3D PRINTER

A PROJECT REPORT

Submitted by

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In partial fulfillment for the award of the degree of

BACHELOR OF ENGINEERING

in

Computer Engineering

G. H. Patel College of Engineering & Technology

Vallabh Vidyanagar – 388120

Gujarat Technological University, Ahmedabad

April, 2022

G. H. Patel College of Engineering & Technology

Vallabh Vidyanagar - 388120

CERTIFICATE

This is to certify that the project report submitted along with the project entitled **3D Printer** has been carried out by **Makwana Yash Kishorbhai** under my guidance in partial fulfillment for the degree of Bachelor of Engineering in Computer Engineering, 8th Semester of Gujarat Technological University, Ahmadabad during the academic year 2021- 22.

Dr.Priyang Bhatt — Internal Guide

Dr.Maulika Patel — Head of the Departmen

GUJARAT TECHNOLOGICAL UNIVERSITY

CERTIFICATE FOR COMPLETION OF ALL ACTIVITIES AT ONLINE PROJECT PORTAL

B.E. SEMESTER VIII, ACADEMIC YEAR 2021-2022

Date of certificate generation : 05 May 2022 (13:41:29)

This is to certify that, ***Makwana Yash Kishorbhai*** (Enrolment Number - 180110107023) working on project entitled with ***IoT Robot(3D Printer)*** from ***Computer Engineering*** department of ***G. H. PATEL COLLEGE OF ENGINEERING & TECHNOLOGY, V V NAGAR*** had submitted following details at online project portal.

Internship Project Report	**Completed**

Name of Student : Makwana Yash Kishorbhai

Name of Guide : Mr.BHATT PRIYANG PRAKASH CHANDRA

Signature of Student : _____

*Signature of Guide : _____

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*Guide has to sign the certificate, Only if all above activities has been Completed.

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Vallabh Vidyanagar - 388120

DECLARATION

I hereby declare that the Project report submitted along with the Project entitled **3D Printer** submitted in partial fulfillment for the degree of Bachelor of Engineering in **Computer Engineering** to Gujarat Technological University, Ahmedabad.

Name of the Student	Sign of Student
Makwana Yash Kishorbhai	

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With sincere regards,

Makwana Yash

ABSTRACT

3D printing also known as Additive manufacturing technology has been dubbed the nextbig thing and be as equally wide spread as cellular telephone industry. 3D printers printobjects from a digital template to a physical 3-dimensional physical object. The printingis done layer by layer (Additive manufacturing) using plastic, metal, nylon, and over a hundred other materials. 3D printing has been found to be useful in sectors such as manufacturing, industrial design, jewellery, footwear,architecture,engineering and construction, automotive, aerospace, dental and medical industries, education,geographic information systems, civil engineering, and many others. It hasbeen found tobe a fast and cost effective solution in whichever field of use. The applications of 3D printing are ever increasing and it's proving to be a very excitingtechnology to look out for. In this paper we seek to explore how it works and the current and future applications of 3D printing.

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1.0 INTRODUCTION

1.1 PROJECT SUMMARY:

Three-dimensional (3D) printing is an additive manufacturing process that creates a physical object from a digital design. The process works by laying down thin layers of material in the form of liquid or powdered plastic, metal or cement, and then fusing the layers together.

1.2 PURPOSE:

3D printers can be used for both business purposes and as a hobby. The main purpose is to create items with only minimal material used. In industry products are made cheaply with mass production due to techniques such as injection moulding to ensure there is no material wastage.

GOALS OF THE PROJECT:

- Provides 3D model
- Printing Parts
- Easy to use

OBJECTIVES OF THE PROJECT:

- The main objective of this Project is learn about printer type and fetures.
- Learn about routine maintenace tasks necessary to support printer
- To help to built manufacturing parts in helth sector and industriul

1.3 SCOPE:

What it can do?

- It can give you 3D model to use in technology.

1.4 TECHNOLOGY AND LITERATURE REVIEW:

I find that with help of 3D printer we're able to print any part in printer.if you are design any 3d part with the help of Cura or fusion 360 than your pinter print that part.

Fusion 360 is an excellent choice for creating models for 3D printing. It allows you to create not only "prismatic" models such as gears or brackets, but it also allows you create more "organic" models using T-Splines, including characters, plants, and vehicles.

Cura is an open source slicing application for 3D printers. It was created by David Braam who was later employed by Ultimaker, a 3D printer manufacturing company, to maintain the software.

https://knowledge.autodesk.com/

https://en.wikipedia.org/wiki/Cura_(software)

Chapter

2

2.0 PROJECT MANAGEMENT

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2.1.1 PROJECT DEVELOPMENT APPROACH

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2.0 PROJECT MANAGEMENT

2.1 PROJECT PLANNING AND SCHEDULING

2.1.1 PROJECT DEVELOPMENT APPROACH

3D printing is an additive process whereby layers of material are built up to create a 3D part. This is the opposite of subtractive manufacturing processes, where a final design is cut from a larger block of material. As a result, 3D printing creates less material wastage.

This Printer is solve your problem to create a 3D model instaid of buying a new product.printer help you to devlop your own products.

In this project “3D printer ” add some different filament to create different type of 3D model.

In 3D printing, one creates a design of an object using software, and the 3D printer creates the object by adding layer upon layer of material until the shape of the object is formed.

The object can be made using a number of printing materials, including plastics, powders, filaments and paper.

The various phases of Iterative model are as follows:

1. Requirement gathering & analysis: In this phase, requirements are gathered is for basic requirement for your project.

2. Design: In the design phase, desigh your layout of your printer.

3. Implementation: In the implementation,implement your project with help of different tool and product.

4. Testing: After completing the implementation phase, your 3D printer start with the softwere name printum.it's give you a output of g code file to the 3D model.

5. Deployment: After completing all the phases, 3D printer is deployed to its work environment.

6. Review: In this phase, after the product deployment, review phase is performed to check the behavior and validity of the developed product. And if there are any error found then the process starts again from the requirement gathering.

2.1.2 PROJECT PLAN:

The project plan provides a road map for a 3D printer project manager. If it has been properly developed, the project schedule defines the task and milestones that must be tracked and controlled as the project proceeds. Tracking can be accomplished in a number of different ways.

- Start with the information gathering.
- Review tha part and what is use of this part.
- After review part than connet those part accoding to the chat of 3D printer.
- Comparing actual start date for each project task listed in the resource table.

Delivery of Version 1

Title	Date	Priority	Status
Data Gathering	10-01-22 to 16-01-22	1	Completed
Design Diagrams	17-01-22 to 23-01-22	2	Completed
Buy a Product	24-01-22 to 6-02-22	3	Completed
Download requirment softwere	7-02-22 to 13-02-22	3	Completed
Xloader,Fusion 360,cura,Pronterface	14-02-22 to 20-02-22	4	Completed
Connet all product and create 3D printer	21-02-22 to 6-03-22	5	Completed
GUI Designing and code	7-03-22 to 20-03-22	7	Completed
Testing	21-03-22 to 03-04-22	8	Completed
Implementation & report	17-04-22 to 03-05-22	9	Completed

Table 2.1: Table for Milestones and deliverables

2.1.3 SCHEDULER REPRESENTATION:

Scheduling the project tasks is an important project planning activity. It involves deciding which tasks should be taken up and when. In order to schedule the project activities, a software project manager needs to do the following:

- Identify all the tasks needed to complete the project.
- Break down large tasks into small activities.
- Determine dependencies amongst different activities.
- Establish most likely estimates for the time durations necessary to complete the activities.
- Allocate resources to activities.
- Plan the starting and ending dates for various activities.

