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AN REVIEW ON 3D PRINTER

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Introduction

"When objects can be described in a digital file, they become much easier to copy and distribute and of course, to pirate. Just ask the music industry. When the blueprints for a new toy, or a designer shoe, escape onto the internet, the chances that the owner of the IP will lose out are greater". The personal 3D printers of today most often build things from plastic using a process called fused filament fabrication (FFF), Plastic filament is heated and extruded from a nozzle like a tiny and precise hot injector while the machine draws out 3D objects layer by layer. As one layer of plastic is laid on top of another. they fuse together, and, when cooled, form a solid and durable plastic part. This technology has been around for about 25 years and used in the design and engineering industries for everything from designing parts for cars to designing baby toys. Whilst the real quest was how to make 3D printers more personalized and yet affordable answer came out as a project called "RepRap" (short for replicating rapid prototyper). Developed by Dr. Adrian Bowyer at Bath University, is the 3D printer that started it all in 2007. The first RepRap named Darwin, was a 3D printer capable (at least in theory) of reproducing itself by printing the parts needed to make a new one. Due to the self-replicating ability of the machine, authors envision the possibility to cheaply distribute RepRap units to people and communities, enabling them to create (or download from the Internet) complex products without the need for (distributed manufacturing) including scientific equipment.

Literature Review

A 3D printer uses a virtual, mathematical model to construct a physical artifact that can be manipulated and viewed on the computer screen. The 3D printer can take the symbolic representation of this new object and use it to build a full-size, physical model that can be held and manipulated, helping the designer to better understand the strengths and limitations of their design. Additive rapid prototyping machines were first introduced twenty years ago, when 3D Systems introduced the Stereolithography or SLA machine. While these machines were remarkable for their ability to create complex parts, they were large, expense, and difficult to operate. As such, they are of limited interest to most academic institutions except for a few well-funded laboratories.But when we considering last five years, we can see too many advanced developments in 3D printing technology. Such as Rapid prototyping of electrically conductive components through 3D printing technology. The prototyped model is made of plaster-based powder bound layer-by-layer by an additive printing of a liquid extruder. The resulting model is highly porous and can be impregnated by various liquids. In a standard prototyping process, the model is impregnated by epoxy or polyurethane resin, wax solution. The technology for printing physical 3D objects from digital data was first developed by Charles Hull in 1984. He named the technique as Stereolithography and obtained a patent for the technique in 1986, but this technique is developed to very advanced form such as multi-material stereolithography (MMSL) machine was developed by retrofitting components from a commercial 3D Systems 250/50 stereolithography (SL) machine on a separate stand-alone system and adapting the components to function with additional components required for MMSL operation. Similarly, few more efforts can be stated like,

Methodology

The Frame:

The frame for the 3D printer will be made of acrylic material. The components were designed for a stationary office environment. It will be powder coated to be rust resistant and maintain a presentable appearance.

Stepper Motor:

A stepper motor (or step motor) is a brushless DC electric motor that divides a full rotation into a number of equal steps. The motor's position can then be commanded to move and hold at one of these steps without any feedback sensor (an open-loop controller), as long as the motor is carefully sized to the application.

Hot End:

It is a main working part of our project in which we fit a PTFT tube for a constant supply of material to the printer. It has a high thermal resistance it does not malt at a temperature 170 degree Celsius, if also provide a resister & thermistor in the hot end for heating that hot end and also to measure the temperature of that hot end.

Bearings, Gt2 Timing Belts & Pulleys:

In our project we used a 608-ZZ & LM8UU bearing for the smother ruining of printer. IN that project we used a 608 linear bearing for the smooth movement of y axis & LM8UU linear ball bearing for moving the extruder along the x & y axis. The extruder moves along 3 axes as fast as possible with GT2 timing belts and pulleys aided with 608zz bearing along with smooth rods working through LM8UU linear ball bearings.

Printer Board:

. The features for the printer board include the following:

- Four non- replaceable onboard stepper drivers,
- Two high-power switched loads rated at 30 amps for the extruder and printbed.
- One low-power switched output for the cooling fan.
- Three end stop and one emergency stop connection.
- Two thermistor connections.
- Single power input of 12 to 20 volts.
- Onboard microcontroller with integrated USB and onboardMicroSD.

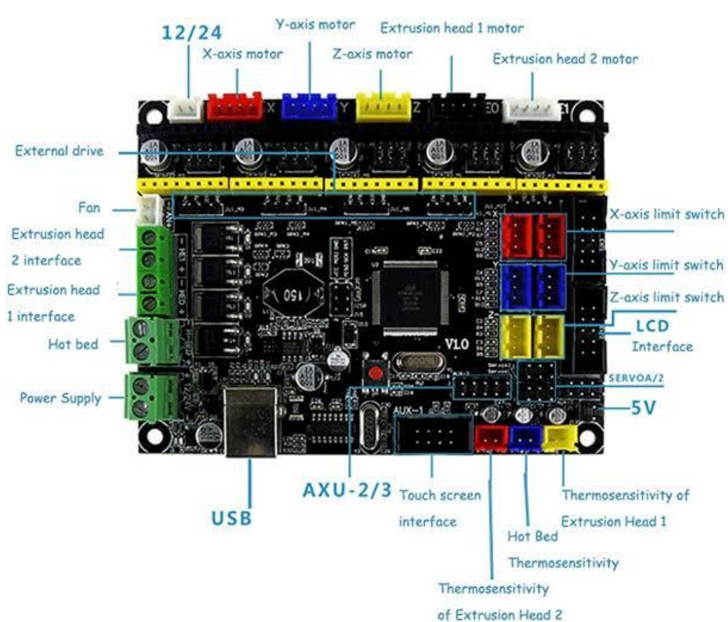

Figure 4-1: printer board with relevant details

Fans:

