PORTABLE AND EASY TO USE 3D PRINTER

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Abstract -*The Additive manufacturing market is constantly growing in everything from the automotive industry to ceramics. However, the vast majority are in traditional areas such as prototyping using plastics. 3D printing has benefits such as faster and slower over conventional production, this makes it easy to reproduce when needed. As a tool of Industrial 4.0, Intelligent Manufacturing, and enable technology, 3D printing technology, has made fast progress in current years and is extensively used in many areas of public life. In addition, 3D printing technology is a high-quality form of production, which plays a transformative role in industrial growth. So, in the interest of determine the nature of the research and growth of 3D printing technology, this project orderly analyses some common methods and applications in other fields, and predicts its future development trends based on a brief introduction of the 3D performance policy.*

***Key Words*: FDM, Additive technology, 3d printer,**

1. INTRODUCTION

The additive manufacturing or fast prototyping 3D printing machinery is a new manufacturing technique that is being employed worldwide as a low-waste technology. The 3D printing technology is based on the model file, connecting some adhesive type materials together in solid form such as metals or plastics. And then through the layer-by-layer printing method, it is possible for two-dimensional data to transform into 3D materials. [1]. The 3D printing technology allows you to do this, and it has much more complicated applications in science and industry, it also shows that it can be zero release, zero waste technology. [2]. Further, the 3D printing method leads to the redesign of some tools and products, it pushes the limits of traditional processingmethods and leaves plenty of room for innovative design [1].

As mentioned earlier, 3D printing technology is known as AM by designing CAD data and adopting a method of incrementally increasing materials to create parts of an entity. It is a manufacturing method that adds materials from bottom to top compared to conventional material removal techniques (machining, etc.). With development in late 1980s, AM was also known as material enhancement, rapid prototyping, stacked manufacturing, solid freeform manufacturing, and 3D printing method. Different designations refer to special features of manufacturing technology. [1]

2. REVIEW OF LITERATURE

2.1 Yiran Yuan, "Research Status and Development Trend of 3D Printing Technology",presented at IOP Conf. Series: Materials Scienceand Engineering VOL. 711, Hefei, China, September 2019.

3D printing technology plays a great part in industrial growth. Due to high productivity and low cost, 3D printing technology brings great old school conversion production, which can be considered a drive for economic and social growth in China.

However, there are also other 3D printing problemsto deal with, such as without warranty production rate, high demand for production technology, solid staff training and pollution of rubbish, etc. Although the bottle of technology is still available today, thereis a bright future here technology, so the whole world is connecting great notice to it. In short, 3D printing technology will create a new era of nationalproduction.[1]

2.2 SAMER MKHEMER, SAED MAKHOOL, QAIS SAMARA, "3D PRINTING TECHNOLOGY", PRESENTED AT 3D PRINTING BIRZEIT UNIVERSITY, BIRZEIT, PALESTINE, NOVEMBER2014. PP-3.

Scientists and engineers fascinate us every day with ever-changing technologies what has recently been considered a science fiction or unimaginable future is a reality, making it ours it lives easily and is very interesting. For example, you thought you could do it Your framed mirror frame, children's toys, and any other image in your home using green building materials and a single machine? 3D printing technology enables you to do this and more the most complex applications in science and industry. This is an analytical research paper in which the student is introduced to 3D printing technology, its meaning, history, basic components, and operating theory.

So, what is this technology? There are many similar meanings and words used to describe 3D printing such as: additional production, and faster prototyping. However, all of which define the main dividing concept in the most common methods of subtraction Additional productivity. In general, 3D printing: a process in which solid 3D piece of any shape or x-ray type can be created from a slicer file. Creation is obtained by placing down the consecutive layers of something up to everything is created. Each of these covering constitute a horizontal section cut slightly (similar a output of a standard printer, this hence the so-called print) of the object at the end, in contrast to the standard output production methods that depend on the extraction of goods in order to create something.[2]

2.3 HIDEO KODAMA, " BACKGROUND OF MY INVENTION OF 3D PRINTER AND ITS SPREAD", IN PATENT MAGAZINE OF JAPAN PATENT ATTORNEYS ASSOCIATION, VOL.67, NAGOYA, JAPAN, , NOVEMBER 2014 NO.13, PP.109-118

