



UPGRADATION OF CONVENTIONAL LATHE MACHINE USING ARDUINO CONTROLLER

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Abstract: We have a conventional lathe machine in our workshop. So, after seeing it we have decided to convert it to CNC. So, that our workshop will have CNC lathe machine and it will be beneficial to our college. We are going to use Arduino base automation using stepper motor driver Arduino Mega circuit board. It also includes programming of Arduino controller. Before the automation it performs turning, grooving, step-turning, facing operations manually. And it contains single point cutting tool, grooving tool, and it is also capable for holding two more tools. And after automation above mention operation will be performed automatically, by using Arduino Mega circuit, two stepper motor drivers, Smmps, breadboard, laptop or mobile or PC.

Keywords - Conventional lathe machine; Upgrade; CNC lathe machine; Arduino Mega circuit board and devices; Automation

I. INTRODUCTION

We have a conventional lathe machine in our workshop. So, after seeing it we have decided to convert it to CNC. So, that our workshop will have CNC lathe machine and it will be beneficial to our college. We are going to use Arduino base automation using stepper motor driver Arduino Mega circuit board. It also includes programming of Arduino controller. Before the automation it performs Turning, Grooving, Step turning, and Facing operations. And it contains single point cutting tool, grooving tool. And after automation above mention operation will be performed automatically, by using Arduino Mega circuit, two stepper motor drivers, Smmps, Breadboard. We have done maintenance of the conventional lathe machine before upgradation.

II. BLOCK DIAGRAM AND MAIN CIRCUIT DIAGRAM

Here in the block diagram all the main components of the machine are shown (Fig. 1). And in the main circuit diagram the connection between Arduino controller and DM542 stepper motor driver is shown (Fig. 2).

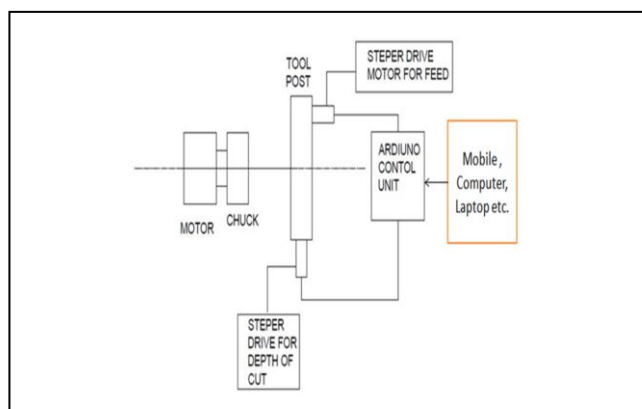


Fig. 1 Block Diagram

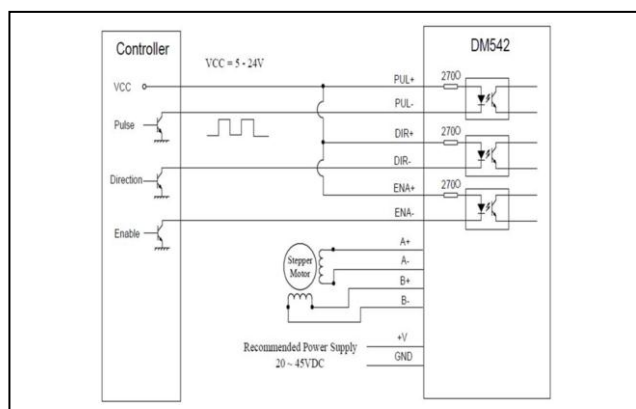


Fig. 2 Main Circuit Diagram

III. MAIN COMPONENTS FOR UPGRADATION

1) DM542 digital stepper drive:-

The DM542 is a fully digital stepper drive developed with advanced DSP control algorithm based on the latest motion control technology. It has achieved a unique level of system smoothness, providing optimal torque and nulls mid-range instability. Its motor auto-identification and parameter auto-configuration feature offers quick setup to optimal modes with different motors.



Fig. 3 DM542 Digital Stepper Drive

2) Arduino Mega Circuit Board:-

The Arduino Mega 2560 is a microcontroller board based on the ATmega2560 (datasheet). It has 54 digital input/output pins (of which 14 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. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. The Mega is compatible with most shields designed for the Arduino Duemilanove or Diecimila.

