the addition of multiple layers of material. It can also be called as rapid prototyping. It is a mechanized method where 3D objects are quickly made as per the required size machine connected to a computer containing blueprints of any object. The additive method may differ with the subtractive process, where the material is removed from a block by sculpting or drilling. The main reason to use 3D printer is for 90% of material utilization, increase product life, lighter and stronger. 3D printing is efficiently utilized in various fields such as aerospace, automobile, medical, construction and in manufacturing of many household products. The 3D printing innovation is not a new concept as many. When FDM (fused deposition modeling) licenses had expired in 2009, the 3D printing became a new innovation topic. What's more, because of which it turned out to be more mainstream, individuals envisioned that FDM was the just a single added substance producing system. Be that as it may, the initial 3D printing procedure was SLA not FDM, and its first patent was recorded in 1980's. Here is the historical backdrop of 3D printing innovation, from 1980 to today. In 1980's there was the introduction of 3 primary 3D printing systems. Dr. Kodana was the first person to present layer by layer approach for assembling and furthermore he was the principal individual to create fast prototyping strategy. What's more, he made a progenitor for SLA. He polymerized a photosensitive gum with the assistance of UV light, however, did not succeed. Shockingly for Dr. Kodana, the full patent detail was not recorded by him before the one-year due date after the application. the causes of 3D printing innovation can be followed from 1983. The object or the model which has to be printed first it has to designed or modeled using a CAD (computer aided drawing) tool like solid works etc. By the 3D scanner or by the digital camera and a very unique photogrammetry software. These 3D printed models were created with help of the CAD results in the reduction of errors which were found and can be corrected before printing.

II. METHODOLOGY

This 3D Printing Evolution Functional Block Diagram shows the process flow of 3D printing in the X direction and the evolution of the functional blocks in the Y direction.

A. Extruder

The first improvement to the 3D-printer, that several 3D printers have now, is extruder. Printers with a single extruder can perform multi-color and multi-material operations but it is faster and easier to perform these operations with multiple extruders 3D printing and multi-material functionality has a huge interest in material science; people have invented wood, ABS like PLA, nylon, flexible PLA, stone, carbon fiber, and other special filaments. Not only has 3D printing material undergone significant material research, but MIT found a way to enforce spider webs with carbon fiber to make it a stronger. It is also going to be interesting to see special blends of materials in creating objects. Multi-material functionality allows for optimized design: strain issues can be addressed with more flexible material and stress issues can be addressed with more rigid material. Currently this can be done if each part is done in different and distinct areas, but in the next five to ten years design software will allow for objects to be designed for a blend of materials. While the FFM printer have a wide range of available filaments, there is not a huge range of different resins available for SLA printing so it will be interesting to see what resins may be developed in the years to come.

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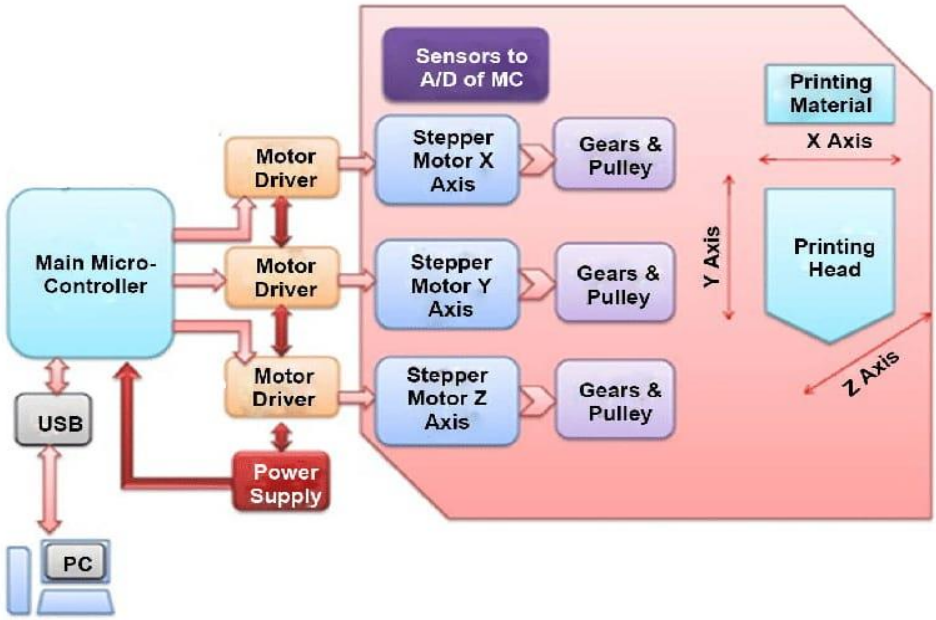