Increased productivity can have a huge impact on the environment. For example, unlike conventional manufacturing, when parts are cut from large cubes of material, AM makes a layer of product and prints only the wanted parts, using very little material and thus less energy to produce the required materials. The production of additives can also contribute significantly to the reduction of energy consumption and greenhouse gas emissions to vehicles and other modes of transport by simply fulfilling the structural requirements of products. For example, a case study of an aircraft component using additive manufacturing found that partial use resulted in optimal energy and carbon dioxide emissions savings of 63% over the life of the product. Additionally, previous experiments in the manufacturing lifecycle had predicted that using of the technology could reduce Carbon dioxide emissions are reduced because 3D printing allows for local manufacture and eliminates the need for products to be transported long distances to their final destination.

However, continuing to adopt additive manufacturing creates a downturn. Despite the fact that additive manufacturing reduces waste from extra production processes by 90%, it also generates other sorts of waste, such as non-recyclable material dust. Additional productivity has yet to reach your 97% active visual capacity, but may come closer as technology continues to increase productivity.[3]

2.4 AN OVERVIEW ON 3D PRINTING TECHNOLOGY: TECHNOLOGICAL, MATERIALS AND APPLICATIONS. N.SHSHRUBUDIN, T.C.LEE, R.RAMLAN

In this review, there are rich landscape of 3D printing in manufacturing industry. At present, 3D printing technology is beginning in the manufacturing industries, it offers many benefits to the people, company, and government. Therefore, more information is needed to progress on ways to enhance the adoption of 3D printing technology. The more information about 3D printing technology will help the company and government to upgrade and improve the infrastructure of 3D printing technology. Thus, this paper is to overview the types of 3D printing technologies, materials used for 3D printing technology in manufacturing industry and lastly, the applications of 3D printing technology. In the future, researchers can do some study on the type of 3D printing machines and the suitable materials to be used by every type of machine.[4]

2.5 GERALD C. ANZALONE1, CHENLONG ZHANG1, BAS WIJNEN1, PAUL G. SANDERS1,AND JOSHUA M. PEARCE2, "A LOW-COST OPEN-SOURCE METAL 3-D PRINTER", PRESENTED AT IEEE ACCESS, DECEMBER 5 2013, DOI: 10.1109. PP 1-6

This article has successfully provided a proof of concept of 70,000 open source metal 3D printers. What 3d print objects or models using metal as filament, solid carbon steel ER70S-6, open source microcontroller and a low cost commercial gas metal arc welder (GMAW)? shape. This allows for the printing or fabrication of a variety of metal components, although the printer may require further adjustments in resolution in prints. There issignificant potential for the creation of an entirely new and large market for weld-like products to be used in the manufacture of user-specific metal components in the wider consumer market. This technology is likely to follow an evolutionary path similar to polymer open-source 3-D printing.[5]

3. METHODOLOGY

1. As per the research made by us by studying various research paper, we got ideas related to improving previous methodologies andtechnology. papers which are relevant to this topic.

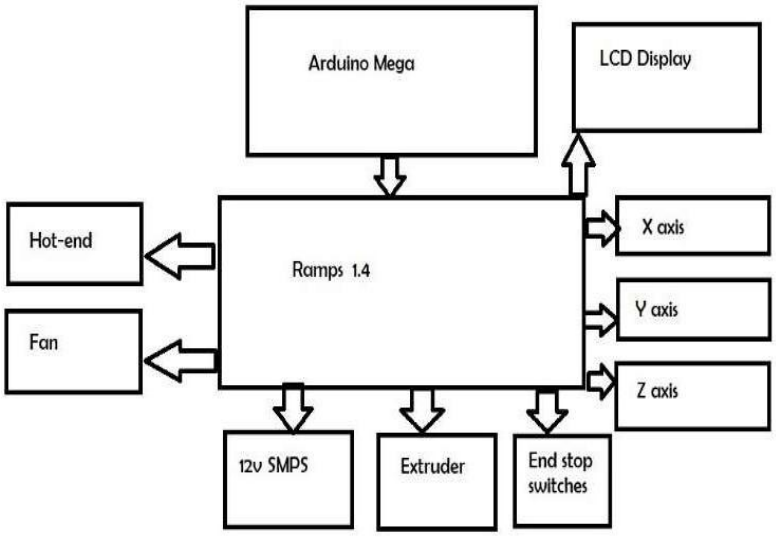
2. Our aim was to make low budget, affordable, 3d printer. In this proposed system we used Arduino mega, RAMPS, Nema17 stepper motors for controlling x, y and z axis which are connected.

