3D Printer Using E-Waste Management

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***Abstract*- Green energy generation and E-waste management has always been the centre of world concerns. Implementing correct green resources to develop strategies is something that should remain the fundamental of modern technology and its implementations. The idea of 3D printing was long sought by Chuck Hull, but there remained some discrepancies. One of which is the requirement of a 3D printer which could harness the idea of green energy and e-waste management. 3D printing is a dominant world technology that is used in almost all walks of industry. Creating a green 3D printer which is completely assembled from the e-waste generated from rejected computers and electronic devices will help reduce the e-waste by 12% to 16%. At the same time the resources which are used for the recycling of computer-generated wastes can be channelized to a better purpose, manpower and health hazards can also be reduced at the same time. One of the major advantages of such 3D printers is that they are an economical spearhead costing almost 1/4th than that of a commercial factory-made 3D printer. Since the cost is low, the efficiency might be affected in terms of speed, but the magnitude of output remains almost the same. Since this project is of a small-scale nature it can be commercialized to boost the small-scale industries to provide income sources.**

***Keywords*- E-waste management, green energy, rejected computers and electronic devices, economical spearhead, small-scale.**

I. INTRODUCTION

The target of the task is to make 3d printing affordable in all walks of industry. Giving e-waste management a new shape. Making 3d printers portable and solving the issues of large power consumption. And also, providing efficiency at the cost of less complexity.

The 3D printing process collects a three-dimensional article from a Personal Computer helped plan (CAD) model, typically by dynamically including material layer by layer, which is the explanation it is in like manner called added substance gathering. In an additional substance procedure, a thing is made by setting down dynamic layers of material until the article is made. All of these layers can be seen as a pitifully cut level cross-territory of the conceivable thing. The articulation "3-Dimensional printing" covers a combination of systems where material is joined or solidified under computer control to make a three-dimensional article, with material being incorporated, (for instance, liquid iotas or powder grains being merged), consistently layer after layer. 3D printing empowers you to create complex shapes utilizing lesser substance compared to standard assembling strategies.

II. RELATED WORKS

This section shows the existing systems that are present today in the field of 3D Printing.

Barry Merman proposed the attributes and utilizations of 3-D printing and compares it with large scale modification and other manufacturing techniques. 3D printing allows meagre amounts of tweaked items to be made at respectably low costs.[1]

Mazher, Anirudra, Badwal proposed to examine reusing of squander plastic items into fibers for the purpose of usage in a regular 3D printing framework. At last, the creation of usable fibers can give a feasible-methods for expending waste plastics and decreasing the weight of expanded landfill.[2]

Jukka Pakkanen, Diego Manfredi, Paolo Minetola proposed that Added substance Manufacturing (AM) and 3D printing are leads in substance reserve funds in assembling. Attributable to the consistent dispersion of 3D printing driven by ease passage level material expulsion printers, supportability of a so mainstream AM innovation is of vital significance.

In this manner, reusing 3D printed squanders and 3D parts again toward an incredible finish is a significant issue to be tended to.[3]

Ashish Patil, Bhushan Patil proposed that Added substance producing procedure or 3d printing process is presently turning out to be progressively mainstream on account of its focal points over regular procedures. A 3d printer is a device which make questions out of plastic, nylon-like numerous different substances. 3D printers nowadays accessible are not all that convenient and furthermore they are expensive. By investigating this issue, we are attempting to cause a versatile 3D printer which we can carry anyplace effectively as a result of it's satchel like structure.[4]

Alexandru Pîrjan, Dana-Mihaela Petroşanu analysed the creation of 3D printing development, its implementations and different social, money related, and characteristic results. We consider without a doubt the most gigantic already present 3D printing plans, considering the acquiring esteem, the particular subtleties, their key central focuses and obstacles. Likewise as it happened in the earlier decades with the computers and Internet, the impact of 3-D printing will a little bit at a time increase later on, inciting enormous changes, renaming our standard everyday presence, economy and society.[5]

3D printers in India are treated as industrial luxury and is barely available and applicable for solving rest world problems of the society. A large percentage of population is still unaware that a full-fledged prosthetic replacement can be made using 3d printing technology. There are many reasons to this unpopularity and its application such as very few companies work in the field of 3d printing in India. Lack of knowledge in printable technology installing a 3d printer at a facility might cost an average man's annual salary. 3d printing not being used as hobby application . 3d printers are mostly unknown to the youth faction causes lot of e-waste and resource wastage to fabricate one.

