

SEMI-AUTOMATIC FLEXIBLE DRILLING MACHINE

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ABSTRACT

In this present age the application of micromachining operations continues to grow. These operations are required to fabricate the products required for sectors like medical science, automobile industries and electronics manufacturing etc. which deals with miniature trends. Drilling process is one of the machining processes which is used to drill micro holes not only in micro products but also in relatively larger work pieces which require ultra-small features which can be accomplished only by drilling process. With the help of Arduino we can make semiautomatic drilling machine. Arduino is the physical programmable board. A wide array of sensors can be attached with this board and many third-party libraries can be linking with an Arduino sketch. Arduino hardware components are cheaper in relation with other controller architecture and programming language is easy.

The machine is constructed with power feed technology is aimed to drill the job up to certain specified depth, For ex: if a particular piece of job is supposed to be drilled to a limited depth, doing it manually consumes lot of time, because every time depth has to be measured through a crude method, thus estimating the drilling depth is quite complicated. For this reason this machine is designed & its mechanical movements are restricted by programming

Key words: semiautomatic drilling machine, Arduino,

1. Introduction:

Drilling is a cutting process that uses a drill bit to cut a hole of circular cross-section in solid materials. The drill bit is usually a rotary cutting tool often multi-point. The bit is pressed against the work-piece and rotated at rates from hundreds to thousands of revolutions per minute. This forces the cutting edge against the work-piece, cutting off chips from the hole as it is drilled. Conventionally drilling machine are hand operated. Often these machines are used for drilling a hole through the job. In conventionally drilling machine, human is the main operator. This engages a Person with time consuming efforts taken to drill the objects.

The manually operating Drilling Machine is semi-automated with the help of "arduino". The proposed of system will reduce the Human Efforts required to Drill the objects. In these system, concept is based on designing of an Semi- Automated Drilling System so as to perform drilling operation semi-automatically in an efficient way. Drilling is the operation of producing circular hole in the workpiece by using a rotating cutter called DRILL. The machine used for drilling is called drilling machine. The drilling operation can also be accomplished in lathe, in which the drill is held in tailstock and the work is held by the chuck. The most common drill used is the twist drill. It is the

simplest and accurate machine used in production shop. The work piece is held stationary i.e. clamped in position and the drill rotates to make a hole. It is quite common in the industries now to drill holes in parts, sheets, and structures. To have a perfectly aligned drilling its crucial to make use of powerful and fixed drills. As the distance between the drill bit and the drill bed is quite small, thus some sections cannot be drilled using fixed drills. Making use of hand drills is also not worth here since they have their own shortcomings like alignment issues during drilling. In order to overcome these shortcomings we decided to work on a machine that could remove all the above shortcomings which is a flexible drill machine that can be mounted on a table and used to drill holes horizontally, vertically, or even upside down. Due to this property, even complicated pieces and surfaces can be now easily drilled. Thus, we design and build a flexible drill for convenient drilling operations by taking help of rotating hinges and connectors, as well as a motor mount and supporting framework.

MODELLING

For making the semi automatic flexible drilling machine we require some idea about mechanism and some design for that machine. For this purpose we design our model of drilling machine in NX 12 Cad design software. We design every part of our machine mechanism in NX 12 software with the exact dimensions . We use NX 12 software to design the arm of the semi automatic flexible drilling machine.

DESIGN OF BLOCK A

The BLOCK A is used for to support the entire arm of the drill machine and also used for to control the vertical arm of our machine . it is placed above the base. The BLOCK A is fit to the base with the help of screws . the design of element is done by Selecting the BLOCK command in design features option on tool bar. Enter the required dimenstions of the BLOCK A and provide the holes based on the motor dimensions and location of the vertical arm on the BLOCK A by using the hole command in toolbar options.