2.2 RISK MANAGEMENT

2.2.1 RISK IDENTIFICATION

There are three main categories of risks which can affect a software project:

- Project Risks
- Technical Risks
- Business Risks

Project Risks: Project risks concern various forms of budgetary, schedule, personnel,resource and customer related problems.

1. **Time shortage:** It leads to delay in the delivery of the project
2. **Lack of expertise to fulfill certain tasks:** Lack of knowledge in some areas leads to insignificant delay.

Technical Risks: Technical risks concern potential design, implementation, interfacing,and testing and maintenance problems.

1. Too many planned features lead to infeasible design
2. Design errors: Due to lack of experience design errors are bound to happen.
3. The customer changes the requirements: The scope of our project keepschanging as per user's requirements
4. The customer disapproves of the prototype: The customer may find the developed prototype unsuitable to his requirements
5. Unavailability of customer

Business Risks: Business risks threaten the viability of the software to be built. Business risks often jeopardize the project or the product.

1. **Market risk:** Building an excellent product or system that no one really wants
2. **Strategic risk:** Building a product that no longer fits into the overall business strategy for the company
3. **Management risk:** Losing the support of senior management due to a change in focus or a change in people

2.2.2. RISK ANALYSIS

Personal Shortfalls:

They may cause the developmental delays and would cause a change in the working strategy due to developmental dependencies of the functional modules.

Unrealistic Schedule:

It may cause the developers to give unrealistic commitments to the users and so lose their faith when the deliverables are not produced as per schedule.

Developing wrong Software functions:

It can be caused due to wrong requirement analysis or wrong programming method used to automate the requirements. It may cause the system to fail and not be implemented at all.

2.2.3 RISK PLANNING

The three identified Risk types, Technical, Project, and Business all have different mitigation strategies that can be used to reduce or eliminate their impact or probability of occurrence. In the following sections, the general outline for each case is discussed.

1. Project Risk: In general, project risks will be minimized by realistic planning and close surveillance.

2. Technical Risk: Clear and concise specifications and implementation of QA provisions will minimize technical risk. Technical risks can be further minimized by exploiting previous experience to the greatest extent possible. Making deliberately conservative design choices, where possible, where new technologies are involved has minimized technical risk throughout the Project.

3. Business Risk: Business risks can be minimized by studying the feasibility of the project and the requirement specification closely.

2.3 ESTIMATION

2.3.1 EFFORT ESTIMATION

Project Estimation proper evaluation of the system and to get the estimation of the project, it was needed to do some metrics calculation for this project. project metrics are the way to do this task efficiently. Project metrics allow knowing the size and complexity of the project and helping us on the planning and cost estimation.

2.3.2 COST ANALYSIS

The cost spent in the making of the project is categorized into two parts:

A.) Direct cost:

This is in terms of money.

In our project it is the estimated cost of:

- Hardware (3D printer)
  - Extruder kit
  - Hot End
  - Stepper Motor
  - Filament
  - SPDT Switch
  - 12v smps
  - Ramps 1.4
  - Arduino mega
  - Old DVD Writer
- Software
  - Xloader
  - Fusion 360
  - Cura
  - Pronterface

- System study

  Average cost for this product is 5000 to 7000.

B.) Indirect cost:

In my project it is the estimated cost in terms of:

- Time spent in system analysis.
- Managing time design
- Printing model requirment time.

Chapter

3

3.0 SYSTEM REQUIREMENTS STUDY

3.1 USER CHARACTERISTICS

3.2 HARDWARE AND SOFTWARE REQUIREMENTS

3.0 SYSTEM REQUIREMENTS STUDY

3.1 USER CHARACTERISTICS

This project is use for devloping 3D model for industry and hospital:

User:

User can create your own model for project purpose.

3.2 HARDWARE AND SOFTWARE REQUIREMENTS

1. **Software** Requirements: -

- Xloader :-

  This is use for uplord 3D printer hex file in Rapm 1.4.

- Fusion 360 :-

  It is a softwere to create a 3D model.

- Cura :-

  It translates the 3D STL, OBJ or 3MF file into a format that the printer can understand.

- Pronterface :-

  Pronterface is a simple graphical user interface that allows you to monitor and control your printer from a USB-connected computer.

HARDWARE REQUIREMENTS: -

- Extruder kit
- Hot End
- Stepper Motor
- Filament
- SPDT Switch
- 12v smps
- Ramps 1.4
- Arduino mega
- Old DVD Writer

Chapter

4

==========

4.0 SYSTEM ANALYSIS

4.1 STUDY OF CURRENT SYSTEM

4.2 PROBLEM AND WEAKNESSES OF CURRENT SYSTEM

4.3 REQUIREMENTS OF SYSTEM

4.4 3D PRINTER STUDY

4.5 FUNCTIONS OF SYSTEM

==========

4.0 SYSTEM ANALYSIS

4.1 STUDY OF CURRENT SYSTEM:

Current System is like that all the user can create easy 3D model with help of the 3d design.you can create your different model with the help of diffrent filament.

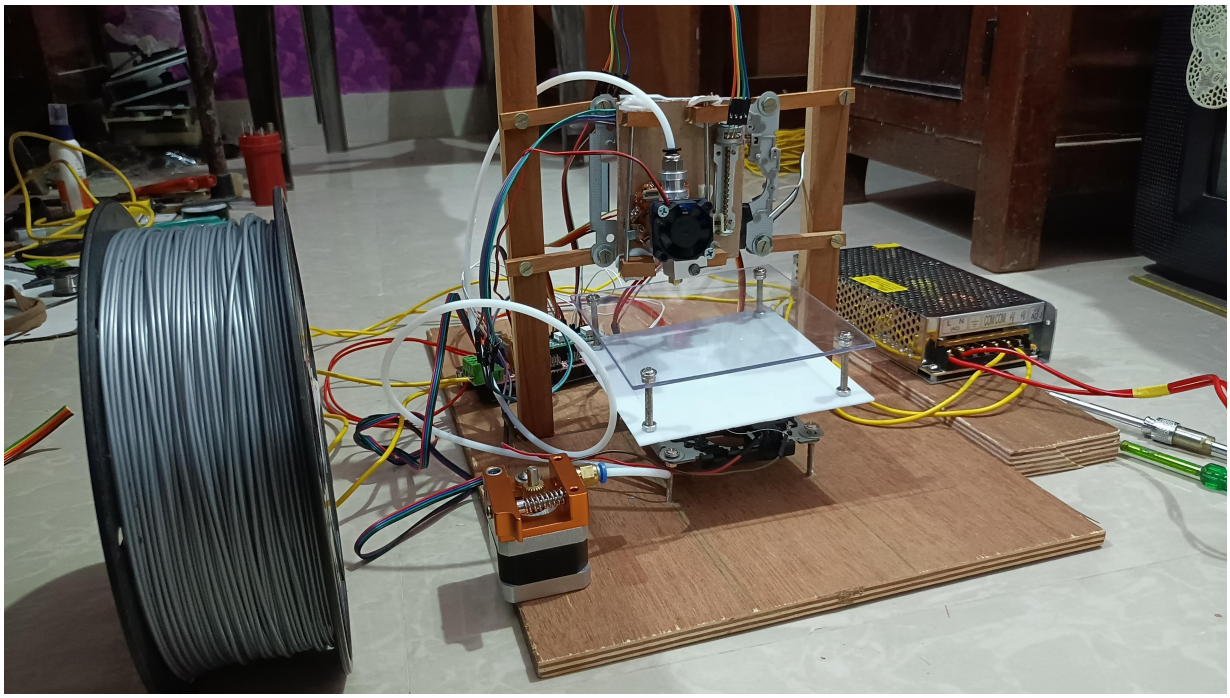


Figure 4.1 Current System

4.2 PROBLEM AND WEAKNESSES OF CURRENT SYSTEM

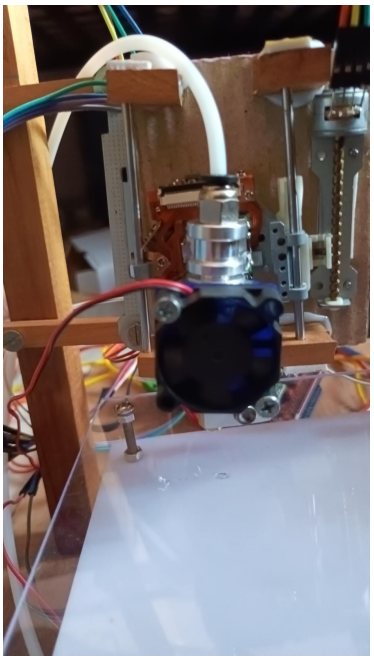
There are following weakness in the current system.