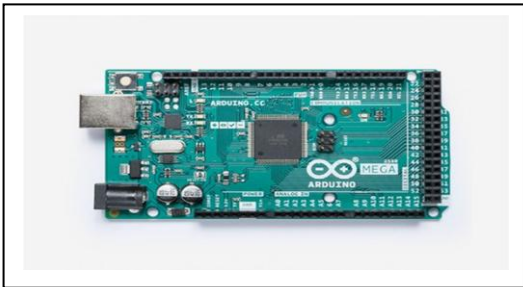


Fig. 4 Arduino Mega Circuit Board

3) Breadboard:-

A breadboard is a construction base for prototyping of electronics. Breadboard does not require soldering, it is reusable. This makes it easy to use for creating temporary prototypes and experimenting with circuit design. For this reason, solderless breadboards are also popular with students and in technological education.

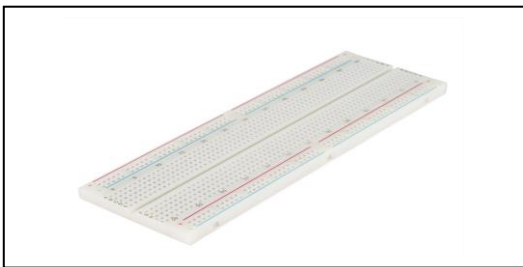


Fig. 5 Breadboard

4) SMPS Power Supply:-

A switched-mode power supply (switching-mode power supply, switch-mode power supply, switched power supply, SMPS, or switcher) is an electronic power supply that incorporates a switching regulator to convert electrical power efficiently. Like other power supplies, an SMPS transfers power from a DC or AC source (often mains power) to DC loads.



Fig. 6 SMPS Power Supply

5) Stepper Motor:-

A stepper motor, also known as step motor or stepping motor is a brushless DC electric motor that divides a full rotation into a number of equal steps. The motor's position can then be commanded to move and hold at one of these steps without any position sensor for feedback (an open-loop controller), as long as the motor is carefully sized to the application in respect to torque and speed.



Fig. 7 Stepper Motor

IV. PROGRAMMING AND ASSEMBLY

Here the programming is done on Arduino IDE software. It can also be programmed from mobile by using its mobile app Arduinodroid. So it is accessible from various devices such as Mobile, Tablet, PC, Laptop etc. As after the Programming is done the assembly of all the equipment is done. Fig. 8 shows the complete assembly.

