International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 06 Issue: 03 | Mar 2019 www.irjet.net p-ISSN: 2395-0072

IMPLEMENTING ADAPTIVE HOST OF PLIABLE TECHNOLOGY FOR 3D IMPRINTER USING RASPBERRY PI AND ARDUINO

Guruprasad K P[1], Karthik S[2], Manikantan K[3], Kamran D M[4], Kavyashree S[5]

[1,2,3,4]U.G Students, Department of Electrical and Electronics, VVIET, Mysore.
[5]Assistant Professor, Department of Electrical and Electronics, VVIET, Mysore.

Abstract - *3D printing is a form of additive manufacturing technology where a three dimensional object is created by laying down successive layers of material. 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. 3D Printers are machines that produce physical 3D models from digital data by printing layer by layer. It can make physical models of objects either designed with a CAD program or scanned with a 3D Scanner. It is used in a variety of industries including jewelry, footwear, industrial design, architecture, engineering and construction, automotive, aerospace, dental and medical industries, education and consumer products..*

Keywords: Nema-17 stepper motor, G-code, Prototype, Arduino, Raspberry-pi.

1. INTRODUCTION

3D printer is a machine which is capable of manufacturing complex and difficult objects in one long step and it only requires a 3D model of the object to be made with a defined set of parameters and scaling ratios, which can then be converted into G-code. This data is then used for controlling the motors and extruding plastic based on the g-code generated. This approach towards fabricating contrasts with the traditional way of manufacturing, where an object is formed by removing excess material or folding and shaping materials based on certain dimensions. It also eliminates the needs of tools and machinery for cutting, shaping and fabricating. It also reduces the time needed for reproducing a prototype when making changes to it. Fused Deposition printing is one of the most widely used 3D printing technique. In fused deposition process a plastic polymer in the form of a filament is used as the raw material for printing. Its structure and mechanics is similar to that of a CNC machines and its print head is known as an extruder. The tip of the extruder has a nozzle that is heated to a certain temperature, as the filament reaches this nozzle it softens to a semi solid state. This molten polymer is then pushed through the nozzle and deposited onto a heat bed, layer by layer.

1.1 PROBLEM IDENTIFICATION

Recent years have seen dramatic progress in the performance of electronic devices such as mobile phones, notebook personal computers (PCs), and tablet devices. This technology revolution wouldn't have happened without the major use of the 3D printer which provided the ability to achieve higher densities and multi-layered structures. One of the ways of enhancing this progress is through the development of the manufacturing methods, by Computer Numerical Control machines. There is also another method called moulding technique were the polymer is melted to certain temperature and moulded in cast and this cast should be changed if design is changed this increases the cost. The commercially available 3D printer machine controlling system is very sophisticated and closed to specific low level machine language which makes it very expensive.

One important deployment of this method will be to replace moulding technique. This will give better results since it will help bypassing the unknown hidden problems between components. This will help making electronic projects easier, more flexible and faster to implement through simplifying the complex 3D modeling. The objective of this project is to present a low cost and simple controlling system.

1.2 OBJECTIVE

The main objective of the proposed project is to develop a low cost automatic mini 3D Printer machine for printing 3D models and prototypes. This system reduces the cost of machine and increases the flexibility.

2. METHODOLOGY

This project demonstrates hardware and software implementation of a 3D printer machine that is able to draw trace lines and mould. The system consists of a mechanical setup of that can move in X, Y and Z directions, a computer, a driving circuit and a software program. The driving circuit is developed to control the mechanical

setup as well as to communicate with the computer. The software program is developed to control overall operation of the machine. In this initial work, we have demonstrated that the machine can produce a trace line on two pads that are on both ends of the trace line. The mechanical setup has a flat layer is put on it to be processed. Above the flat layer, there is a product that can move along X, Y axis. The block diagram of 3d printer using Arduino and Raspberry-pi is shown in figure-1.

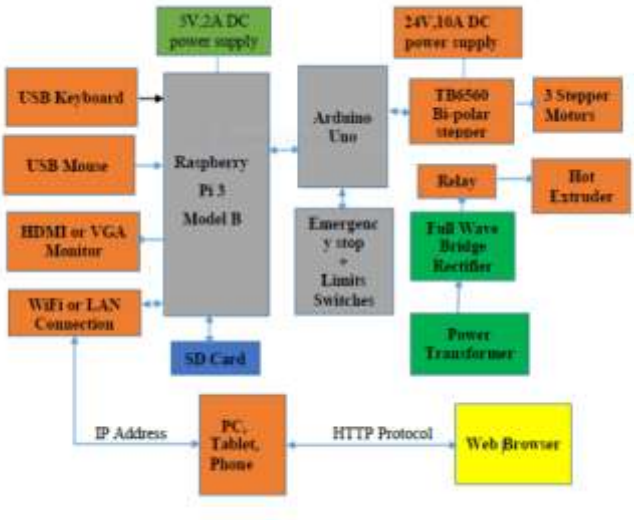

Fig -1: The block diagram of 3d printer using Arduino and Raspberry-pi.

