Modern Printer

Associate Professor Mr. Parthiban, Ms. Ramya, Ms. Harinevalli, Ms. Kausalya, Ms. Arisha
Department of Electrical and Electronics Engineering,
Sri ManakulaVinayagar Engineering
College, Madagadipet, Puducherry
parthipondicherry@smvec.ac.in, gcrctr@gmail.com, harinivalli@yahoo.in, kausalyagouhanandan@gmail.com,
arishakalivarathan1998@gmail.com

Abstract-The main aim is to explore the theories and techniques behind procedures of developing a high precision cost-effective Portable android printer. This newly designed tool may be widely employed in electrical industry and graphics to enhance the standard of printing which has additional benefits like desired font size and magnificence. Various structures were explored and compared during the planning stage. as in Ref.7 Different components for the development of prototype were carefully selected and purchased from the market. Stepper motor and servo motor drives was used because the motion controller. A newly designed motion controller using Arduino and CNC V3 shield a4988 which is accessed using ben-box software or the self developed application was also tested and implemented as a replacement of ordinary CNC to cut back the price. as in Ref.1 This developed prototype machine was tested under various conditions and procedures to satisfy the economic standard. Analysis of product and profit estimation was conducted after development of the product.

Keywords-Arduino, Stepper motors, Servo motors, Shield, Ben-box Software, Bluetooth module.

I.INTRODUCTION

With the rapid development in technology and economy, the industrial requirements such as high production rate, good quality, low cost of production are the basic requirements. The present technology on printer machine are not up to the human requirements and are not in high faster manner. Printing industry rules a major role in the development of the entire human technology. A printing machine stands as a medium to connect people at the domestic as well as international level. Thus, the requirements of the printer in human race plays a major role in everyday life. Such requirements includes compact size of the product, improved technologies in constructional components.

However, with the drastic increase of industrial varieties and growing demands of miniature products, these existing printers are not sufficient both in rate of size, cost and working time. Usually, the output of the traditional printers includes text or picture output which is fed into the machine in a fixed pattern. The replacement of this printer is bought up in CNC technologies which do not satisfy human requirements like working time, cost and size. Therefore, the large volume machines are usually the only choice in existing technology.

As in Ref.5 In order to overcome all these faults and able to machine efficient output with the desired font, size and style, this product is improvised. This digital portable android printer is an online assessable printer which is assessed using Bluetooth port. The input which is to be printed is fed to the Arduino UNO through which the printer is accessed using Bluetooth android application. The existing printer does not support the android application which is the improvement updated in this machine. The power supply required to operate the machine is reduced as well. The weight of moving component also comes down so that during operation, the vibration and noise, as well as pollution to the environment, are markedly reduced. As the system becomes denser and lighter, it becomes more portable. As in Ref.4 The weight of the moving component is reduced, thus the overall size and space is saved. In addition, the vibration, noise and pollution to the environment are reduced. Due to its compact size, the machine becomes more flexible for utilization and increased productivity and manufacturing speed. This satisfies the high production rate with lesser production cost of the product.Therefore, the large volume machines are usually the only choice in existing technology.

1. Research Objective:

The overall objective of this project is to develop a portable android printer prototype which is user friendly, ease of handle and affordable by every common user in existance. The various new improvments is to improve the performance and reduce the budget of utilization.The set of objective to develop this portable android machine which is accessed by application are as mentioned below, as in Ref.5

- To develop a portable machine where the cost of production is relatively low.
- To increase the quality of sketching and increse the overall quality.

- To design a portable machine which can be accessed using benbox software throught the Bluetooth port as well as the android application designed with anvmobilevphone in which the application is is installed.
- Time of obtaining output with desired quality to be reduced.
- low power supply is enough to run the entire machine.
- To obtain a user friendly machine which can be handled by every type of users

II. EXISTING MODEL

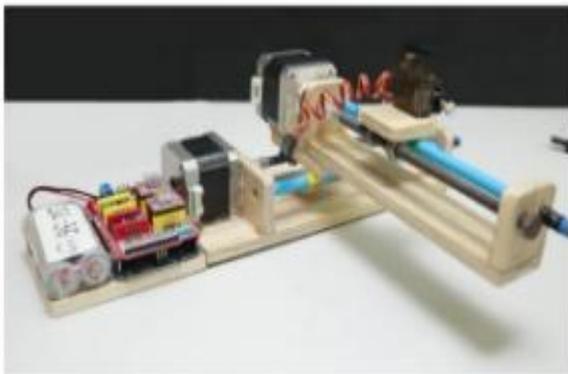The existing model of the printer is as shown below figure 1,

Figure 1 Existing Model of Android Printer(not img).