- For wire desconnected or dis soldering.

4.3 REQUIREMENT OF THE SYSTEM:

Hardwere part for 3D Printer Details :-

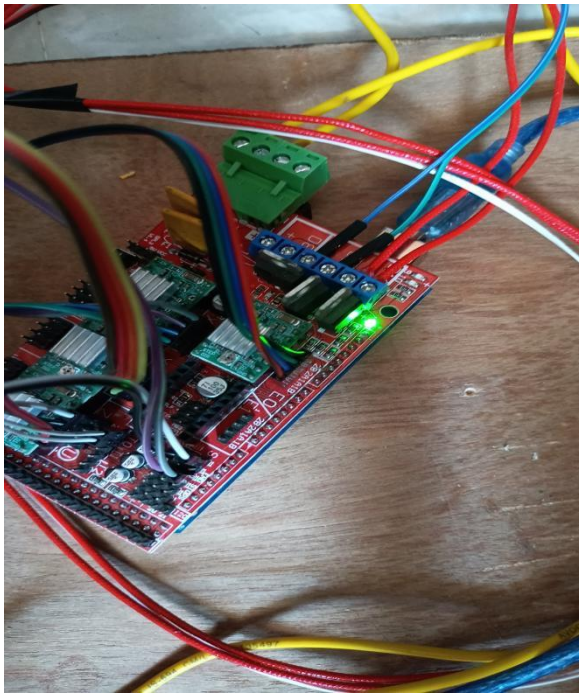
4.3.1 Hot End :-



It is use of the melting filament and print the model .This product is connect with the nozer to connect with Extruder.Hot End connect with the fan for cooling the system.

Figure 4.3.1 Hot End

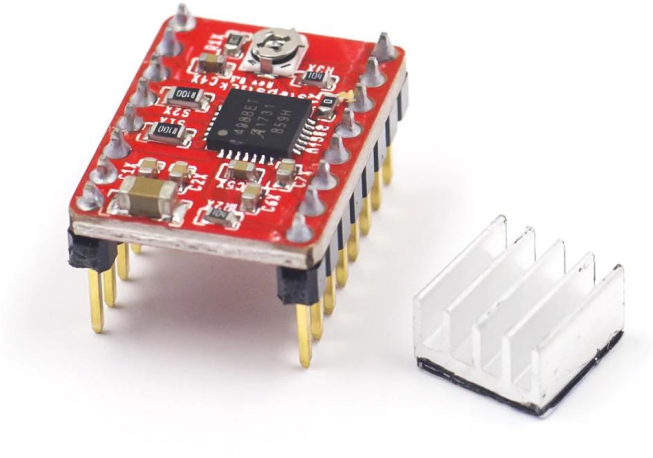
4.3.2 Ramps 1.4



Every 3D printer has a small computer and control circuitry to amplify and direct the signals that perform all the functions the printer needs to operate. Some printer suppliers put all these functions on a single circuit board and use proprietary chips to control their printers.

Figure 4.3.2 Ramps 1.4

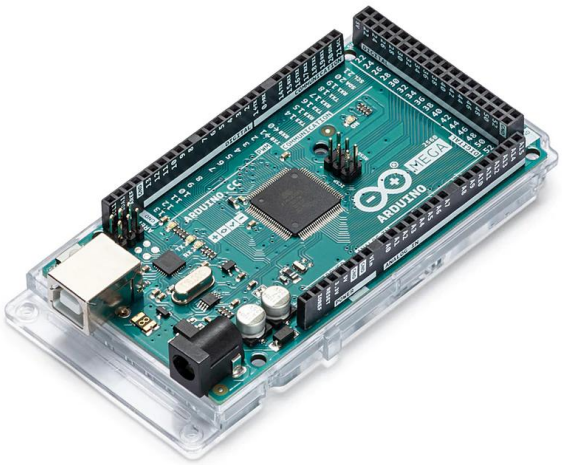
4.3.3 A4988 stepper motor driver



The A4988 is a complete Microstepping Motor Driver with built-in translator for easy operation. The driver has a maximum output capacity of 35 V and ± 2 A. It can operate bipolar stepper motors in full-, half-, quarter-, eighth-, and sixteenth-step modes.

Figure 4.3.3 A4988 stepper motor driver

4.3.4 Arduino mega 2560



The Mega 2560 is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins (of which 15 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.

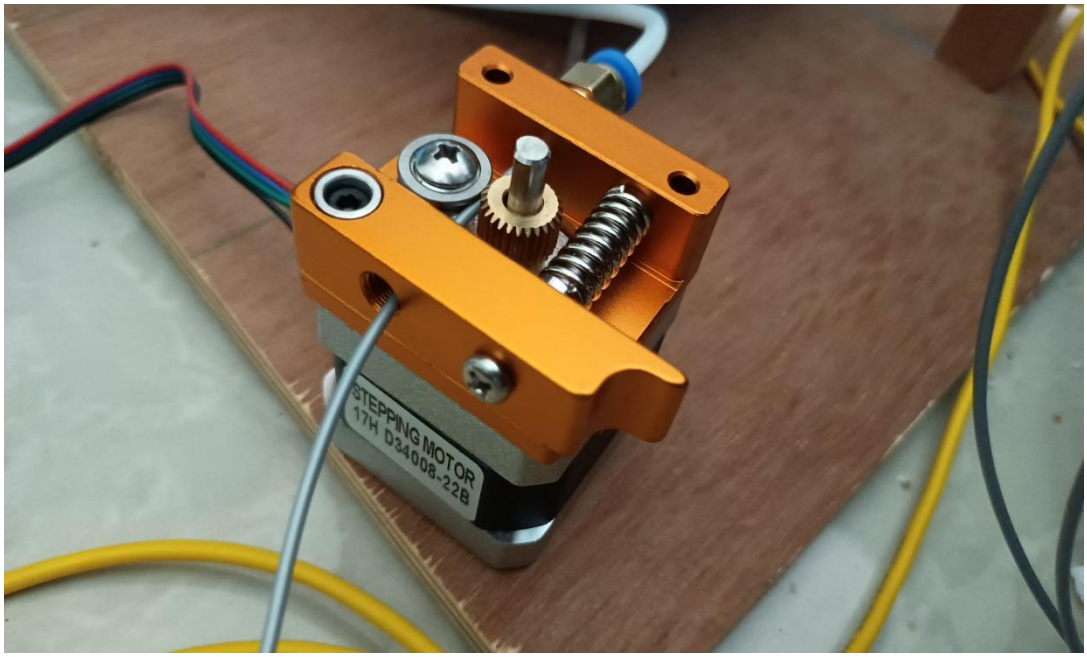
Figure 4.3.4 Arduino mega 2560

4.3.5 Nema 17 stepper Moter

NEMA 17 is a hybrid stepping motor with 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. NEMA 17 Stepper motor is generally used in Printers, CNC machines and Laser Cutters.

