

Implementation of 3D Printer Using Fused Deposition Modeling

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ABSTRACT

This is the research paper of the 3D printer (three-dimensional) we will look at the rapid prototyping or additive manufacturing technology and the various steps are required to build the 3D printer.

This paper presents building of our imagination and operating of the low-cost 3D printer. We shall observe the modeling, methodology and the architecture of the 3D printer. We shall see the flexible for the target application. We can observe the firmware to control the device from the printing the image. This paper reviews the current applications and the future trends of the 3D printer.

Keyword: - Rapid prototyping, flexible, modeling, designing, 3D-printing.

I. INTRODUCTION

The 3D printing is a technology that it makes digital file into the physical object. Nowadays one of the most exciting new development in the printer is 3D printing.

Fused deposition modeling is a 3d printing method that makes durable objects at the same plastic you seen every day product. FDM take a spool of plastic filament melts it and extruder on to tray and build a product layer by layer.

Here in this technology 3D Printer creates an object by lying down the material on the platform of printer until the desired object is formed. In this melted material use to create object. Printing is nothing but the process of producing text or images.

In 2D Printing can be done using paper & ink but in 3D there is various material used to print an object.

This technology mostly uses in industry to turn ideas into reality. This is the leading technology now a day's which attracts the educated students & industries.

We can create a whole model at once using 3d printer. If we use another method then it takes more time & cost to design, creates separate part and then joined all the parts by glue.

The basic principal of this technology is material cartridge, flexibility of output, & converting code into visible manner. The printer is a machine which is convert digital data or simply the design into physical object.

The 3D design is created by using CAD software and it will extract the STL file is imported to the host software. It is used in various industries such as footwear, jewellery, dental, aerospace, automotive etc.

The filament as many types in that PAL and ABS is used for the good printing of the 3D object. To melt the PAL the extruder temperature should be 190-230 and the melting point of the ABS is above 220-240.

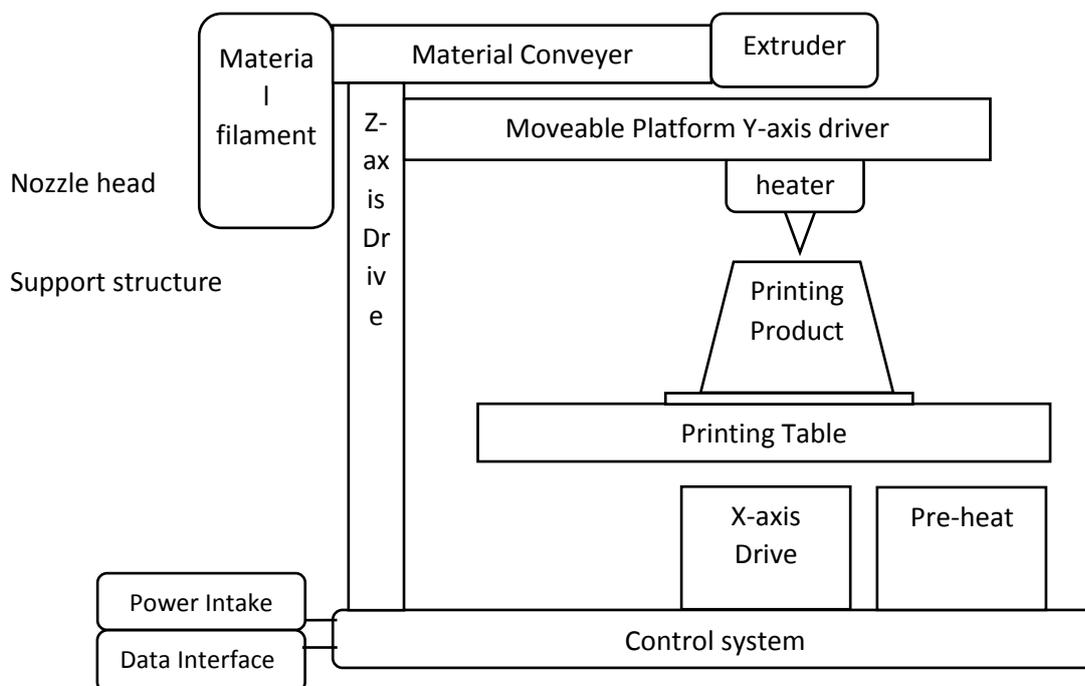
The term "3D printing" originally referred to a process that deposits a binder material onto a powder bed with inkjet printer heads layer by layer. More recently, the term is being used in popular vernacular to encompass a wider variety of additive manufacturing techniques. United States and global standards use the official term additive manufacturing for this broader sense.