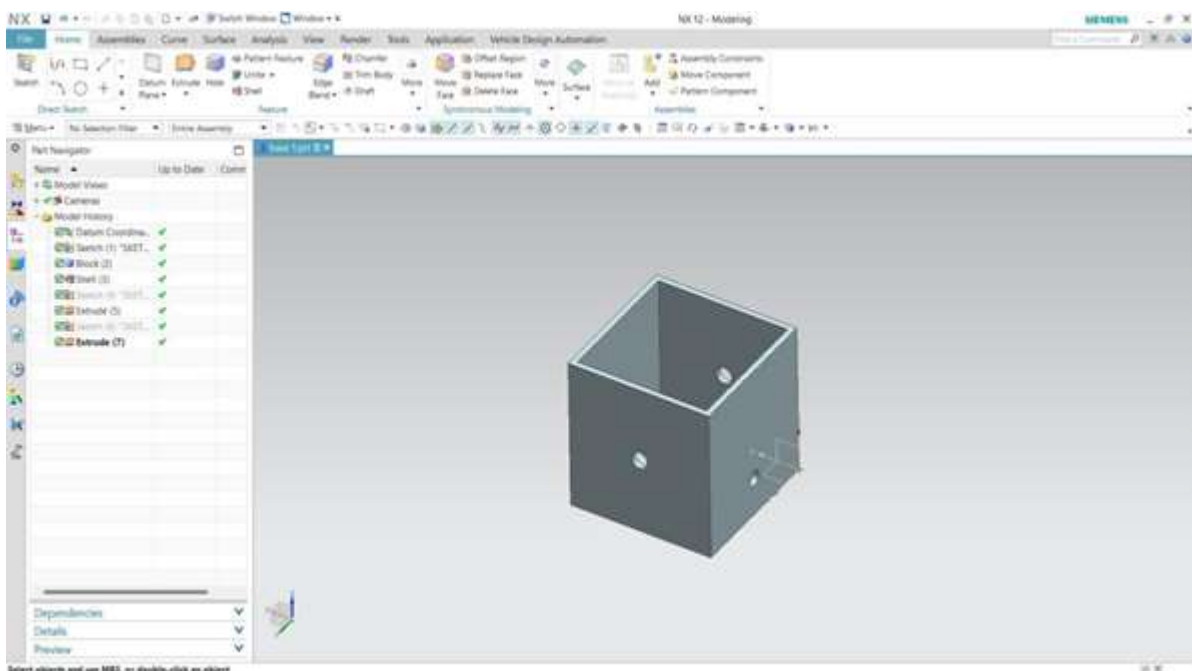


Fig.1 Block a

DESIGN OF A CONNECTING JOINT FOR THE MACHINE

Main purpose of the connecting joint is to transfer the motion between the one element to the other elements with the help of worm gear mechanism using high torque motors . In this machine

We use two pair of connecting joints for complete transformation of motion .For design select the plane > draw the sketch of the joint as per dimensions > select extrude command (convert 2D into 3D figure) > enter the thickness value of 3D model > select the hole command and required face for holes , The holes are used for providing connections between the BLOCK elements and connecting arm .