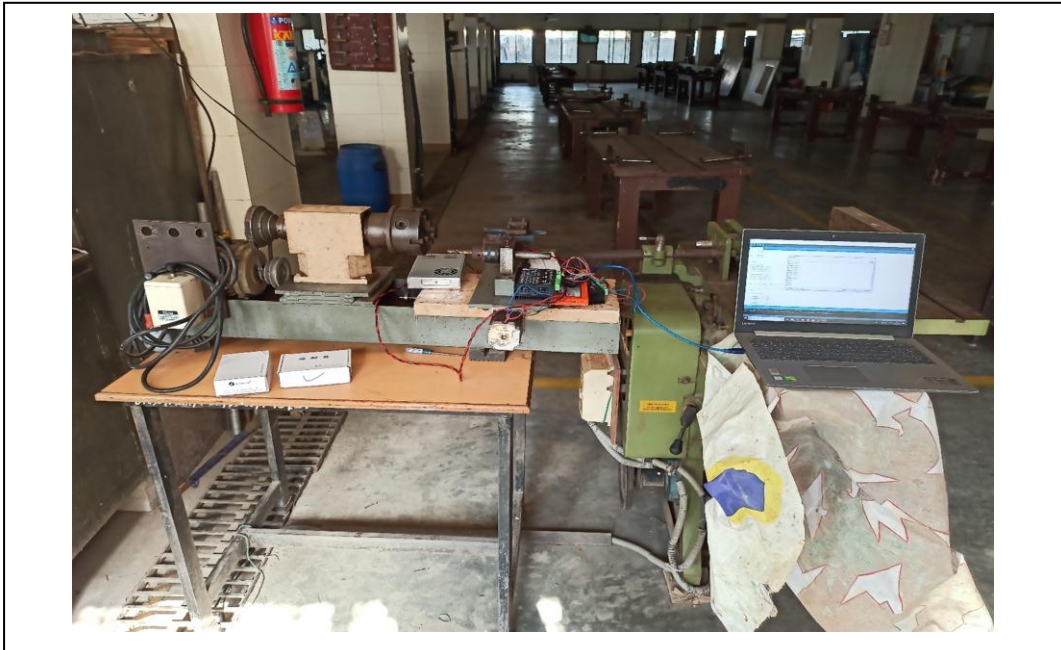


Fig. 8 Assembly

V. INTERFACING AND CO-ORDINATING THE PROGRAM WITH MACHINE

Here after programming and assembly the main work is to do the interfacing and co-ordinating the program with machine so that the machine can run according to the program and if the machine is not functioning properly then the changes should be made where it is necessary.

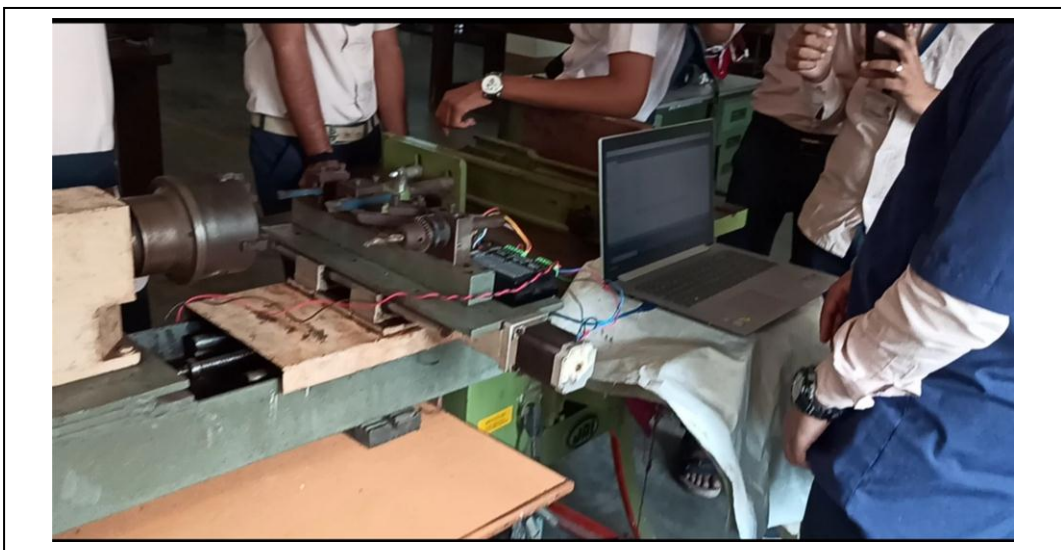


Fig. 9 Interfacing and Co-ordinating the Program with Machine

VI. SPECIFICATION AND LIMITATIONS OF MACHINE

• SPECIFICATION:-

- Spindle Motor RPM : 2500
- Tool Capacity : 4 Tools
- X - Axis motor of tool post:-
 - Speed : 5mm/Rev
- Z - Axis motor of tool post:-
 - Speed : 2.5mm/Rev
- Power Transmission System for Spindle : Belt drive
- Power Transmission System for Tool post: Stepper motor coupled with Leadscrew.
- Here Guideways are used to help the sliding motion of tool post.

• LIMITATIONS:-

- Here drilling, taper turning, parting off, thread cutting, grooving etc operations cannot be performed.
- Here only soft material is used as workpiece.

VII. PREPARING WORKPIECE

Here set the machine as per the requirement of the production of workpiece and then prepare the workpiece as per the given design. Here we have use wood as a material for workpiece. We can also use the soft metals also.



Fig. 10 Preparing Workpiece



Fig. 11 Workpiece Prepared

VIII. CONCLUSION

- In order to upgrade the conventional lathe machine, we have use Arduino controllers.
- The modification made in this machine is simple and easy to operate.
- The purposes of modification are to upgrade the machine to perform the task with high accuracy and precision.
- 'It is one type of open loop control system'.

IX. REFREANCES

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