II. PROPOSED WORK

2.1. Connection Setup of Hardware

Fused deposition modelling is also known as fused filament fabrication uses material extrusion to print the object, where a feedstock material is pushed through an extruder. In most fused filament fabrication 3D printing machines, the feedstock material comes in the form of a filament wound onto a spool.

Extruders for these printers have a cold end and a hot end. The cold end pulls material from the spool, using gear- or roller-based torque to the material and controlling the feed rate by means of a stepper motor. The cold end pushes feedstock into the hot end. The hot end consists of a heating chamber and a nozzle. The heating chamber hosts the liquefier, which melts the feedstock to transform it into a thin liquid. It allows the molten material to exit from the small nozzle to form a thin, sticky bead of plastic that will follow the material it is laid on. The nozzle will usually have a diameter of between 0.3 mm and 1.0 mm. Different types of nozzles and heating methods are used depending upon the material to be printed.



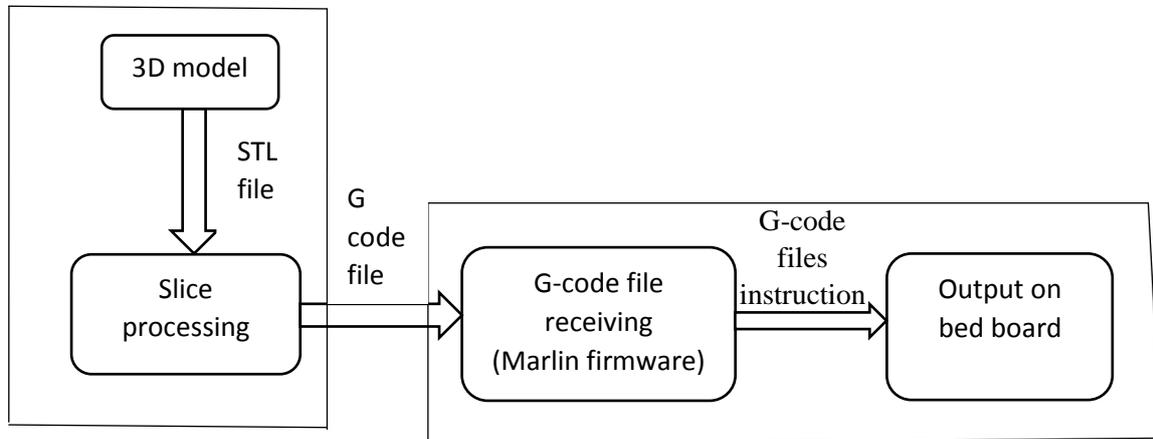
A Schematic Diagram of 3D printer

To setup the hardware connection consists of RAMPS 1.4 shield, Arduino mega 2560 and 5 A4988 stepper drivers.

it can be controlled up to 5 stepper motor with 1/6 stepping precision and interface with a hotend, a heated, a LCD controller, a 12v power supply.

- Install the heat sink on the step stick on RAMPS board.
- Assemble the RAMPS and Arduino mega 2560 that means simply stacking on RAMPS 1.4 Shield, sure the pins should be matched else step stick will be damaged.
- After assembling of RAMPS connect the hotend and heated depending on the marlin firmware configuration you can wire hardware.
- Connect the thermistor, power supply, end stopper and LCD controller to the specified pins

2.2. Manufacturing process of 3D printer



2.3. Software Setup.

The 3D design is created by using CAD software and it will extract the STL file is imported to the host software. When the 3D printer software sends the G-code to the 3D printer, the firmware translates the G-code commands into specific electrical signals that are sent to the motor, heaters and other components on the 3D printer. Finally, we will get the output on the heat board.