Figure 4.3.5 Nema 17 stepper moter

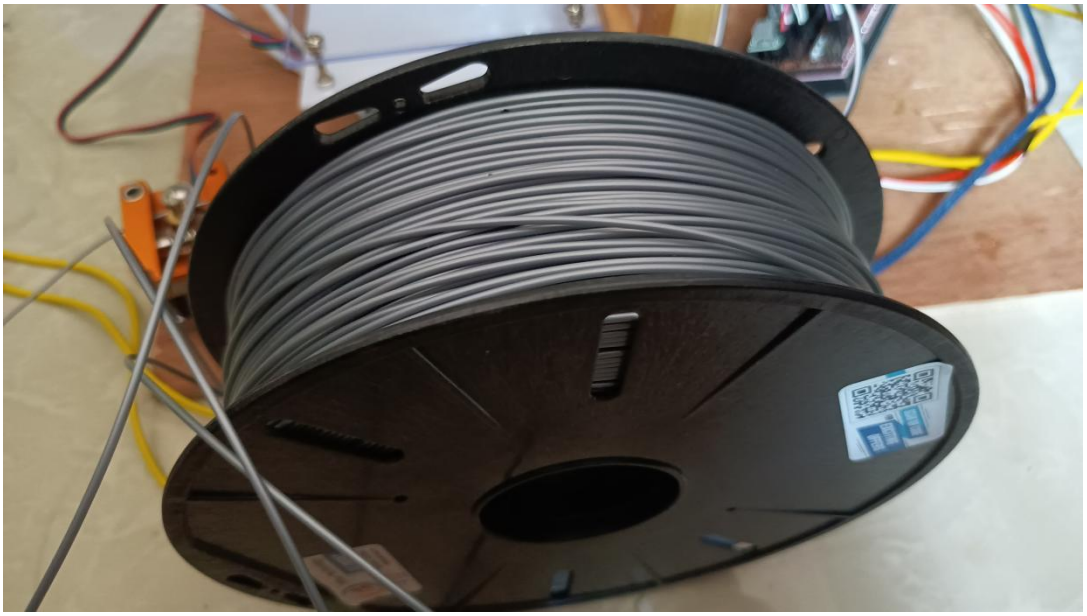
4.3.6 Extruder kit



The 3D extruder is the part of the 3D printer that ejects material in liquid or semi-liquid form in order to deposit it in successive layers within the 3D printing volume. In some cases, the extruder serves only to deposit a bonding agent used to solidify a material that is originally in powder form.

Figure 4.3.6 Extruder kit

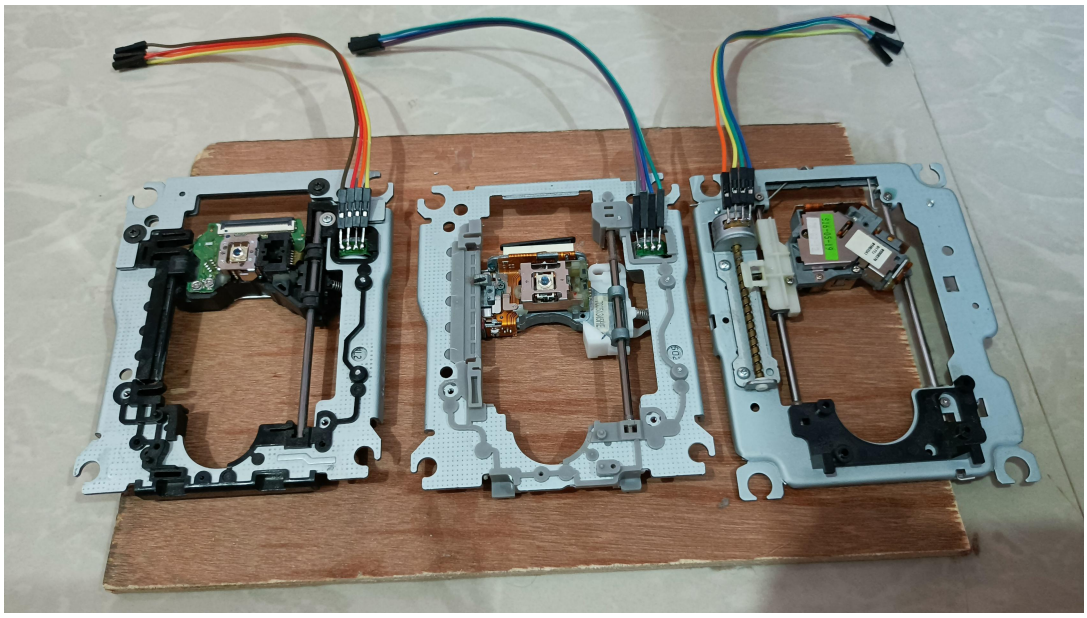
4.3.7 Filament



3D printing filament is the thermoplastic feedstock for fused deposition modeling 3D printers. There are many types of filament available with different properties, requiring different temperatures to print. Filament is commonly available in the two standard diameters of 1.75 mm and 2.85 mm.

Figure 4.3.7 Filament

4.3.8 Old DVD Writer



Old DVD Writer is use for 3D printer X,Y and Z axis.It is move accoding to the axis and Ramps 1.4 driver is give command for X,Y and Z Axis.

Figure 4.3.8 Old DVD Writer

4.3.9 12V power Supply

The standard minimum for 3D printers is usually 240 watts (12 volts @ 20 amps). That would be enough for a printer with a single hot end and a heated bed around 180 x 180 mm. With a 200 x 200 mm bed or a second hot end, you'd be better off with 300 watts (12V @ 25A).

Figure 4.3.9 12V Power Supply

4.4 . 3D printer STUDY

Operational Feasibility

Performance: - Our system provides 3D layout and its response time is slow. Because when the filament is milt than it convert in to a model.

Information: - The system provides 3d layout.

Economy: -As 3D printing becomes more competitive for mass production, it gains potential to deliver major economic impact. In the world's $80 trillion economy, traditional manufacturing accounts for about 16 percent, or $12.8 trillion. Today, 3D printing is used to create less than 1 percent of the world's manufactured parts.

Efficiency: - 3D printing is even several times faster than traditional manufacturing processes. Industrial machines such as 3DGence INDUSTRY F420 reach speeds of up to 400 mm/s. If you need to make prints in a truly short time, this 3D printer is an exceptionally good solutio

Chapter

5

5.0 SYSTEM DESIGN

5.1 DATABASE DESIGN/DATA STRUCTURE DESIGN

5.1.1 FLOW CHART

5.0 SYSTEM DESIGN

5.1 DATABASE DESIGN/DATA STRUCTURE DESIGN:

- Design Approach: - All the softwere part start with the Xloder in 3D printer.Xloder is uplord Hex file to the Ramps 1.4 driver.fusion 360 is use for create 3D object and lord into the cura for converting a G-Code.G-code is use for the uploding printum for creating 3D model.

