

DESIGN AND FABRICATION OF COST EFFECTIVE 3D PRINTER

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Abstract— 3D printing is a form of additive manufacturing technology where, three dimensional objects are created by successive layer of material. It is also known as rapid prototyping. It is a method whereby 3D objects are quickly made in a machine connected to a computer containing 3D model for the object. The 3D printing concept of custom manufacturing is exciting to nearly everyone.

This revolutionary method for casting 3D models uses fused deposition modeling (FDM) technology along with coordinate controls by means of CD drive, saves times and cost. It can make physical models of Object designed with CAD program alone. The building volume of this machine is quite high in terms of its kind and cost. It is affordable and cost effective so that evolving prototypes can be made with reasonable cost which is the main advantage of this project.

Index Terms—3D Printer, FDM, Extruder Pen, ABS, CD drive, Arduino

I. INTRODUCTION

3D printing is a quickly expanding field, with the popularity and uses for 3D printers growing every day. In this guide, I will attempt to give an introduction to the wide range of technologies in 3D printers, a comparison of the most common 3D printers on the market, an overview of materials that can be used to print, online services and communities that offer 3D models or 3D printing services, and an intro to designing and printing your first model.

A range of different metals, plastics and composite materials may be used. It is also known as rapid prototyping, is a mechanized method whereby 3D objects are quickly made on a reasonably sized machine connected to a computer containing blueprints for the object. The 3D printing concept of custom manufacturing is exciting to nearly everyone. This revolutionary method for creating 3D models with the use of inkjet technology saves time and cost by eliminating the need to design; print and glue together separate model parts. Now, you can create a complete model in a single process using 3D printing.

The basic principles include materials cartridges, flexibility of output, and translation of code into a visible pattern. The inception of 3D printing can be traced back to 1976, when the inkjet printer was invented. In 1984, adaptations and advances on the inkjet concept morphed the technology from printing with ink to printing with materials. In the decades since, a variety of applications of 3D printing technology have been developed across several industries.

While all 3D printers create objects using additive methods (the opposite of a CNC machine), different approaches exist to actually physically depositing the material. The most common methods are:

Fused Deposition Modeling

A very common method in which the part is printed by extruding molten stings of material that melt together to create the part. This is usually the cheapest method, but quality can suffer, and materials are limited.

Selective Laser Sintering

More common in industrial style prototyping settings, a laser melts together powdered plastic, ceramic, or other material, then spreads more powder on top, repeating the process to build the part layer by layer. The main advantage of this is the wide variety of materials that can be printed.

Powder Bed and Binder

Similar to Laser Sintering, an inkjet head distributes binder to the correct location on a bed of powder. The most notable advantage is the ability to print in many colors.

Stereolithography

Here, an ultraviolet laser hardens resin in a vat layer by layer until the part is built. It can quickly create high definition parts that can be machined. However, the

resin is fairly expensive compared to other 3D printing materials.

II. COMPONENTS

The list of components in 3D Printer is:

A. Arduino Uno

Arduino is an open source computer hardware and software company, project, and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical and digital world.

B. CD Drive

The CD player has the job of finding and reading the data stored as bumps on the CD. Considering how small the bumps are, the CD player is an exceptionally precise piece of equipment.

C. L29 3D

A motor driver is an integrated circuit chip which is usually used to control motors in autonomous robots. Motor driver act as an interface between Arduino and the motors. These ICs are designed to control 2 DC motors simultaneously.

The L293D is a 16 pin IC, with eight pins, on each side, dedicated to the controlling of a motor. There are 2 INPUT pins, 2 OUTPUT pins and 1 ENABLE pin for each motor. L293D consist of two H-bridge. H-bridge is the simplest circuit for controlling a low current rated motor.

D. Extruder Pen

A 3D pen is like a handheld 3D printer. It consists of a heating element and an extruder like desktop 3D printers. Unlike desktop 3D printers where the nozzle movement is controlled by motors and computer software, the movement of 3D pen is controlled by our hands.