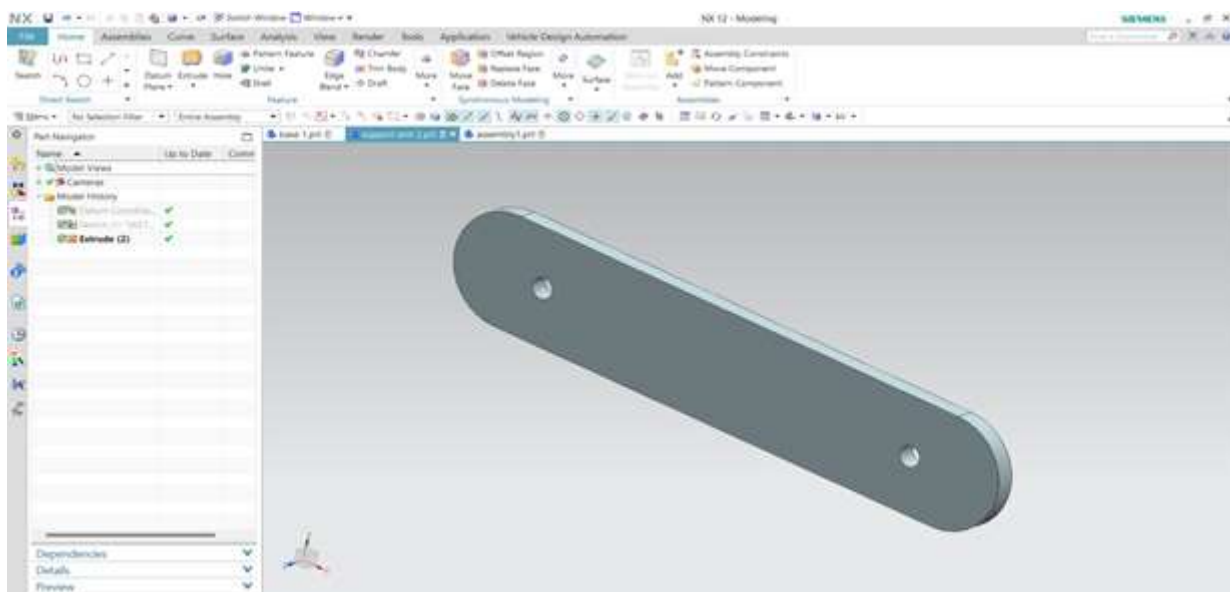


Fig 2 Connecting joint

DESIGN OF BLOCK B

The BLOCK B is plays a important role in arms moment . At the BLOCK B the two pair of connecting arms are divided into one pair of horizontal arm and one pair of vertical arm . the vertical arms are used for to move the drill motor up and down and the horizontal arms is used for to and fro motion of drill motor . the design of the BLOCK B is same as the BLOCK A but provide a extra pair of holes for connecting the two pair of connecting joints.