5.1.1 Flow chart:

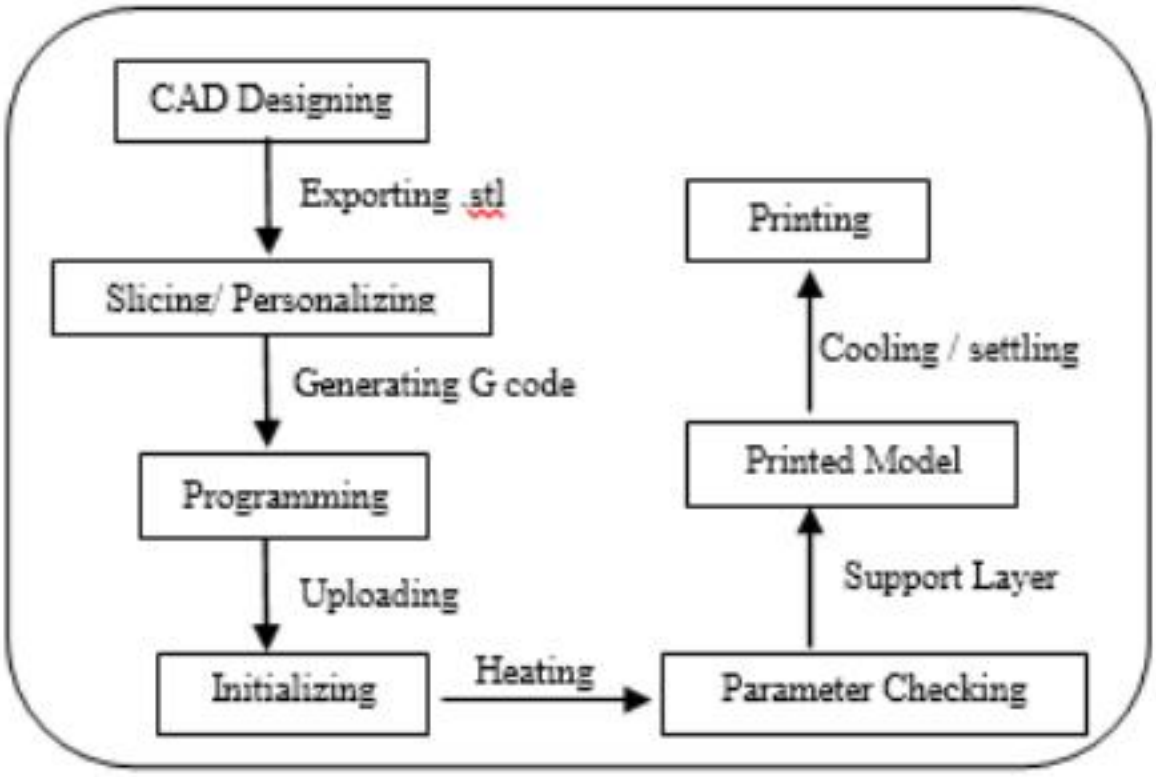


Figure 5.1.1 Flow Chart

Chapter

6

6.0 IMPLEMENTATION PLANNING & DETAILS

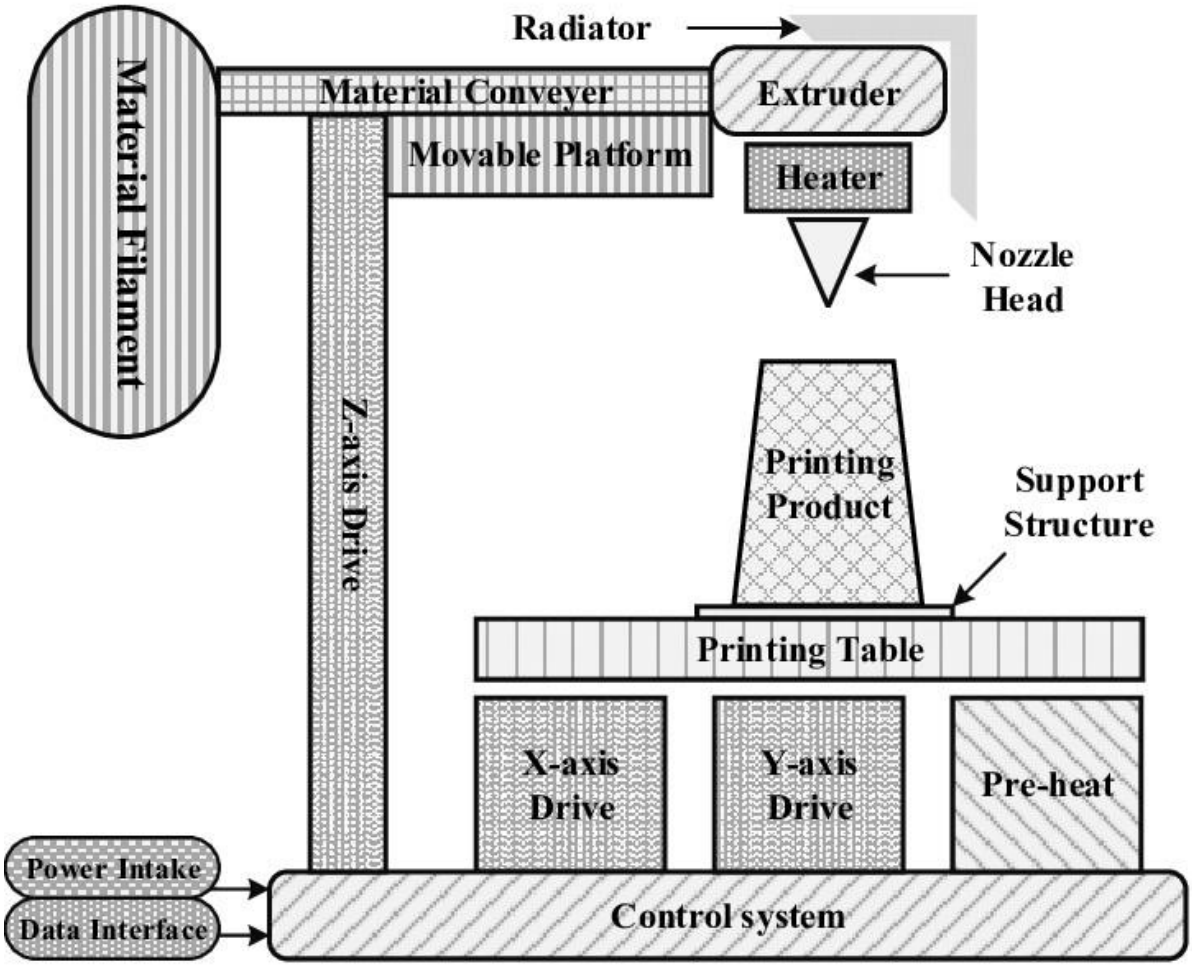
6.1 IMPLEMENTATION ENVIRONMENT

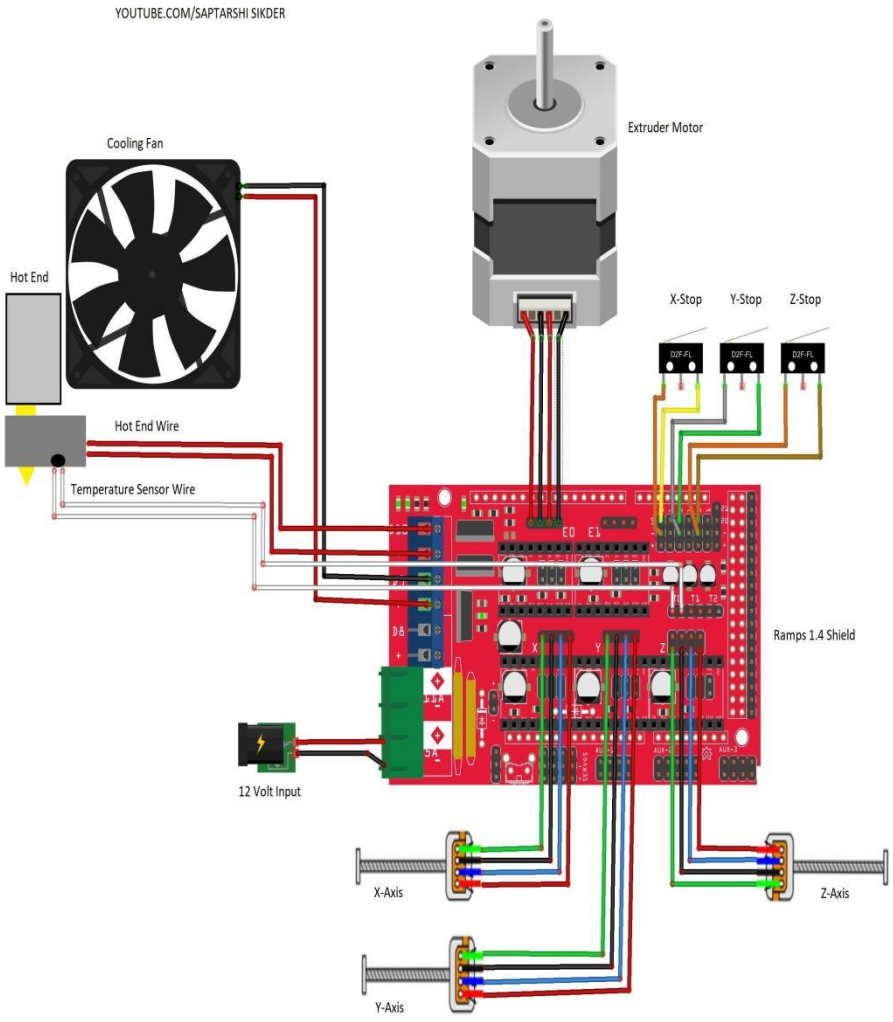
6.2 PROGRAM/MODULES SPECIFICATION

6.3 DESIGN CURA

6.0 IMPLEMENTATION PLANNING & DETAILS

6.1 IMPLEMENTATION ENVIRONMENT




YOUTUBE.COM/SAPTARSHI SIKDER
Extruder Motor
Cooling Fan
Hot End
X-Stop
Y-Stop
Z-Stop
Hot End Wire
Temperature Sensor Wire
Ramps 1.4 Shield
12 Volt Input
X-Axis
Z-Axis
Y-Axis

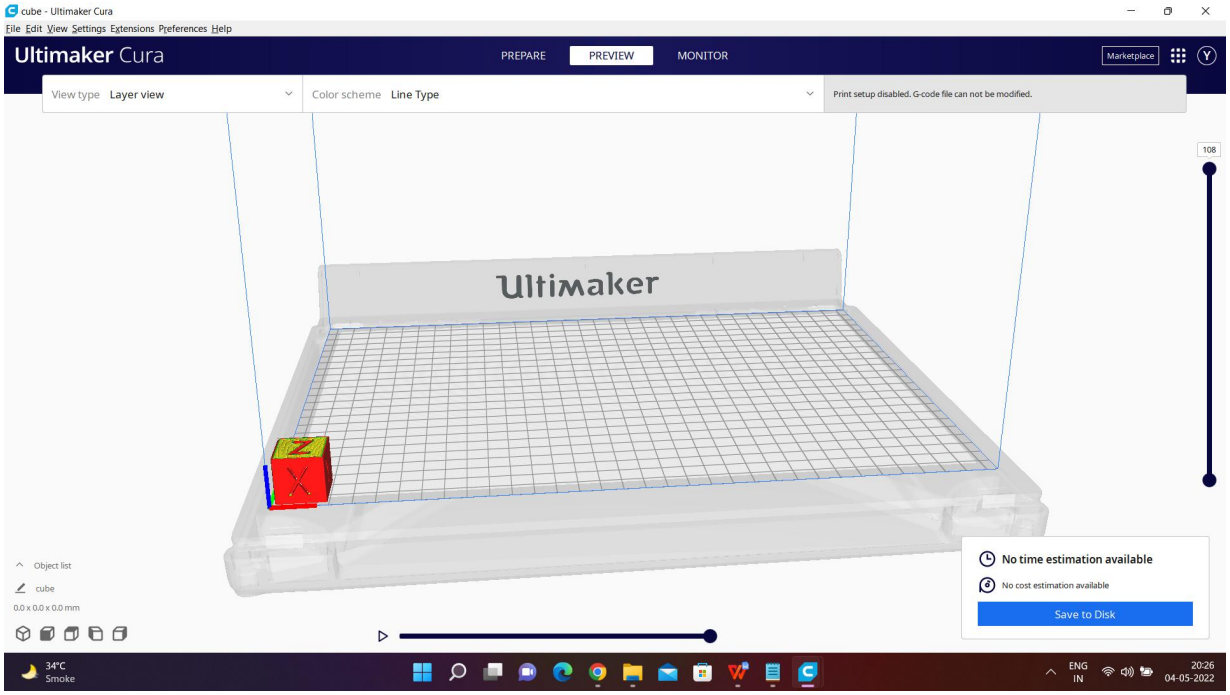
6.2 PROGRAM/MODULES SPECIFICATION

(1) User Module:

User Module is for user create 3D model in fusion 360 and convert in to G-code with the help of Cura .

6.3 Design Cura

Main G-code File :-



Chapter

7

7.0 TESTING

7.1 TESTING PLAN

7.2 TESTING STRATEGY

7.3 TESTING METHODS

7.4 TEST CASES

7.0 TESTING

7.1 TESTING PLAN

A test plan is the cornerstone of a successful testing implementation. The testing plan represents the overall approach to the test. In many ways, the test plan serves as a summary of the test activities that will be performed. It shows how the tests will be organized, and outlines all of the tester's needs that must be met in order to properly carry out the test.

The goal of test planning is to establish the list of tasks that, if performed, will identify all of the requirements that have not been met in the software. There are many standards that can be used for developing test plans. Early in the deployment planning phase, the testing effort, and identifies the methodology that your team will use to conduct tests. It also identifies the hardware, software, and tools required for testing and the features and functions that will be tested. A well-rounded test plan notes any risk factors that jeopardize testing and includes a testing schedule. So I can say that Test Planning details the activities, dependencies and effort required to conducting the system test.

7.2 TESTING STRATEGY