1. Problem Identification:

The existing printer does not support the android application which is the improvement updated in this machine. The power supply required to operate the machine is reduced as well. The weight of moving component also comes down so that during operation, the vibration and noise, as well as pollution to the environment, are markedly reduced. As the system becomes denser and lighter, it becomes more portable. The weight of the moving component is reduced, thus the overall size and space is saved. In addition, the vibration, noise and pollution to the environment are reduced. Due to its compact size, the machine becomes more flexible for utilization and increased productivity and manufacturing speed. This satisfies the high production rate with lesser production cost of the product manfactured. Hence this portable android printer is capable of printing the output required without any physical inputs i.e., the input isfedfro the android application software designed. As in Ref.2

2. Drawbacks:
- The major problems faced by printing industries are intermittent power supply.
- The calligraphy font styles and quality in the existing printers cannot be changed.
- The cost of printing increases with increase in number of units to be printed.

III. PROPOSED MODEL

The overall block diagram of the Portable Android Printer is as shown in figure 2.
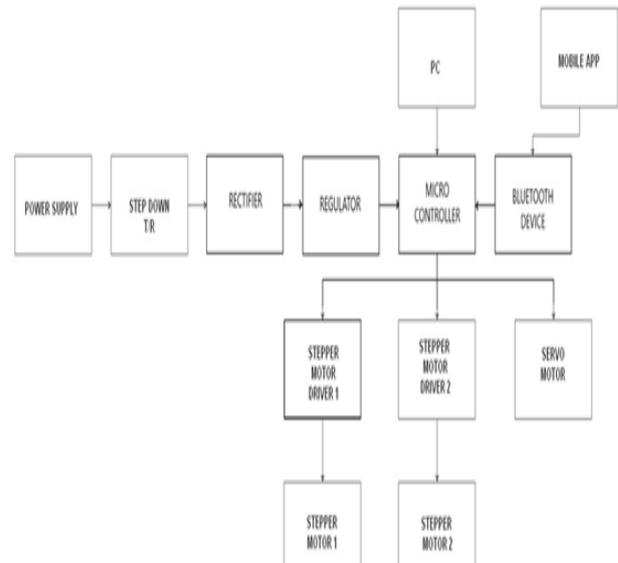

Figure 2 Block Diagram of Portable Android Printer.

1. Components Utilized:

Table 1 List of Components and Its Function.

SL no	COMPONENTS	FUNCTION
1	Stepper motor 1	Used for the movement of X-axis arm (right/left).
2	Stepper motor 2	Used for the movement of Y-axis arm(right/left).
3	Servo motor	Used to change the position of the pen/pencil (up/down) for writing and drawing.
4	Driver	Used to protect the motor from load.
5	Arduino	Used to access the instructions from the user to the circuits.
6	Bluetooth module	Used to communicate between the android mobiles and machine.
7	Pen/Pencil	Used to print the content (text/draw)
8	Expansion Board (Shield)	Used to add or expand some sort of functionality to the system.
9	Other essential parts and accessories(shafts/bearings)	Used to fixing the components which is a mechanical support.

2. Circuit Diagram:

The entire setup of the printer involves two circuit, i.e., overall circuit as shown in figure 4.1 and the power supply circuit as shown in figure 3.
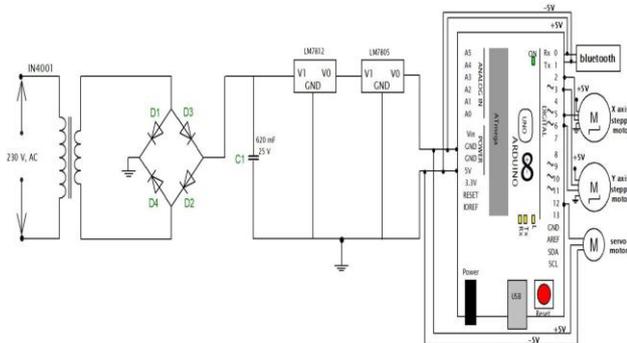

Figure 3. Overall Circuit Diagram.