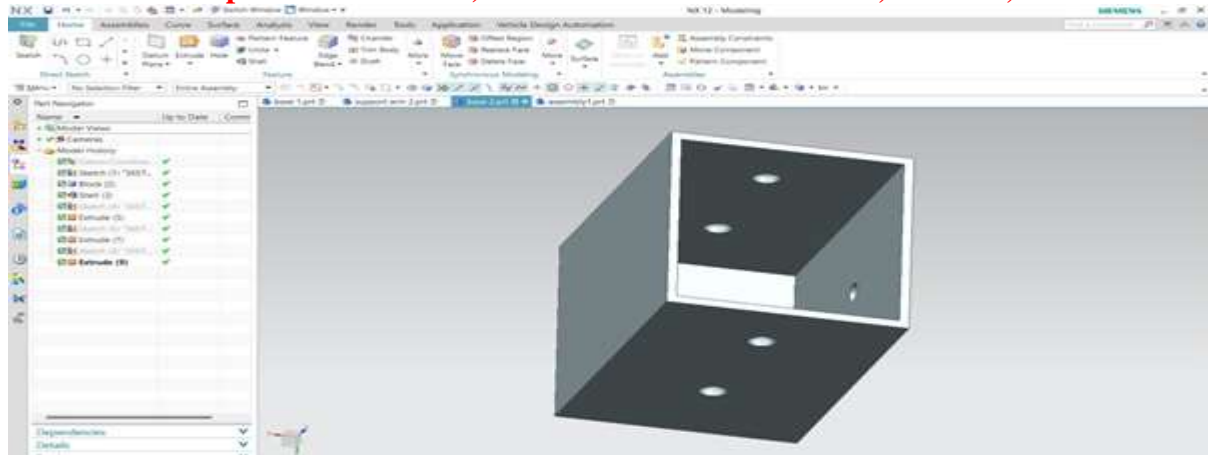


Fig 3 Block b

ASSEMBLY OF THE DESIGN

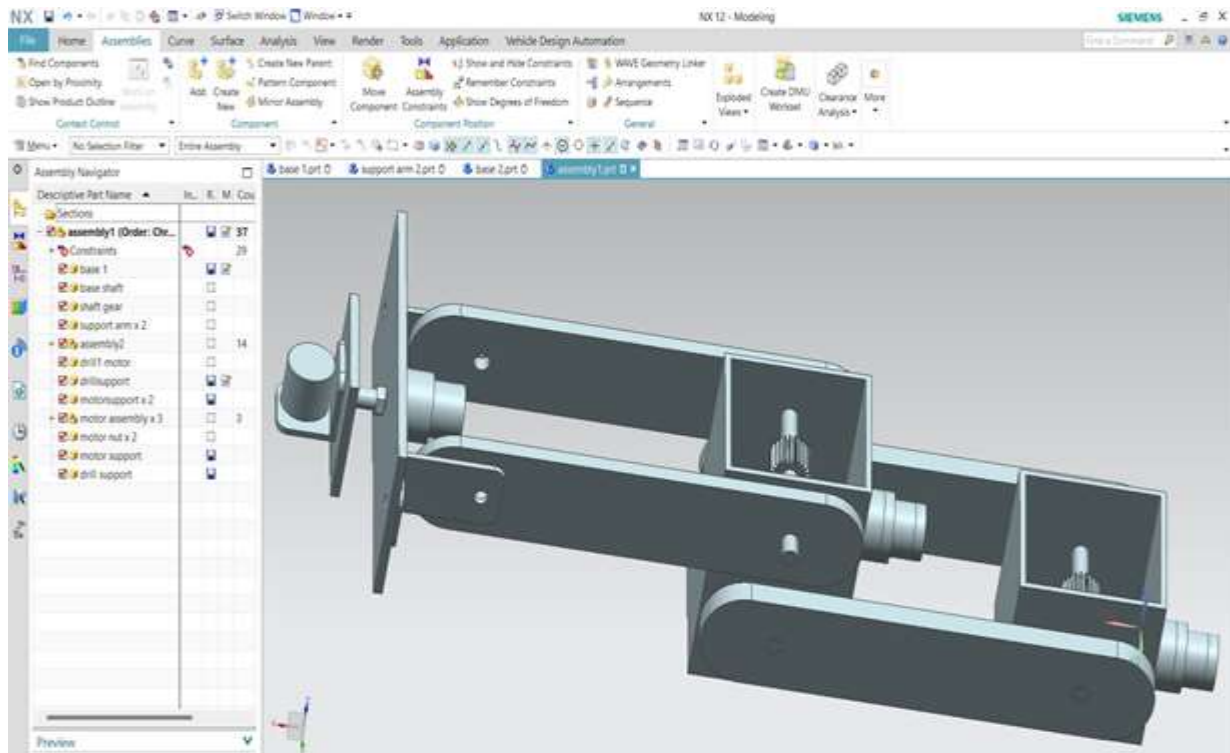


Fig4: ASSEMBLY OF THE DESIGN

To assemble the all the design models to create a new workspace by selecting the assembly option in NX 12 software with the help of the some assembly constraints providing some relationship between models. The final output of the idea as shown in figure Fig Assembly of all elements

PROGRAMMING FOR ARDUINO

The following steps outline the process of programming the Arduino microcontroller:

STEP 1 : Download and install the Arduino IDE.

STEP 2 :Connect the Arduino microcontroller to the computer using a USB cable.

STEP 3:Open the Arduino IDE and select the correct board and port.

STEP 4 :Copy and paste the following code:

```
#include <SoftwareSerial.h>  
SoftwareSerial BTserial(10, 11);
```

```
int motor1B = 3;
```

```
int motor2A = 4;
```

```
int motor2B = 5;
```

```
void setup() {  
  BTserial.begin(9600);  
  pinMode(motor1A, OUTPUT);  
}
```

```
  pinMode(motor1B, OUTPUT);
```

```
  pinMode(motor2A, OUTPUT);
```

```
  pinMode(motor2B, OUTPUT);
```

```
void loop() {
```

```
  if (BTserial.available()) {
```

```
    char c = BTserial.read();
```

```
if (c == 'F') {  
    digitalWrite(motor1A, HIGH);  
    digitalWrite(motor1B, LOW);  
    digitalWrite(motor2A, HIGH);  
    digitalWrite(motor2B, LOW);  
} else if (c == 'B') {  
    digitalWrite(motor1A, LOW);  
    digitalWrite(motor1B, HIGH);  
    digitalWrite(motor2A, LOW);  
    digitalWrite(motor2B, HIGH);  
} else if (c == 'L') {  
    digitalWrite(motor1A, LOW);  
    digitalWrite(motor1B, HIGH);  
    digitalWrite(motor2A, HIGH);  
    digitalWrite(motor2B, LOW);  
} else if (c == 'R') {  
    digitalWrite(motor1A, HIGH);  
    digitalWrite(motor1B, LOW);  
    digitalWrite(motor2A, LOW);  
    digitalWrite(motor2B, HIGH);  
} else if (c == 'S') {  
    digitalWrite(motor1A, LOW);  
    digitalWrite(motor1B, LOW);  
    digitalWrite(motor2A, LOW);  
    digitalWrite(motor2B, LOW);  
}  
}}
```

STEP 6 :Upload the code to the Arduino microcontroller.