Fig1: block diagram of 3d printer

B. Cooling extruder

One way to decrease the overall print time would be to increase the rate at which the filament is coming out of the extruder, however, the layer before must be fully solidified before the next layer of plastics is placed. One possible solution to this problem would be to add a special cooling head that would trail the hot print head to the hot plastic solidify faster

C. Movement

Different 3D printers have different ways to move the extruder. A lot move the extruder in the Cartesian coordinate system or in the X, Y, and Z direction and the most common ways of doing it is by moving the extruder in the X and Y direction while the bed moves in the Z direction or have the extruder move in all three directions around a stationary bed. Having both the bed and extruder move in the X, Y, and Z direction could be a way to minimize the travel time.

D. Special nozzles

The extruder might be able to change the print head diameter at different times during the print similar to how cake frosting have special decorative tips

E. Bed

Many printers already have the functionality of heating the bed to improve print quality and protect against the warping during the print job.

F. Movement

As mentioned above, both the bed and extruder could move in the X, Y, and Z direction to minimize the travel time. As for the delta 3-D printers, they could have their circular base to rotate to make the travel time faster of the print head.

G. Auto-leveling

As someone who has used a variety of 3D printers, the leveling of the bed is one of the most annoying thing in 3D printing and even the slight height difference could stop print jobs from being completed. The Creatbot is the only 3D printer that I know of that has an auto-leveling bed and other great features.

H. Post Processing

Current methods for post processing include deburring, sanding, priming, airbrushing, and application of acetone. One of the biggest misconceptions with 3D printing is that the 3D printer can print out objects just as nice as store bought items.There might an effective trade of between a very high resolution print with no post processing and a lower quality print and some post processing to make it smoother. The two major factors to be considered in these processes is speed vs structure integrity. If the goal is to achieve a faster time while not worrying so much about the strength of the object then the low resolution with the post processing seems to be better choice; however, if it is a functional part then the first option is a safer choice.

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I. Missing Dimension: Information & Modeling

The CAD model development and related data flows are an important dimension of 3D printer functionality. Scanners, CAD design system, design rule checks, model repair tools, and other software that creates, modifies, or verifies the models needed for an object to be printed are undergoing as significant a rate of evolution as the functional blocks identified here. A truly complete functional block diagram would include them

III. RESULT ANALYSIS

This is a 20mm calibration cube for checking the dimensional accuracy of 3D printer. It was created using the guidelines in our guide on creating a 20mm 3D printer cube. The results that you see here we tested and printed using 3d-printer loaded with filament PLA

Print setting used:
Layer Resolution: 1.2mm
Nozzle Diameter: 0.4mm
Infill: 40%
Material Used: Polylactic Acid (PLA)
Duration of print: 35mins
Filament used (1.75mm): 155cm
Temperature to melt filament:210°C

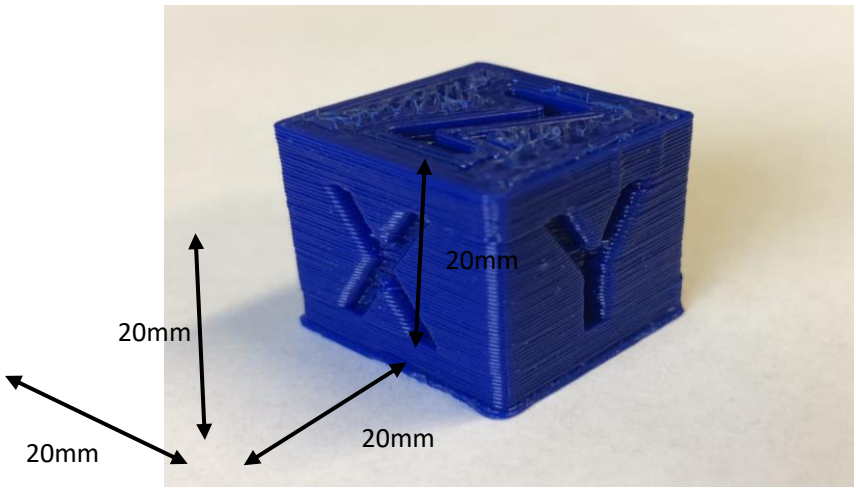

Fig2: 20mm cube

IV. CONCLUSION

As 3D printers become more affordable, they will inevitably be used for local, small scale manufacturing, largely eliminating supply chains for many types of product. Consumer units for home use will even become feasible, allowing end users to simply download a design for the product they require and print it out.There will be major challenges for the conventional manufacturing industry to adapt to these changes. The opportunities for technology and engineering are clearly huge, however, and the creative possibilities in product design and printing material formulation are nearly endless

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