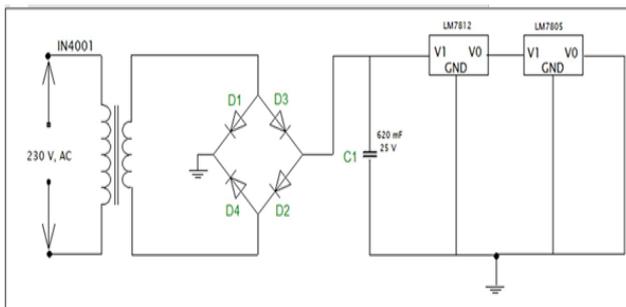The power supply circuit of the printer is as given in the figure 4.

Figure 4 Power Supply Circuit Diagram.

V. WORKING OF THE PROTOTYPE

In the rapid growing technical world, the printing machine plays a major role for both technical and non technical purpose. This machine does both sketching as well as printing the input text in a same machine which is accessed using a developed android software. This system uses arduino controller platform with arduino UNO controller which is the brain of the entire printer. The content to be printed should is converted into G-code via in built software. Further this G-code is transferred to the microcontroller through which the motor drives are accessed and the instructions to the motor in the system is given. As in Ref.12- Ref.15 Based on the output to be obtained, the software will generate the coordinates at which the motor to be positioned to print the text or the sketch. X-axis and the Y-axis are accessed using stepper motor and the pen positioned handler servo motor will be accessed at z-axis. Thus the coordinates are positioned using the output obtained by the arduino to the stepper motor. As in Ref.7

1. Design Calculation:

The selection of components for development of the circuit is calculated as shown below eqns,

$$C = (¼) * (1.732) * f * R * δ \text{ --------------------eqns(1)}$$
$$V = I * R \text{ --------------eqns(2)}$$
$$V = 12 * 1.414$$
$$R = (16.96 / 500) * 1000 \quad R = 33.92 \text{ Ω}$$
$$δ = Vrm / Vdc \text{ ----------------eqns(3)}$$
$$V = Vmax – Vmin \text{ ---------------eqns(4)}$$
$$Vr = 12.5 - 11.5$$
$$Vr = 1 \text{ V}$$
$$Vdc = Vmax - (Vr / 2) \quad Vdc = 12.5 - (½)$$
$$Vdc = 12 \text{ V}$$

$$δ = Vrms / 12 \quad δ = 0.833$$
$$C = (¼) * (1.732) * 50 * 34 * 0.833 \quad C = 614 \text{ μF} ~ 620 \text{ μF}$$

where,
C - capacitance of the circuit component
δ - change in voltage sine wave

2. Power Circuit Simulation Result

The simulation circuit in proteus 8 software is compiled and the result is as given in the figure 5.
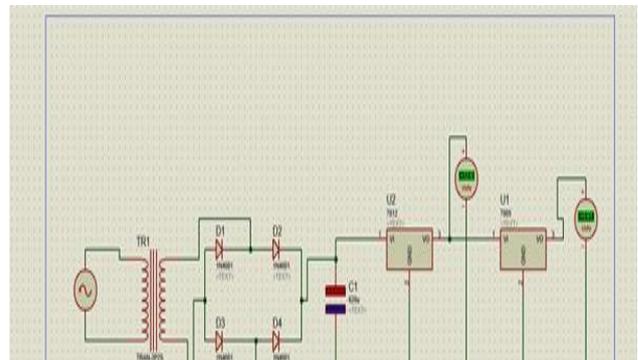

Figure 5 Simulation Result of The Circuit.

3. Prototype Image:

Figure 6 shows the image of prototype under development,

Figure 6 Image of The Developed Circuit.

4. Product Differentiation:

There are several printing machine that are available in the market, but the unique features of this portable android printer are as mentioned below,

•This portable android machine can be accessed using mobile phone.
•It can be operated even in power supply failure.
•Cost when compared to other printing machine, is lesser.
•Multiple process can be done in a single machine.
•Process can be resumed from any step that is stopped.