The test strategy is a formal description of how a software product will be tested. A test strategy is developed for all levels of testing, as required. The test team analyzes the requirements, writes the test strategy and reviews the plan with the project team. The test plan may include test cases, conditions, and the test environment, a list of related tasks, pass/fail criteria and risk assessment

The purpose of the testing strategy is to define the overall context for the entire testing process. The process is different depending on the specific characteristics of your solution. In many respects, this is the most important part of the testing process, since all future testing decisions will be made within the context of the strategy.

As a programmer, we have to just do a unit testing which is a part of White Box testing. Other type of the testing in each phase of the software is done by testing department. Unit testing begins at the vortex of the spiral and concentrates on each unit (i.e. component) of the software as implemented in source code.

Unit testing

Unit testing is a software development process in which the smallest testable parts of an application, called units, are individually and independently scrutinized for proper operation. Unit testing is often automated but it can also be done manually.

Unit testing involves only those characteristics that are vital to the performance of the unit under test. This encourages developers to modify the source code without immediate concerns about how such changes might affect the functioning of other units or the most efficient and error-free manner possible, larger components of the program can be evaluated by means of integration testing.

The unit test verifies that the requirements are being met. The unit testing generally tests two types of requirements.

User requirements:

User requirements typically specify some combination of function, performance, data, and workflow. A general template for this can be illustrated as:

The user typically thinks in terms of the user interface, clicking on a button that does something, and having the user interface change as a result. The user also specifies the data, from the presentation level perspective.