E. ABS Filament

Acrylonitrile Butadiene Styrene (ABS) is a 3D printing plastic. It's a versatile petroleum-based material that belongs to a family of thermoplastic polymers.

The purpose of our ABS guide is to highlight the best options around today. This means we only list the brands that check enough boxes to make it onto this shortlist. The table includes things like the star rating, colors available, and sizes. We've added the printing and bed temperatures for your convenience too, as well as where to buy the filament.

F. SMPS

Switched-Mode Power Supply is an electronic power supply that incorporates a switching regulator to convert electrical power efficiently. Switching regulators are used as replacements for linear regulators when higher efficiency, smaller size or lighter weights are required.

III. WORKING

A 3D Printer is able to draw complex line drawings. The coordinates are uploaded to the machine controller by a separate program. The image file is transformed into a G-code via Software. Then the code is transferred to the microcontroller by which the motor mechanism is instructed to draw the image.

In this project, we are going to present a simple design for a CNC plotter. Our idea is an Arduino based design using L29 3D drive microcontroller.

Once you have the design, the object is sent to the printer. Most printers have software that lets you convert the STL to the layers that the printer will print in and commands for the printer.

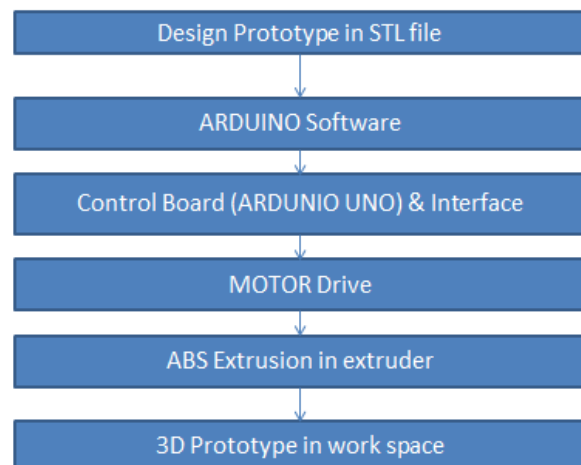


Fig 1.1 working methodology

A CAD model is done by using PTC CREO which is converted into .STL file. The process to convert is by selecting: File => Save as => Change 'Save as type' to .STL

Then the .STL file is send to the interface software (Arduino) which converts into coding which is implemented to the Arduino Uno, where Arduino Uno is the Control Board.

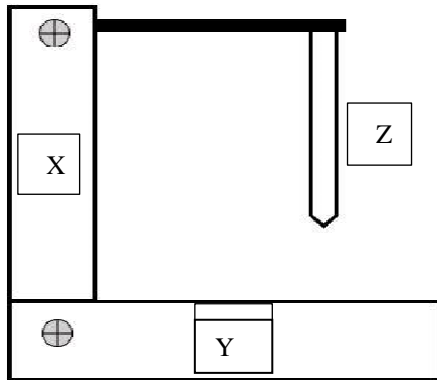
The power supply (SMPS) is used to give power to the motor, the motor power is be given using the L29 3D drive thus the power is converted to motor power. The motor moves in coordinate axis thus the moment is given by the coding input to the Arduino Uno.

The printing is based on coordinate axis where the Y-axis is for the moment of the work place, X-axis is

for the horizontal movement, Z-axis is for the movement of CD drive.

The filament is fed to the Z-axis where the extruder pen is fixed, inside the extruder pen is a motor which push filament and a thermostat which melt the ABS filament then the filament is been extruded by the nozzle.

Thus the desire shape or design is been done by using 3D printer.



IV. CONCLUSION

It is generally accepted that **3D printing** will be a revolutionary force in manufacturing, whether positive or negative. Despite concerns over counterfeiting, many companies are already using the technology to repeatably produce intricate components, for example in automotive and aerospace manufacturing.”

V. RESULT

While comparing with the 3D printer available in the market it is more cost efficient and its size is smaller and effective as 3D printer. Thus it reduce the work of the worker and its quite easy to use.

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