HOW TO CONTROL THE PROJECT

The following steps outline the process of control the flexible semi automatic drilling machine with Bluetooth control robot:

STEP 1 :Connect the Bluetooth module to a smartphone or computer.

STEP 2:Open a serial terminal app on the smartphone or computer and connect to the Bluetooth module.

STEP 3 :Send the following commands to the Bluetooth module to control the drilling machine:

'F' to move forward

'B' to move backward

'L' to turn left

'R' to turn right

'S' to brake or stop

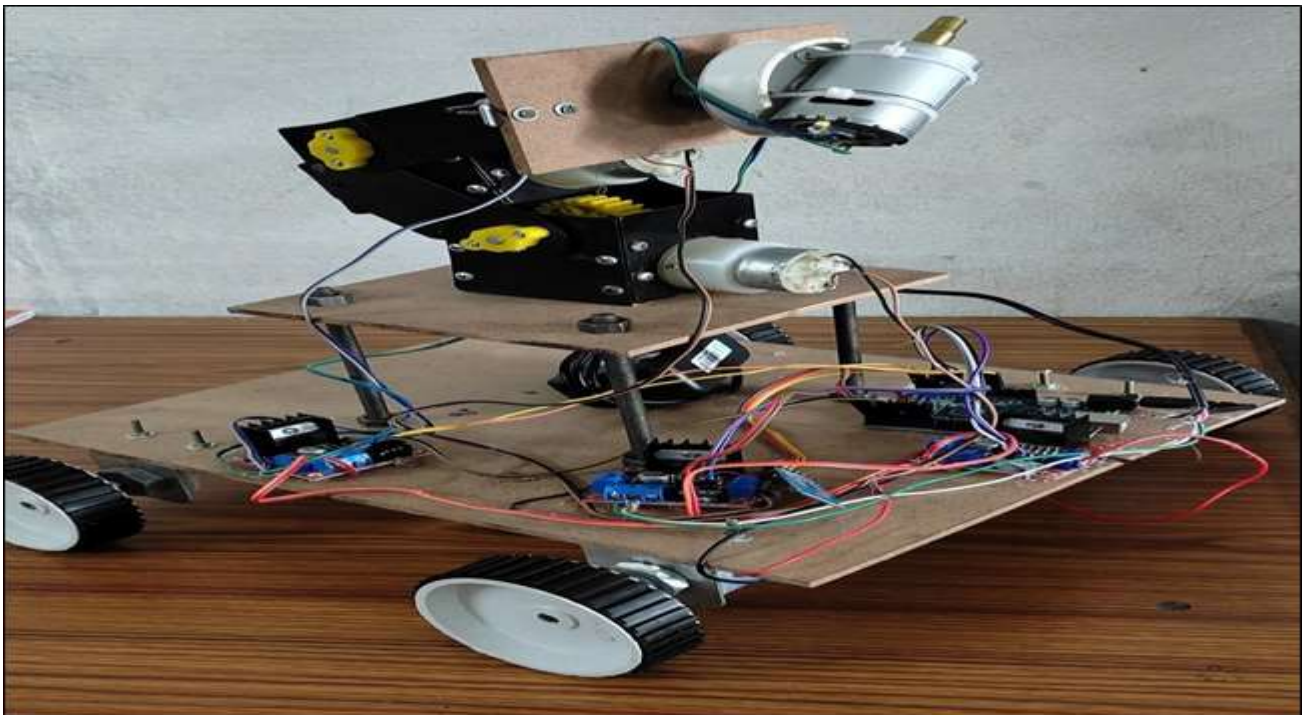


Fig.5 side view of the project



Fig. 6 Front view of the project

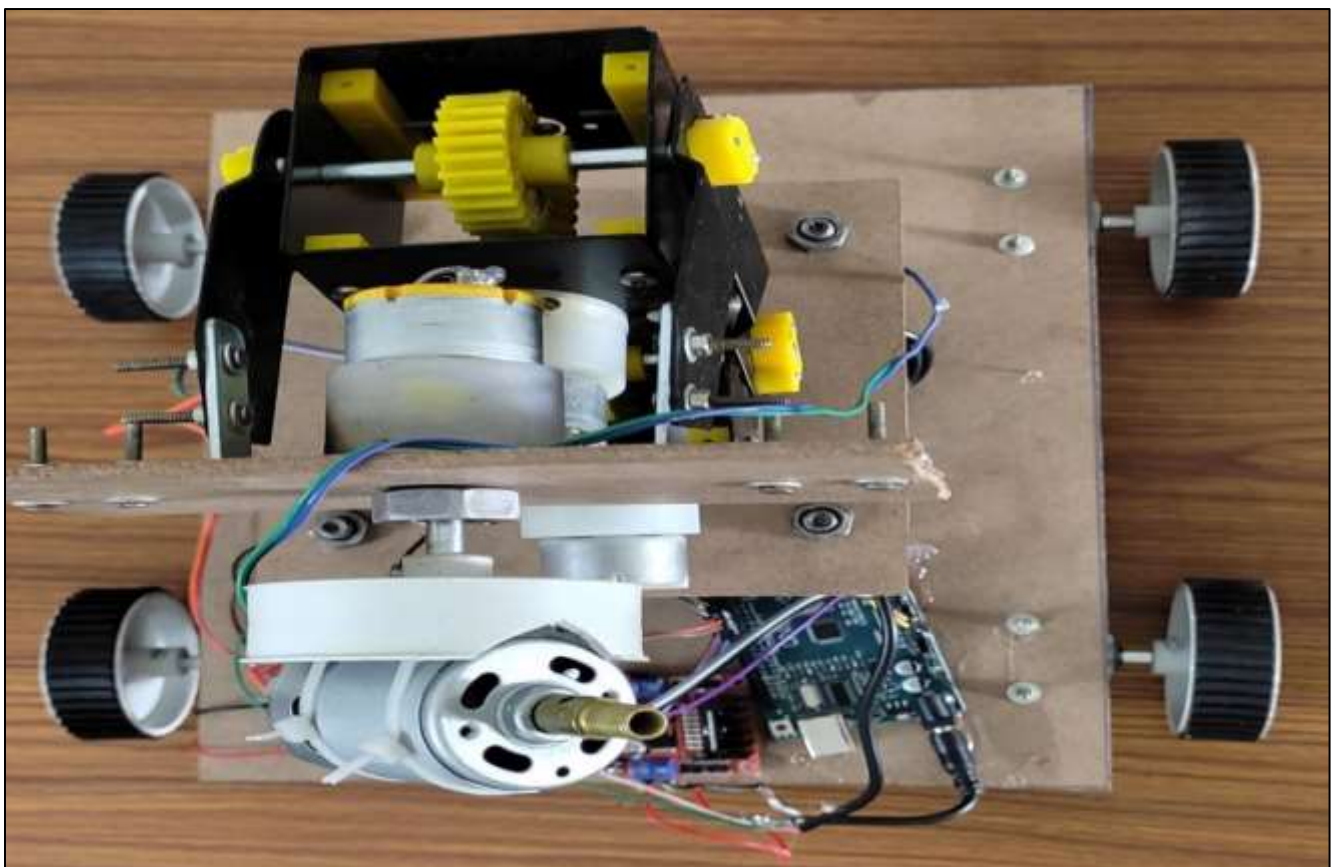


Fig. 7 Top view of the project

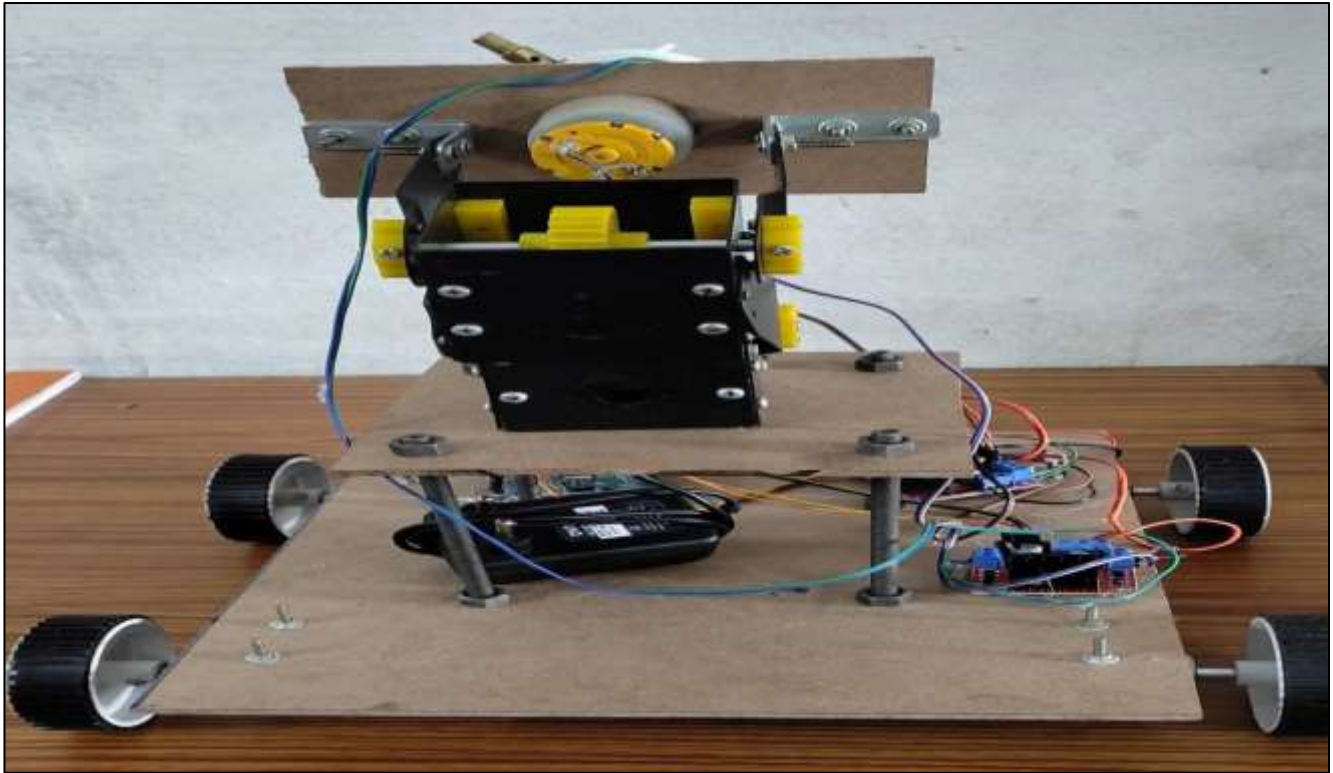


Fig.8 Back view of the project

CONCLUSIONS

Effective performance and competitive costs can be guaranteed by this project, as many operations can be done via this machine. Many holes with greater efficiency can be cut by this machine. It works well and is quite economical compared to other resources available. Considering its use and model price this machine can prove to be quite economical as compared with other machines. This provides a working space between the drill bit and the drill bed where there are small gaps. For this we have suggested to use a rack and a pinion mechanism over the arms to make it a telescopic arm to increase and decrease arm length. . Machine size is less than the older drilling machines. Therefore, the required space is also small. With this machine it is possible to drill as many holes as we need without moving the working piece. Therefore, it reduces the amount of equipment needed and reduces human error.

FUTURE SCOPE :

- It might be utilized in industries.
- It would be used with automation for computerized drilling.
- In the coming years it can be used in every area wherever drilling is required.
- We also can use this approach of rotation of arm in different machining operation.
- Good future in marine and robotics sector.
- Codings and programmes can be used in this machine.
- This machine shall get operated through computers and smartphones someday
- Reduces the time taken for drilling holes with accuracy rate

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