The program implements this workflow by decomposed into a set of functions, again, often functions familiar to the customer. Unit testing of the customer requirements therefore consists of several things, each at a different quantization. From bottom up:

Testing each function

Testing each process

Testing the workflow

Implementation requirements:

During the design/implementation phase, what's really going on is that the programmer is translating the customer requirements to schemas and implementations. The following is a rough idea of this concept.

- Translating between user data presentation to more optimal internal data presentation.
- Translating functions into objects.
- Translating data store into schemas.

7.3 TESTING METHOD

There are mainly two strategies:

1. Black box testing
2. White box testing

1. Black box testing

Black box testing is testing without knowledge of the internal workings of the item being tested. For example, when black box testing is applied to software engineering, the tester would only know the legal inputs and what the expected outputs should be, but not how the program actually arrives at those outputs. It is because of this that black box testing can be considered testing with respect to the specifications, no other knowledge of the program is necessary. For this reason, the tester and the programmer can be independent of one another, avoiding programmer bias toward his own work. For this testing, test groups are often used. Also, due to the nature of black box testing, the test planning can begin as soon as the specifications are written.

This strategy has some advantage like it is more effective on larger units of code than glass box testing, tester needs no knowledge of implementation, including specific programming languages, tester and programmer are independent of each other, and tests are done from a user's point of view, will help to expose any ambiguities or inconsistencies in the specifications, test cases can be designed as soon as the specifications are complete.

2. White box testing

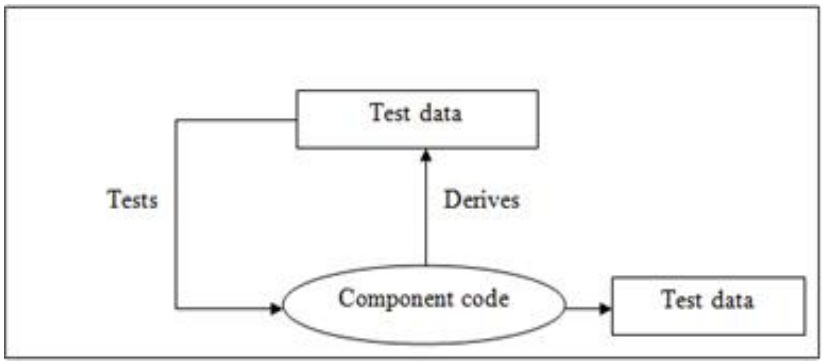


Figure 7.1 White box Testing

the code. White box testing is also called as glass, structural, open box or clears box testing. The tests written based on the white box testing strategy incorporate coverage of the code written, branches, paths, statements and internal logic of the code etc. In order to implement white box testing, the tester has to deal with the code and hence is needed to possess knowledge of coding and logic i.e. internal working of the code. White box test also needs the testerto look into the code and find out which unit/statement/chunk of the code is malfunctioning.

The white box testing has also some advantages like as the knowledge of internal coding structure is prerequisite. It becomes very easy to find out which type of input/data can help in testing the application effectively. It helps in optimizing the code. It helps in removing the extra lines of code, which can bring in hidden defects.White box testing strategy deals with the internal logic and structure of

7.4 TEST CASES

Test Cases for User

Test objective	Design 3D model
Technique	1. Enter wrong code 2. Electricity failure 3. Wrong wiring
Result	It shoud give error
Completion criteria	Cross check with the COM and wiring
Special consideration	None

Chapter

8

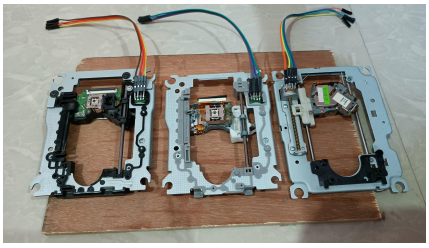
8.0 SCREEN SHOTS AND USER MANUAL

8.0 SCREEN SHOTS AND USER MANUAL

1. Base:

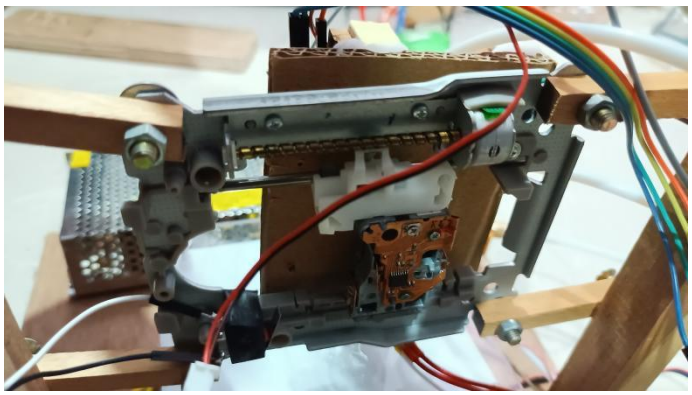
Description: This is a base of th3D printer

2. Old DVD Writer:

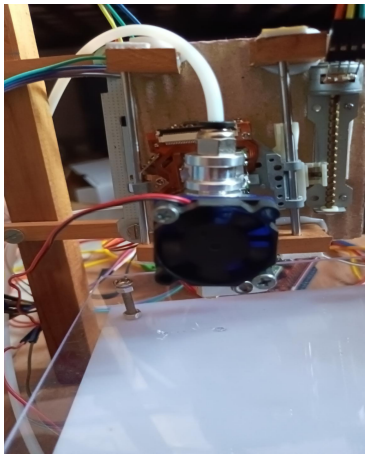


Description: Connect Old DVD Writer to the X Axis , Y Axis and Z Axis

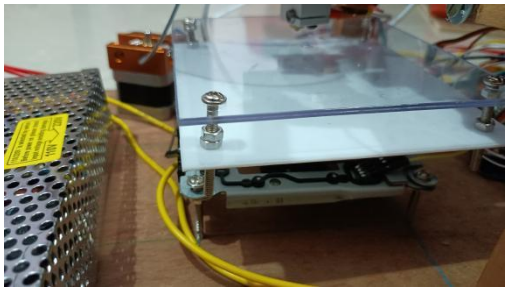
3. X Axis:



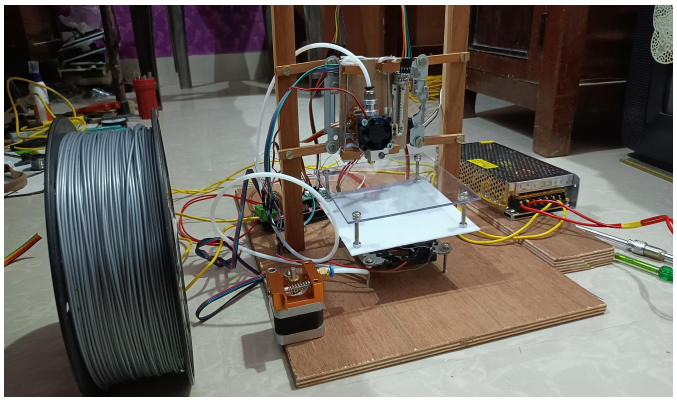
4. Y Axis:



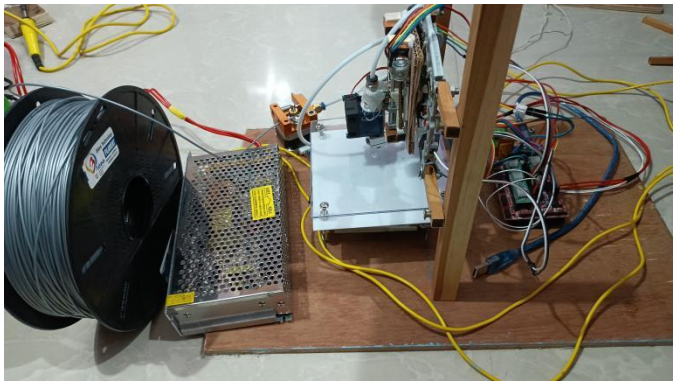
5. Z Axis;



