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Assembly of Ender 3V2 3D Printing Machine

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A B S T R A C T

The revolutionizing of intelligent manufacturing, 3D printing has made a major impact on many fields of manufacturing industries. The ability to work without much intervention is the most advantageous factor in the additive manufacturing process. Additive manufacturing is a process of making a 3- Dimensional solid object of virtually any shape from a digital model.3D printings achieved using an additive process, where successive layers of material are laid down in different shapes. 3D printing is considered distinct from traditional machining techniques, which mostly rely on the removal of material by methods such as cutting or drilling (subtractive processes). A material printer usually performs 3D printing processes using digital technology. Since the start of the twenty-first century, there has been a large growth in the sales of these machines, and their price has dropped substantially. This aims at enabling power resume option, auto bed-levelling, remote monitor, and control feature using IoT to manufacture high temperature, good impact light and tensile strength materials.

Keywords: CAD solid edge, creality slicing.

1. Introduction

Liquid resin-based 3D printing, also known as stereolithography (SLA) printing, is a type of additive manufacturing technology that utilizes liquid photopolymer resins to create three-dimensional objects. In this process, a UV laser or light source selectively cures (hardens) thin layers of liquid resin, solidifying them into the desired shape, one layer at a time. The printer's build platform gradually moves downward or upward as each layer is cured, allowing the object to be built from the bottom up or top down. After the printing process is complete, the object is typically rinsed in a solvent to remove excess resin and then post-cured under UV light to strengthen its final structure. SLA printing is known for its high resolution, smooth surface finish, and ability to produce intricate details, making it ideal for prototyping making, dental applications, and other industries where precision and aesthetics are part.

Stereolithography belong to a family of additive manufacturing technologies known as vat photopolymerization commonly known as resin 3D printing machines are all build around the same principle using a light source a laser or projector to cure liquid resin into hardened plastic the main physical differentiation lies in the arrangement of the core components such as light source the platform and the resin tank. Three common technologies for 3D printing plastics exist today. Fused deposition modelling (FDM) melts a string of thermoplastic filament and lays it down on a print bed stereolithography (SLA) solidifies liquid photopolymer resin with a light source, and selective laser sintering (SLS) uses a laser to sinter powdered raw material.

2. Literature Review

3D printing or additive manufacturing is the construction of a three-dimensional object from a CAD model or a digital 3D model It can be done in a variety of processes in which material is deposited, joined or solidified under computer control, with material being added together (such as plastics, liquids or powder grains being fused), typically layer by layer.

Hideo Kodama [1] In April 1980, Nagoya Municipal Industrial Research Institute invented two additive methods for fabricating three- dimensional plastic models with photo-hardening thermoset polymer, where the UV exposure area is controlled by a mask pattern or a scanning fibre transmitter,

Bill Masters [2] On 2 July 1984, American entrepreneur filed a patent for his computer automated manufacturing process and system (US 4665492). This filing is on record at the USPTO as the first 3D printing patent in history,

Chuck Hull [3] In 1984 who invented a process known as stereolithography, in which layers are added by curing photopolymers with UV lasers. Owning a 3D printer in the 1980s cost upwards of $300,000.

Fraunhofer [4] In 1995 developed the selective laser melting process. in 1999 the first use in medicine, in 2000 the first parts of human such as ears, fingers were done, 2005 3D printing technology became open source, in 2006 the first SLS (selective laser sintering) machine become variable, in 2008 the first self-replication printer which made the printer able to print the majority of its own components also at the same year 3D technology developed to do a very hard shapes and artists for designers. Assembly Specification

3. Design Specifications

Frame Design: Choose a sturdy frame to minimize vibrations during printing. Consider materials like aluminum or steel for stability.

Extruder System: Opt for a high-resolution extruder for precise filament deposition.

Motion Control: Implement an accurate motion control system using stepper motors. Consider a precise and smooth linear guide system for movement.

Print Volume: Determine the desired print volume based on intended applications. Ensure flexibility to accommodate various project sizes.

Material Compatibility: Support a range of filament materials (PLA, ABS, etc.) for versatility.

Safety Features: Integrate features like thermal sensors to prevent overheating Implement emergency stop mechanisms for user safety

Filament Handling: Include a filament sensor to detect jams or spool depletion. Design an efficient spool holder for smooth material feeding.

User Interface: Develop an intuitive and user-friendly interface for easy operation. Consider adding features like touchscreen controls for convenience.
Testing and Optimization: Conduct iterative testing to identify and address potential issues.

Future Expansion: Design the system with modular components for future upgrades. Consider compatibility with evolving 3D printing technologies

4. Objective

The main objectives of a 3D printing machine are to revolutionize manufacturing by enabling rapid prototyping, customization, and on-demand production of complex objects with diverse materials while promoting sustainability, innovation, accessibility, and advancements across various industries such as aerospace, automotive, healthcare, and education. These overarching objectives underscore the transformative potential of 3D printing technology across a wide range of industries and applications, from manufacturing and aerospace to healthcare and beyond.

