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## Controller based CNC Lathe Machine

CNC are widely used in automobile to small scale industries for manufacturing process and welding also used in 3D printing. Industries spend huge sums of finance on installing this machines their maintenance and also training programs operators. Due to the increasing demand industries are looking for alternatives according to our industrial survey. So we thought of using the most updated controller system of this era Arduino Mega 2560.

And by combining both this technology of Manufacturing and machine controlling with Soft Coding also according to the requirement of user. Our objective of this paper is to design CNC Lathe System powered by Arduino Controller and easy execution of job. Also cutting down the task of machine operator, cost reduction of installing and easy installing. Low power and reliable system of controlling based on IDE and user friendly interface.

Arduino is a microcontroller chip. It is the most advanced controller chip and we are using this controller 2560 for controlling CNC machine with the required driver as we are showing it for Prototype of CNC we are using L298N motor driver for Arduino and CNC configuration as there are different power requirements of both ARDUINO requires 5v and servo motor requires 12v. As such the system is coded for giving instructions to the CNC machine we can have two separate power supplies for Arduino of 5v and 12v DC for Servo which would be eventually running the CNC machine and it is quite simple to control the Servo with the PWM as Pulse width modulation pins are by default defined on the Arduino board and also the PWM signal pin is or wire is taken out from the Servo Motor configuration as there inside the servo there is inbuilt 555 Circuit for pulse wise configuration. CNC stands for computer numeric control. Consisting of Microcontroller or computer for defining various tooling operation for example feed rate, speed, co-ordinates and location etc. CNC combine with Lathe machine is useful for basic operations such as drilling, chamfering, knurling etc.

### Materials and Methods:

#### CNC Lathe

CNC is used in areas with requirement of highly automated operations and end to end component manufacturing at large scale. The exact velocity and location of tools are defined by G-codes and M-codes. G-codes defines the geometry of tools and work piece including information regarding the change in shape of the work piece or the shape preferred by the client. M-codes stands for miscellaneous codes. It controls the speed, time, velocity. G-codes and M-codes are used in the traditional machines available in the market. But we will be defining Embedded code in the Arduino IDE. No extra requirement of memory just we can plug and play with USART of our controlling machine. Programmes are already feed into the Flash Memory of controller which is 256kb and large enough to store the code of thousands of different different operations. We will be storing this programmes in the Numerical 16\*4 Keypad. With different storage of programme on different numbers of digital keypad. Fig 1 shows CNC machine.

#### Arduino MEGA 2560

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Arduino is the most advanced microcontroller. Arduino is also an open-source platform used for building electronics projects. Arduino consists of PCB microcontroller implanted with all the necessary requirement of microcontroller like quartz crystal and input and output pins with very low power consumption of 5v and due to easily reliable plug and play system .IDE (Integrated Development Environment) that runs on computer, used to write and upload code to the USART port of the controller. It has good processing speed oof 1.4GHz dual core processor with 256kb of flash memory installed in it. For generating frequency internally quartz crystal is pre installed on the kit. Then if we have requirement of different type of motors for normal DC motor normal Digital Pins could be used and for Servo motor PWM pins can be used to give pulses for certain angle rotation and motion control of motor shaft.

Arduino is fabricated dual side as you can see in that fig 2. There are 13 analog pins 7 PWM pins and 46 Digital Pins on the controller with Power pins which consist of VCC,5v,Reset and Ground.

## **L298N Motor Driver and Power Supply**

Motor driver name itself suggests the driver based circuit for driving the motor through L298 IC which will also take signal from arduino on one of its Pin and then giving that signal to motor with addition of power requirement of the motor which is 12V. Arduino board is pre installed with power jack and voltage regulator of 7805 which will potentially power the microcontroller. Fig 3 shows L298N with its pin.

## **16\*4 Keypad**

Keypad is used for sending numeric to the microcontroller so that the code stored in its loop can be called when the hardware switched is pressed.

## **Results and Discussion**

The designed structure will be able to perform the task quite faster as compared to the traditional machines. The load depends upon the scale of machine and processor configuration. The combination of arduino and motor driver makes the controls more accurate. Incorporating the arduino simplifies the loading of G-codes and M-codes over and over again from hardware media. The arduino controllers are commercially available which provides flexibility to change core programming and user friendly experience. The designed product is shown in the fig below:

## **Cost calculations(based on prototype):**

1. Motor Drivers (750/-)
2. Power supply
3. Arduino mega
4. Lathe machine
5. 16\*4 keypad
6. Screws, nuts , bolts, wires
7. Miscellaneous

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## Future advancements:

1. The programming can be cloud based where the all the core programmes are stored in a cloud and can be installed/uninstalled according to the requirement.
2. The combination of g-code, m-codes and arduino programming can be useful and implemented in other machines like cnc drill, cnc slotting, cnc shaper etc.
3. The main advantage of using a arduino is its user friendly and flexible nature of operation.

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