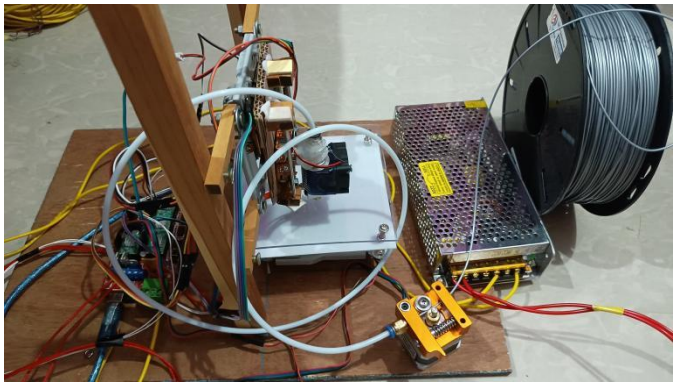
6. 3D printer:



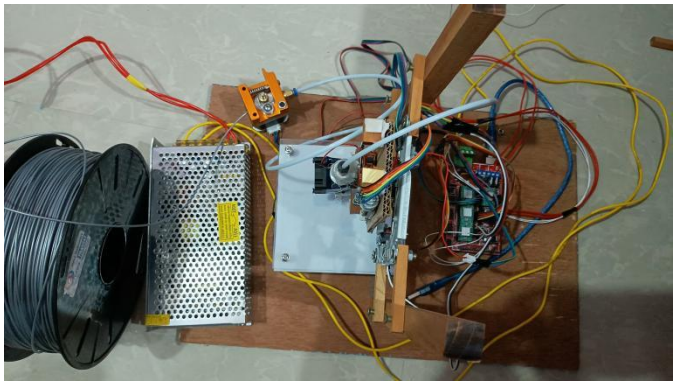
Front



Right

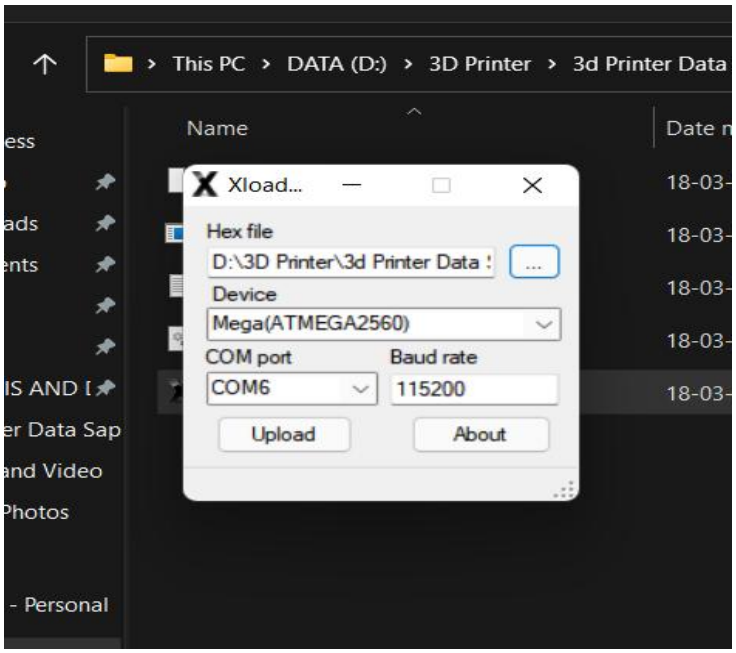


Left



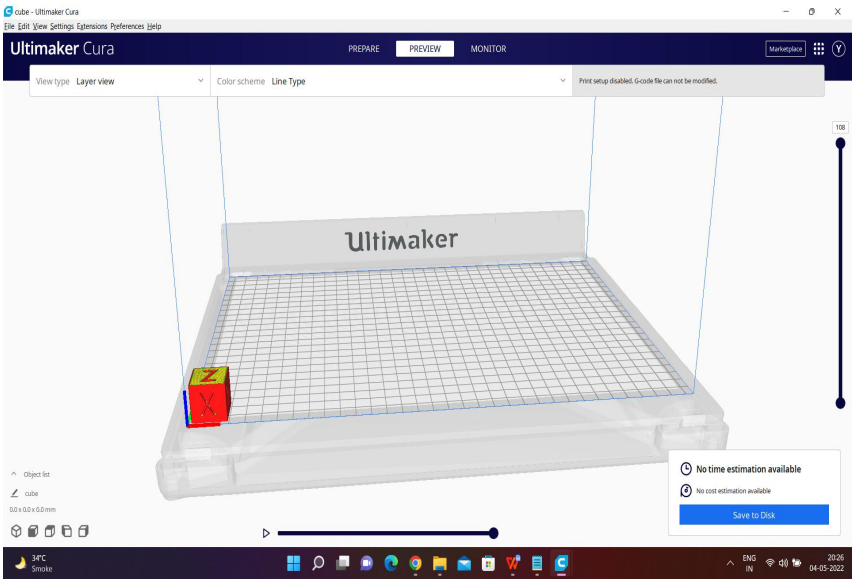
Top

7. X Loader:



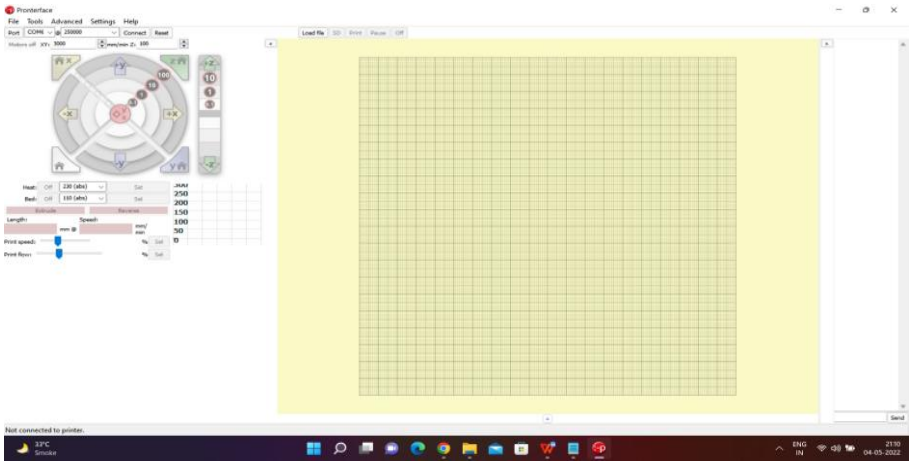
Description: Xloader is load hex file in driver

7. Convert 3D object in G code:



Description: convert into G code.

8. Enter G code file :



Description: Enter G code file into Printer

Chapter

9

9.0 LIMITATIONS & FUTURE ENHANCEMENT

9.0 LIMITATIONS & FUTURE ENHANCEMENT

Limitations

- ✓ There are limitation of design.
- ✓ Power must be required
- ✓ If your connection is Wrong .

Future enhancement

- ✓ New materials and material composites, lower pricing, and mature post-processing options will make it more viable to integrate 3D printing into production cycles.As the technology keeps developing, it provides an ever more competitive alternative to injection molding for low-volume plastic parts.

Chapter

10

10.0 CONCLUSION

10.0 CONCLUSIONS

- "I conclude that this product create your 3D model, user friendly environment to user, Flexible to use. It is create 3D parts"
- 3D printer is an advanced manufacturing process used to built physical objects from digital images.
- 3D printer is highly efficient and time saving & ecofriendly.

Functionality:

Get 3D object

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