Thus the efficiency of the machine is rich than other market models in rate of cost as well as time of printing. Therefore the requirement of the machine is high and affordable for every group of people.

VI. CONCLUSION

This Portable android printer is easy to use , it consist of three axis (X,Y,Z) are responsible for the movement of the axis. To plot the paper on the surface area of the plotter using the XY- plotter. The setup of the hardware in which the G-code is used for the location of all the stepper motor, which helps in starting and ending of the machine when ever necessary. This machine is easily portable and flexible for working. Further research are also required to develop the circuit to work without continuous power supply, i.e., with the help of a portable batteries or chargeable sources that results in great effective usage.

REFERANCES

[1] S. Bhandari, and B.Regina, "3D Printing and Its Applications", IEEE Int .J. Computer Science and Information tech.Research., vol.2, no.2, pp.378-380, April-June 2014 .

[2] M.T. Shahid, M. Ammar Khan, and M.Z. Khan, "Design and Development of a Computer Numeric Controlled 3D Printer, Laser Cutter and 2D Plotter all in one machine", IEEE Trans.Power Electron., vol.16, no.9, pp. 569-573, Jan 2019 .

[3] S.P. Deshmukh, M.S. Shewale, V. Suryawanshi, A. Manwani, V.K. Singh, R. Vhora, and M. Velapure, "Design and development of XYZ scanner for 3D printing".,IEEE. Int. Conf. Nascent Technologies in Engineering ,2017.

[4] S. Belikovetsky, Y. Solewicz, M. Yampolskiy, J. Toh, and Y.Elovici, "Digital Audio Signature for 3D Printing Integrity", IEEE Tans. Power Electron., 2018

[5] Md. Mahedi Hasan, Md. Rokonuzzaman Khan, Abu Tayab Noman, Humayun Rashid, Nawsher Ahmed SM Taslim Reza, "Design and Implementation of a Microcontroller Based Low Cost Computer Numerical Control (CNC) Plotter using Motor Driver Controller"., IEEE. Int. Conf.Electrical Computer and Communication Engineering., 7-9 Feb 2019 .

[6] Md. Mahedi Hasan, Md. Rokonuzzaman Khan, Abu Tayab Noman, Humayun Rashid, Nawsher Ahmed SM Taslim Reza, "Design and Implementation of a Microcontroller Based Low Cost Computer Numerical Control (CNC) Plotter using Motor Driver Controller"., IEEE. Int. Conf.Electrical Computer and Communication Engineering., 7-9 Feb 2019

[7] A. Doruk, "Two dimensional plotter with arduino", IEEE. Int. Conf. Computer Science and Engineering., vol.6, no.3, pp.1064-1067,Mar 2019 .

[8] R. Krishnan, "Selection criteria for servo motor driver", IEEE Trans. Power Electron., pp. 270-275,1987 .

[9] Lalit Kumar, Qamar Tanver, Vineet Kumar, and MohdJavid,"Developing low cost 3D printer".,IEEE. J. Applied Sciences and Engineering Research., vol.5, no.6, 2016 .

[10] Bhavin Nainesh Thakar,"3-Axis PCB Drawing Machine", Int. Research Journal of Engineering and technology., vol.4, no.10, 2017 .

[11] D. Moreton and R. Durnford, "Three dimensional tool compensation for a three axis turning centre".,Int.J. Machine Tools and Manufacturing technology., vol.15, pp. 649-654,1999 .

[12] S. Ranjan, "Design and Implementation of low-cost 2D plotter Computer Numeric Control (CNC) Machine", vol.7, no.5, pp. 99-102, 2018 .

[13] V. Athani, "The 16-Vector Algorithm for Computer Controlled Digital XY Plotter", IEEE Trans. Computer science., vol.100, pp. 831-835, 1975

[14] SonaliDhanwade, Reshma Magar, Asmita Deshmukh, "KC Draw Using Arduino".,Int. J. Engineering and Technology., vol.6 , no.4,pp. 2658-2659, April 2019 .

[15] P. Srija, U. Mainisha, V.Divyasree, "Automated Sketching Machine", Int. J. Engineering Technology Science and Research ., vol.5, no.4, April 2018 .