Configure and Compile of Marlin Firmware

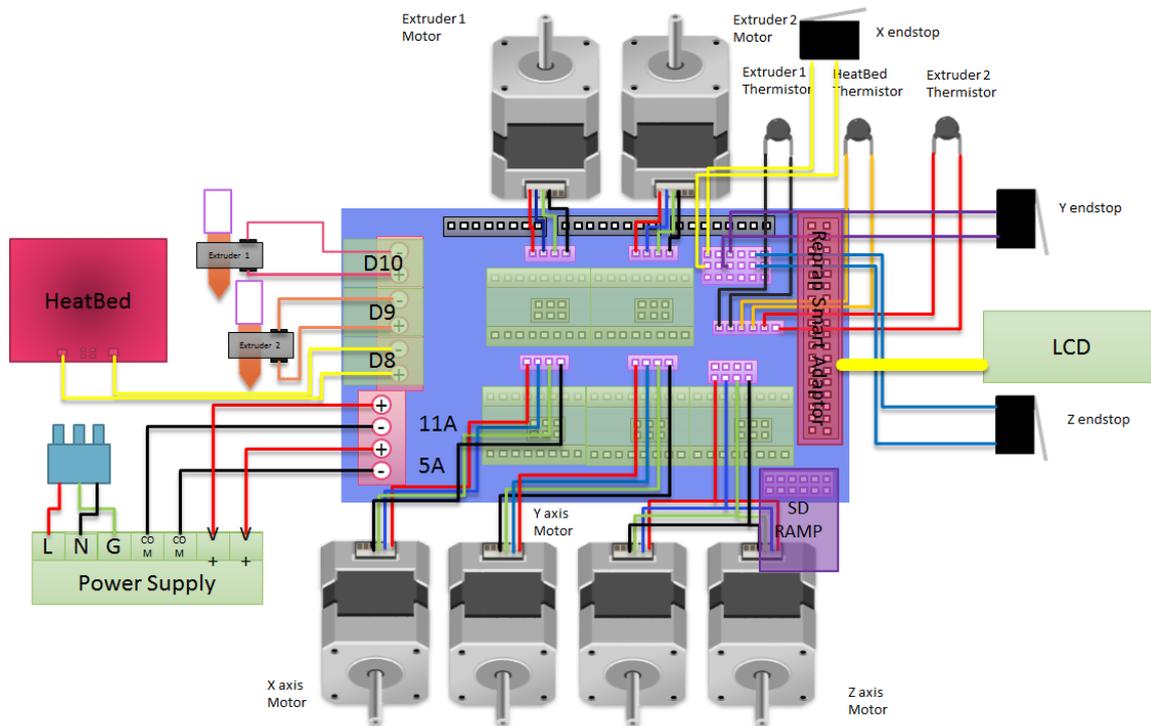
The main thing is we should configure the; -

- Baud rate setting.
- Set the no. of extruders.
- Set the thermistor.
- Set the maximum temperature limits, this feature is to protect hot end from overheating.
- Set the direction of end stoppers when homing.
- Set the direction of the XY & Z axis stepper motor.
- Set the travel limits after homing.

Configure of Repetier-host..

- Start the repetier host software.
- Import the STL file where the design is created by using CAD tool and load it.
- The g-code is sent to firmware by live, then the firmware translates the G-code commands into specific electrical signals that are sent to the motor, heaters and other components on the 3D printer.

IV. THE HARDWARE SETUP



V. HARDWARE AND SOFTWARE REQUIREMENTS

HARDWARE REQUIREMENT	SOFTWARE REQUIREMENT
<ol style="list-style-type: none"> 1. <i>Arduino Mega 2560.</i> 2. <i>RAMPS 1.4 Shield.</i> 3. <i>NEMA 17 Stepper Motor.</i> 4. <i>Power Supply.</i> 5. <i>A4988 Drivers.</i> 6. <i>E3D Hotend.</i> 7. <i>MK8 Extruder.</i> 8. <i>2 x 4mm Glass for Print Bed.</i> 	<ol style="list-style-type: none"> 1. <i>Arduino IDE-Marlin.</i> 2. <i>Slicer and CAD-Repetier host.</i>

VII. CONCLUSION

3D printer is the method of converting 3D design into the reality by using 3D printer. After the arrival of few years we can see 3d printer in every home if they want to make any toy or anything then they will buy the 3d file instead of the product. One day printer will make human organs for the need of peoples. Now days this technology is to be implemented in industries. Advantages of 3D printer are endless therefore it is most preferable technology.

REFERANCE

1. Anderson, A. (2007), 'The World in 2008: A Whole new Dimension'. The Economist, 15th Nov2007. http://www.economist.com/node/10105016?story_id=10105016 (accessed 4Th Jan 2012).
2. Berg, S. Dalton, T. (1975), 'Sectoral Employment and Shifts in the Aggregate Phillips Curve'. Southern Economic Journal, Vol 41, No.4, Apr 1975, p593-601
3. Bowyer, A. (2010), '2020 – Shaping Ideas Project: 3D Printing and the Future of Manufacturing'. <http://econfuture.wordpress.com/2010/03/25/2020-shaping-ideas-project-3dprinting-and-the-future-of-manufacturing/>. 25th March 2010 (accessed 11th Jan 2012)
4. Taufik, Mohammad; Jain, Prashant K. (12 January 2014). "Role of build orientation in layered manufacturing: a review". International Journal of Manufacturing Technology and Management.