3. In this 3d printer we are using additive technology (AM)or FDM for printing models.

4. Once all parts are connected, 3d model is made using 3d modelling software's like CAD, Catiya, Blender etc. which is then converted into G-code using 'slicer' which basically slices the 3d model layer by layer.

5. This is normal 3d procedure, but we added LCD and SD card port through that user can select the g code which will be in the Sd card which can be connected to SD card port. This is something new, so which makes it easier to use the system and making it more efficient and timesaving system.

6. After selecting when user will click print the machine will start printing model as per the g code.Then after required time is passed the 3d model isready use.



4. Working

Step 1: Arduino mega needs interface to connect with all the other components so RAMPS 1.4 is the interface which helps Arduino to connect with all other components. Now the bed is prepared using acrylic sheet and aligned properly. Which are X and Y axis.

Step 2: Then Extruder is connected which guides thefilament to the hot-end. Hot-end melts the plastic filament, and the small fan helps it maintain the appropriate. Temperature through-out the process.

Step 3: Arduino mega is now programmed which is hexfile is uploaded. Now run the machine.

Step 4: Now desired 3D model is made using Pronterface software, the output is a STL file which isconverted into G code using ultimaker cura.

Step 5: Now 3D printer would make the 3d model.

5. HARDWARE AND SOFTWARE DESIGN

To design a 3D architecture of selected application using AutoCAD software. Then a file is generated by AutoCAD having .STL extension. This file is then uploaded into the slicer software. The slicer software sliced the 3D architecture into 2D layers and generates the co-ordinates of the 3D architecture. This co- ordinates are provided to the controller which helps to print the 3D object.

A. Hardware Design

1. Arduino

Arduino Mega 2560 is an ATmega2560 (data center) based microcontroller board. There are54 digital I/p O/p pins (can be used as 14 PWM outputs), 16 analog inputs, 4 UART (hardware serial ports), 16 MHz crystal oscillator, USB connection, power input, ICSP header and resetbutton.

2. Ramps

RAMPS stands for RepRap Arduino Mega Pololu Shield. It's made to fit all of the electronics needed for RepRap into a tiny, low- cost package. RAMPS is a versatile interface that connects an Arduino Mega to the powerful Arduino MEGA platform. It also provides lots ofpotential for expansion. For easy repair, components replacement, upgradeability, and extension, the modular design features pluggable stepper drivers and extruder controlelectronics in an Arduino MEGA shield. Additionally, as long as the main RAMPS board is remained at the top of the stack, a set of Arduino extension boards can be added to the system.

3. SD card

The SDHC card reader allows the card to be used in compatible devices with a Universal Serial Bus (USB) port, such as a computer. SDHC memory card.

4. LCD

In this project I will show you how to interface128X64 Graphic LCD with Arduino mega. This particular LCD Module is based on the ST7920 LCD Controller. Therefore, we will first know a little about the Graphic LCD Module and its LCD Controller ST7920.

5. PROCESSOR

It is a 32-bit processor based on the Harvard architecture. It has a 3-step pipeline, fetch, decode,and execute. The main control chip used in the processor is LPC 1768, which supports the G-code file format. This processor is cost-effective, used toreduce processor space, and has extensive optimization interrupt handling and system debugging capabilities.

TEST RESULTS

We are expecting a 3D printer to make a small- scale prototype which can be put into a use of mechatronics-based industries which have an accuracy up to 90% and is of very cost efficient. Firstly, the prototype is tested to check whether every motor is working in x, y and z axis in correct direction respectively followed by the end stop is triggering or not, then the heat bed is checked, which is properly heating at 50-110 degree centigrade. To melt the plastic filament, the hot endstarted heating at range 200-240 degree centigrade. As in we use aluminum extrusion there was no vibrations in the mechanical part of the printer.

Conclusion

3D-FDM printer is designed and manufactured. For precise printing in geometric dimensions, this printing process ensures that the machine meets all required specifications. Some ABS plastic parts assembled on a3D-FDM printer were printed to replace some metal parts. This project presents the results of the design and production of the 3D printer using the FDM printing method, which provides the necessary technical specifications. Ideal printing parameters willbe done as further research to make sure the product quality for different plastics.

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