Our 3d printer is not only capable of solving the issue of e waste management but it can generate the fabricated products out of it. Our 3d printer is constructed from parts which are termed as scrap in the e waste market. Using e waste to manufacture this printer will not only cut down on the cost but will also help inject a new dimension into the small scale industry that is e waste management. When the issue of costs will be tackled this 3d printer can be applied to the Indian society in the fields of healthcare, local defense, personal care, scientific education and hobby application.

A. Arduino Mega

The Arduino Mega is a microcontroller board works based on the ATMEGA2560 which is made up of Fifty-Four propelled data pins, Sixteen basic information sources, Four UARTs, a Sixteen Mega-Hertz pearl oscillator, a Universal Serial Bus, a jack, an In-Circuit Serial Programming header, and a reset button. It has all necessities required to help the microcontroller, basically interface it to a Computer with a Universal Serial Bus linkage.

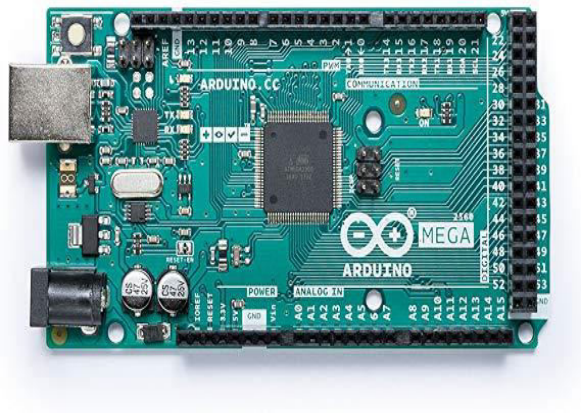


Fig 1: Design of Arduino Mega

B. RAMPS 1.4

RepRap Arduino Mega Polulu Shield, or RAMPS, is a board that fills in as an interface between the Arduino Mega- the controller PC -and the electronic gadgets on a RepRap 3D printer. The PC removes data from files containing information about the item you need to print and makes an interpretation of it into computerized occasions, such as providing a voltage to a particular pin. The measured structure remembers plug for stepper drivers and extruder control hardware on a solitary Arduino MEGA shield. Four drivers are expected to move most 3D printers, with 3 heading off to the hub and one driving the extruder. The board has 3 high force exchanged (By MOSFETS) yields melded to 5 An and 11 A yields for print-bed and extruder. It composes and intensifies the data originating from the Mega so they're properly coordinated down the right channels. For model, if the hot end carriage needs to move one stage to one side, the RAMPs board courses the signs from the Mega to the X-pivot stepper engine through the suitable pins and wires.

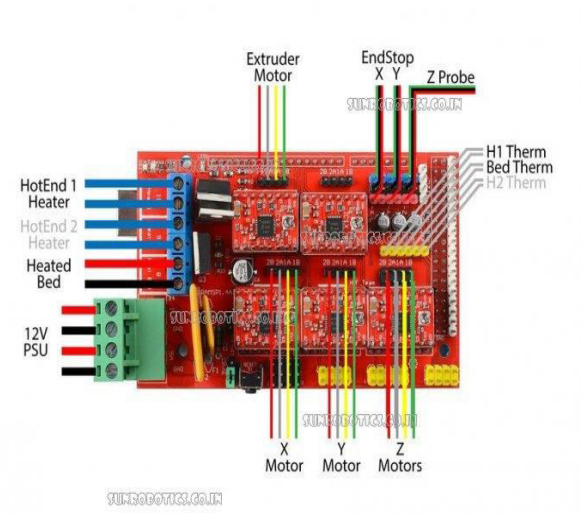


Fig 2: Design of RAMPS

C. *Aluminium Extruder Kit*

This is the part that takes care of the fiber into what's alluded to as the "hot end" – where the fiber turns out. Inside each extruder, there is the following: an engine to push the fiber out, a spout where the fiber comes out, a warming loop to warm up the "hot end" of the extruder, a temperature sensor that identifies when the extruder is at the ideal temperature, a casing to hold everything in.

Fig 3: Design of Aluminum Extruder

D. *Hot-End*

The hot end is the place the warmed fiber turns out and moves over the print bed to make your 3D object. Since this is the place the fiber warms up and in part liquifies, it gets very hot (250 degrees celsius) and is protected from the remainder of the printer. Various materials may print best at various temperatures so the sensor is significant and its temperature can be set with your cutting project.

Fig 4: Design of Hot-End

E. *Stepper Motors:*

There is in any event one associated with the extruder to push out fiber, and three more that connect to timing belts and pulleys which take into consideration the extruder to move along the X, Y, and Z pivot. Stepper engines separate a full revolution of an engine into equivalent advances which considers increasingly exact development and control. The nature of the engine can have a major effect in the precision of a print.