2.1 TOOLS / PLATFORM:

a. NEMA 17 Stepper Motor:

This NEMA 17-size hybrid stepping motor can be used as a unipolar or bipolar stepper motor and has a 1.8° step angle (200 steps/revolution). Each phase draws 1.2 A at 4 V, allowing for a holding torque of 3.2 kg-cm (44 oz-in).

b. Heated Bed:

Heat beds are used because they dramatically improve print quality by keeping the extruded plastic warm and thus preventing warping. The MK2A heat bed (200mm x 200mm) is a good example of a PCB heat bed. Generally heat beds have 2 integrated LEDs and an integrated resistor which makes it rather 'plug and play' when compared to other solutions.

c. SMPS 24V 10A:

A switched-mode power supply (SMPS) is an electronic circuit that converts power using switching devices that are turned on and off at high frequencies, and storage components such as inductors or capacitors to supply power when the switching device is in its non-conduction state.

Switching power supplies have high efficiency and are widely used in a variety of electronic equipment, including computers and other sensitive equipment requiring stable and efficient power supply.

d. Blower Fan:

A Blower fan is a mechanical device for moving air or other gases. The terms "blower" and "squirrel cage fan", (because it looks like a hamster wheel), are frequently used as synonyms. These fans increase the speed and volume of an air stream with the rotating impellers.

e. Hot Extruder:

The extruder is one of the most important components on a 3D printer. It is responsible for sending the correct amount of filament to the hot end where it's melted and extruded Implementing adaptive host of pliable technology for 3D imprinter using Raspberry-Pi & Arduino down in thin layers to make your part. It's important to note that the extruder is not the same as the hot end, though these terms are commonly conflated. The extruder is commonly referred to as the "cold end" because the filament is "cold" when it passes through the extruder on the way to the hot end.

f. Limit Switch:

A switch preventing the travel of an object in a mechanism past some predetermined point, mechanically operated by the motion of the object itself.

g. Arduino Mega:

The Arduino Mega is a microcontroller board based on the ATmega1280 (datasheet). It has 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button.

h. Raspberry-Pi 3:

The first $5 computer! The ultra-small and ultra-slim Raspberry Pi 3 is the smallest form factor Raspberry Pi on the market. It is 40% faster than the original Raspberry Pi but measures only 65mm long by 30mm wide and 5mm deep. The Raspberry Pi 3 supports mini connectors to save on space and the 40pin GPIO is unpopulated providing the flexibility to use only the connections that your project requires.

3. CONCLUSION

By using this setup with a combination of G-code Arduino software for smooth operation and give better accuracy for design. This setup is used to reduce the process. G-code makes position from layout design to move with proper position. Whenever require to start and stop whole process will depend on you. By using Arduino Nano board, the setup is flexible and reduce workload for make Printed model.

REFERENCES

1) Kreiger, M., Mulder, M. L., Glover, A. G., & Pearce, J. M. (2014). Life Cycle Analysis of Distributed Recycling of Post-consumer High Density Polyethylene for 3-D Printing Filament. Journal of Cleaner Production, 70, pp. 90-96.

2) Wittbrodt, B. T., Glover, A. G., Laureto, J., Anzalone, G. C., Oppliger, D., Irwin, J.L., & Pearce, J. M. (2013).Life-cycle economic analysis of distributed manufacturing with open-source 3-D printers. Mechatronics, 23, pp. 713-726.

3) Mohammed R.F. and Mahmoud A.S.(2012), Emphasizing the advantage of 3D printing technology in packaging design development and production in local industries, International design Journal, Vol 1, Issue 1, pp. 111-119

4) Feeley, S.R. Wijnen, B & Pearce J.M.(2014),' Evaluation of potential fair trade standards for an ethical 3D printing Filament', Journal of Sustainable development,Vol.7,No.5, Published by Canadian centre of science and foundation.

5) Molitch-Hou, M. (2014). $1 Million Award to Fund Integrated Electronics 3D Printing. 23 October 2014. 3D Printing Industry, Available at: Langevin, G. (2012). International Journal of Latest Trends in Engineering and Technology (IJLTET) Vol.3