In this project fan is used for a cooling purpose only because if the heating of material is increases it malt at high rate & comes out of nozzle. It can damage the print which is we can give to the printer. Fan is controlled by the printer board automatically. If the temperature of the hot end goes high than the temperature which we set on the printer board it starts automatically & stop when the required temperature is attained by the hot end.

Software:

Once the object is sliced, it can be saved in a format conducive to printing (generally G- code)/ 3D printers are generally controlled through a computer, and require several programs: a driver, a slicer, and a print control program. 3D printer makers often bundle the programs, and optimize the package for their models.

Raw Material:

It is a raw material PLA (Polylactic acid) Plastic as raw material because it is available in any local market easily & it is available it very cheap rate as compare to any other material which is available in the market.

ADVANTAGES, DISADVANTAGES AND APPLICATIONS OF 3D PRINTING

ADVANTAGE:

1. Accessibility

The knowledge & technology was accessible just for engineers & designers, today 3D printing techniques and printers are available to anyone willing enough to invest time.

2. Printing at Home

Now anyone can fabricate 3D printer or 3-D designs in affordable price and enjoy large accessibility to many different kinds of materials. The advantage of printing at home is a key factor in the future 3D printing trends.

3. Product Better Quality

3D product's perfection can be achieved within hours, 3D programs can refine designs and prototypes over and over until the product gets to perfection. Companies that implement 3-D printing designing techniques in their working procedure gain great advantage over their competitors.

4.Rapid prototyping, production & supply chain:

The 3D printing technology allows producing bigger product's quantities with a higher number of prototypes in less time. Designers can constantly improve their prototypes. The time and cost one saves using 3D printers is a huge advantage.

5. Reducing Costs

3D printing helps to track errors in early stages. 3D designs are available online and it's easy to print the final best matching product.

6.Environment friendly

Companies using 3D printing techniques tend to use environment friendly new materials causing less damage compared to the other industries. Moreover - it is known that there's less waste of material by using 3D printed products and techniques. In this project we used PLA its Bio-degradable.

7. Life Quality & Welfare:

Create essential parts and models in industries such as Education, Medical & Health, Military, Automotive, Lifestyle and many more is clearly a big advantage that will only grow with the rising patterns of the 3D printer's industry trends.

DISADVANTAGE:

1. Quality Against Time

While this project is still in its beta testing. It adheres to certain discomfort. One of which is Time factor. At its best i.e., 50-micron resolution or layer height printer takes about 7 hrs to print mere 4*4*4 cube. But as layer height increases viz. 0.2 same cube prints in 2 hrs. This suffers loss in surface quality due to visible layers.

2. Copyright Violation:

3D printed designs, 3-D prototypes, patents and brands. Since the 3D printing market is in its relatively early days there are no clear policies and supervision. Clear disadvantage is that the 3-D printing markets is still breached and expose, easy to buy 3D printer designs and print them at home violating copyrights and brand name products.

3. Printing Weapons and Firearms:

One of the main disadvantages is printing of dangerous crafts is easier with 3D printing technology. Spreading "license free" weapons such as guns, knives, clubs and magazines is only matter of time. Any 3D printer that can print metal or solid polymers can serve criminals in manufacturing their own weapon arsenal. Real evidences and case studies already presented few examples of crafts and tools with the ability to cause serious damage produced by simply scanning & printing weapons using home 3D printer.

4. 3D Black Market:

One of the natural disadvantages & side effects of the growing 3D printing industry will be black market of spare parts, generic versions or fake brands and entire niches that will be boosted with copied items and crafts that will harm product quality, pricing, authenticity and demand.

9.3 APPLICATION:

1. The current slow print speed of 3D printers limits their use for mass production. But it is still a better option to test design at their earlier stages

2.Companies have created services where consumers can customize objects using simplified web-based customization software, and order the resulting items as 3D printed unique objects. Hence resulted in employment.

3.This prototype can be used to print in multiple colours, with different polymers, or to make multiple prints simultaneously. Hence is useful for customization.

4. 3D printing has been used to print patient specific implant and device for medical use.

5.3D printing has spread into the world of clothing with fashion designers experimenting with 3D-printed bikinis, shoes, and dresses.

Conclusion

Following are the conclusion are made

1. This Project is a sincere attempt to minimize the cost of 3d printers to range of at least middle-class Indian families. Thus, main focus would be on quality product design as much possible.
2. 3D printing in developing packaging design success in producing the package sample. In spite of packaging companies develop their packages designs, packaging designers don't use 3d printing in local packaging market.
3. Therefore, it is recommended that - 3D printing Use in the field of packaging design and of packages development is to be intensified 3D printing should be consciously utilized in the field of packages samples production.
4. In education visuals are given utmost importance hence product made from machine can be used as teaching aids to various faculties such as Biology, Medical an essentially any engineering stream.

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