Fig 5: Stepper Motor

F. *12volt Switched Mode Power Supply*

A Switched Mode Power Supply (SMPS) is a circuit which changes over power using trading devices which are turned to a great extent at lofty frequencies, and limit sections, for instance, inductors or capacitors which give power when the trading device is not in its leading state. Trading power supplies have high adequacy and are commonly used in an arrangement of

electronic apparatus, including Computers and different tricky equipment requiring consistent and capable power supplement.

Fig 6: SMPS

III. WORKING OF ARDUINO MEGA:

Arduino Mega is a microcontroller which is an integration of many fundamentals grouped together dedicated towards performing a particular task according to the given input. When it receives an input from the user, it processes the data and gives the output in terms of may functionalities as per required by the user.

A. Working of RAMPS:

RAMPS 1.4 is a 3d printer control module which controls all the components specially of locomotion and delivery by taking input from the microcontroller. The RAMPS functions by integrating itself to the predefined pins present in the microcontroller.

B. Working of Aluminium Extruder:

The Extruder kit facilitates the feed of the filament into the hot-end at various speeds and when required by the user. The extruder is the device which monitors the agility of feed into the hot-end

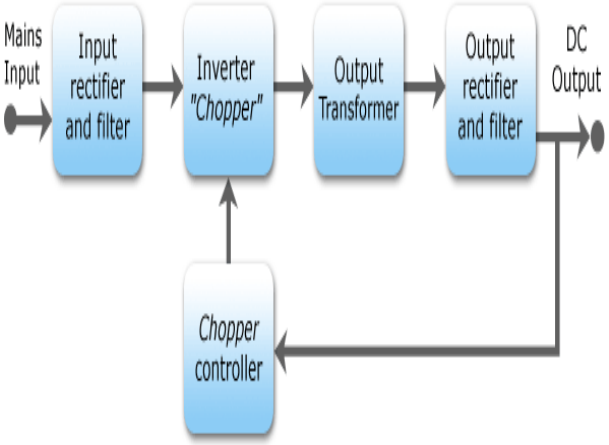
C. Working of Hot-end:

The function of a hot-end is to melt the filament at suitable temperatures to adjust the density of the filament and finally deliver it on the printing board to print the final printable. The hot-end has a thermocouple attached to it which produces temperature which is required for melting of the filament.

D. Working of stepper motor:

The stepper motor is a programmable motor which is employed under the mk8 extruder kit which gives the degree of locomotion and movements to the mk8 extruder kit. The motor can be programmed according to the needs of the feeding algorithm

E. Working of SMPS:



If the Switched Mode Power Supply has an Alternating Current contribution, by then the essential stage is to modify over the commitment to Direct Current. This process known as rectification. A Switched Mode Power Supply with a Direct Current input doesn't need this step. In some power supplies, the rectifier circuit is planned as a voltage doubling device with the development of a switch which works truly or naturally.

IV. EXPERIMENTAL WORK

The initial step in the output process is to switch on the 3d printer by a physical switch given on the device. Next, the entire device is connected to the computer through the Arduino Mega via a standard printer cable. After this, the Arduino Mega software is booted on the computer and the pre-designed code is made to run. There is some standard wait time between booting of the software and the first signal reception in the device. After the first signal reception has been made, any standard 3d printing platform or software such as CAD or Vison 360 is launched. Desired shapes or printables are first generated on the particular software and then they are launched for printing to the device. Parameters such as density, temperature, speed are already adjusted at the Arduino Mega Software which can be adjusted time to time depending on the requirement. Once the master code and the shape input is fed into the device, the mk8 extruder kit slowly starts to feed the filament into the hot-end. At the hot-end, the filament is melted at various temperature depending on the density required by the user. The locomotion of the 3-printing axis is calibrated and adjusted through their degree of locomotion and degree of shift depending upon the

required shape. Once every parameter is incorporated, the final printing starts and the output is the designed shape.

V. CONCLUSION

The described device when applied to the modern Indian Society will firstly incorporate the vast world of 3d printing and its applications in all walks of society and industry. Being made around the idea of e-waste management will not only help fight a global concern of e-waste management but will also give a suitable way to eradicate it. The proposed project aims to bring 3d printing as a cheaper alternative to printing biomedical prosthetics of smaller scale and various other biomedical application. It will also boost the ever-developing small scale industry of India and push the economy of India towards a degree of improvement. Using 3d printing as a hobby application will help young minds to cater new renovation and newer approach to scientific application and education. The proposed project can also be employed in the defense industry for fabrication of miniature parts at a cheaper cost. Because, it is rightly said what starts with green ends in green.

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