5. Description of components

Extruder kit

In an FDM (Fused Deposition Modelling) 3D printer, the extruder system is a crucial component responsible for melting and depositing the thermoplastic filament material to build up the printed object layer by layer. Here's some information about the extruder system

Build platform

In FDM (Fused Deposition Modelling) 3D printing machines, belts are a key component of the motion system, used to move the print head or build platform with precision along the X, Y, and sometimes Z axes. Here's some information about belts in FDM 3D printing machines:

Mother board

The motherboard, also known as the controller board or mainboard, in an FDM (Fused Deposition modelling) 3D printing machine, is the central component that controls and coordinates the operation of various subsystems within the printer. Here's some information about the motherboard in FDM 3D printing machines

LCD control Screen Display

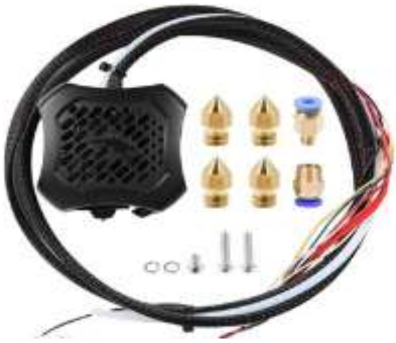
The LCD control screen display in an FDM (Fused Deposition Modeling) 3D printing machine serves as the user interface for interacting with the printer and controlling various aspects of the printing process. Here's some information about LCD control screen displays in FDM 3D printing machines

Z-Axis Screw

In an FDM (Fused Deposition modelling) 3D printing machine, the Z-axis screw is a critical component of the printer's motion system responsible for controlling the vertical movement of the print bed or the print head assembly. Here's some information about the Z-axis screw in FDM 3D printing machines

Stepper Motor

The stepper motor is a fundamental component in FDM (Fused Deposition Modelling) 3D printing machines, driving precise movement in the X, Y, and Z axes, as well as controlling filament extrusion. Here's some information about stepper motors in FDM 3D printers a



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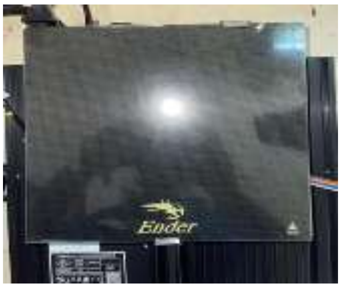

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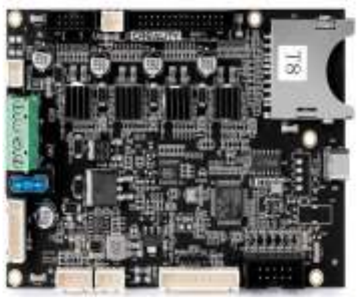

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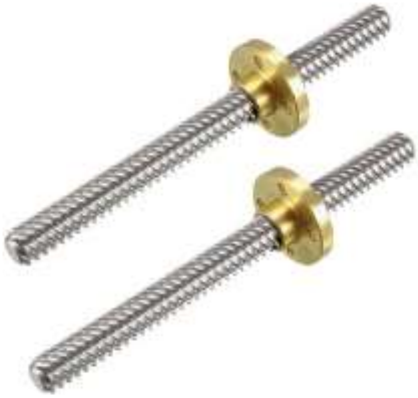

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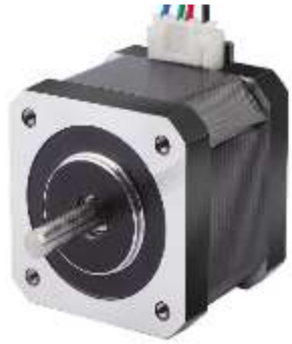

Fig 1- (a) Extruder kit , (b)Build platform , (c) Mother board , (d) LCD screen display, (e)Z- Axis screw, (f) Steeper Motor.

6. Assembly

a

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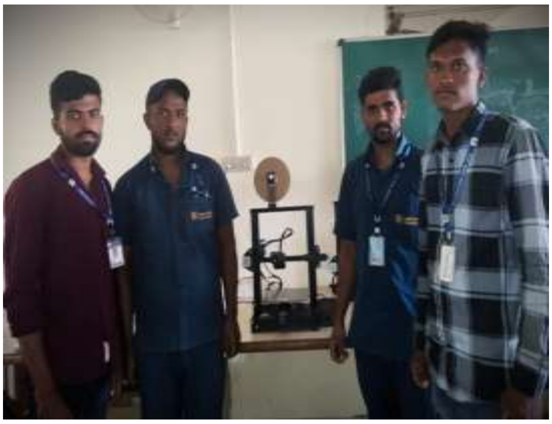
e  f 

Fig 2- (a) Assembly of LCD screen display, (b) Assembly of extruder kit , (c) Assembly of frame, (d) Assembly of Z axis sensor, (e) Assembly of filament holder (f) final Assemble of Ender 3 v2 3D printing machine .

7. Conclusions

3D- Printing reshapes and revolutionized the world. The manufacturing's of custom implants are very easy and cost effective with 3D-Printing. With this high accuracy and surface finish can be achieved. It is very fast and reliable method in the field of medical science. The costs of tailor-made parts are also less as compared to other methods. This technology is also proving beneficial in some critical condition of patient. The manufacturing of scaffolds tissue and bone should be considered as promising with this technology. 3D-Printing provide extensive support in medical application. It is also exploring new market to help humanity.

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