CHAPTER 1

INTRODUCTION

Cropping is important and tedious activity for any farmer, and for large scale this activity is so lengthy, also it needs more workers. Thus agricultural battery operated vehicle are developed to simplify the human efforts. In manual method of seed planting, we get results such as low seed placement, less spacing, less efficiencies and serious back ache for the farmers. This also limits the size of field that can be planted. Hence for achieving best performance from a seed planter, the above limits should be optimized. Thus we need to make proper design of the agricultural battery operated vehicle and also proper selection of components. Various machines are used in the traditional method of agriculture. The agriculture is the backbone of India. And for sustainable growth of India, development of agriculture plays vital role. India has huge population and day by day it is growing, thus demand of food is also increasing. Since long ago in India traditional method is used. Also India has huge man power. This manual planting is popular in villages of India. But for large scale this method is very troublesome. The farmer has to spend his more time in planting. But time available is less for him. Thus it requires more man power to complete the task within stipulated time which is costlier. Also there will be seed wastage during manual planting. Hence there is need of developing such an battery operated vehicle which will help the farmer to reduce his efforts while planting.

CHAPTER 2

LITRETURE SURVEY

1.TITLE: Design and manufacturing of seed sowing machine,"International journal of advance research, ideas and innovations in technology".

AUTHOR: Nagesh B. Adalinge, Ganesh P.Ghune, Ganesh B. Lavate, Rahul R. Mane

FINAL REMARK: The basic objective of showing operation is to put the seed and fertilizer in rows at desired depth and seed to seed spacing, cover the seeds with soil and provide proper compaction over the seed. The recommended row to row spacing, seed rate, seed to seed spacing and depth of seed placement vary from crop to crop and for different agro-climatic conditions to achieve optimum yields. The comparison between the traditional sowing method and the new proposed machine which can perform a number of simultaneous operations and has a number of advantages . As day by day the labor availability becomes the great concern for the farmers and labor cost is more, this machine reduces the efforts and total cost of sowing the seeds and fertilizer placement.

2.TITLE: Design and fabrication of manually operated seed sowing machine, "International Research Journal of Engineering and Technology (IRJET)"

AUTHOR: R. Kathiravan1, P. Balashanmugam

FINAL REMARK: This article addresses betterment in agricultural processes. Manually operated seed sewing machine consist of mechanisms for sowing of the seed. This mechanism runs simultaneously. The essential objective of sowing operation is to put the seed in desired depth and provide required spacing between the seeds and cover the seeds with soil. We can achieve optimum yield by proper compaction over the seed and recommended row spacing. To meet the demands farmer have to use new techniques in cropping to increase the yield. The requirements of small scale sowing machines are, they should be simple in design, easy maintenance for effective handling by unskilled farmers. In this project the attempt has been made for reduction in cost of machine and developing the multifunctional sowing machine which can perform simultaneous operations.

3.TITLE: Review paper on electric vehicle charging and battery management system, "International Conference on Communication and Information Processing"

AUTHOR: Kadlag Sunil data Samantha, MukeshKumar Gupata

FINAL REMARK: Battery powered electric vehicles are gaining popularity worldwide. This trend is driven by several factors including the need to reduce air and noise pollution, and dependence on fossil fuels. The main drawback of today's electric vehicle is its limited range, and the long time duration that is required to charge the electric batteries. In recent years, significant progress (through research and development) has been made to accelerate the charging time of the electric vehicle batteries through pulse charging rather than supplying continuous current and/or voltage. If the amount of remaining battery capacity can be displayed for the driver then it is possible to make decision on the time of recharging the battery.it is necessary to know various battery performance parameters.

CHAPTER 3

PROBLEM DEFINITION

Broadcasting method does not ensure a uniform distribution of the seeds in efficient way. Seeds cannot be placed at regular distance, due to which wastage of large amount of seeds takes place. Also for traditional method of seed sowing process, man power is required and also it is time consuming.

CHAPTER 4

OBJECTIVES

- To build seed sowing battery operated vehicle which can be operated by the single operator
- To enable the vehicle for the sowing of several seeds like corn, wheat etc
- To maintain the same distance between two seeds at the time of sowing process
- To level the ground in small extent

CHAPTER 5

5.1 BLOCK DIAGRAM

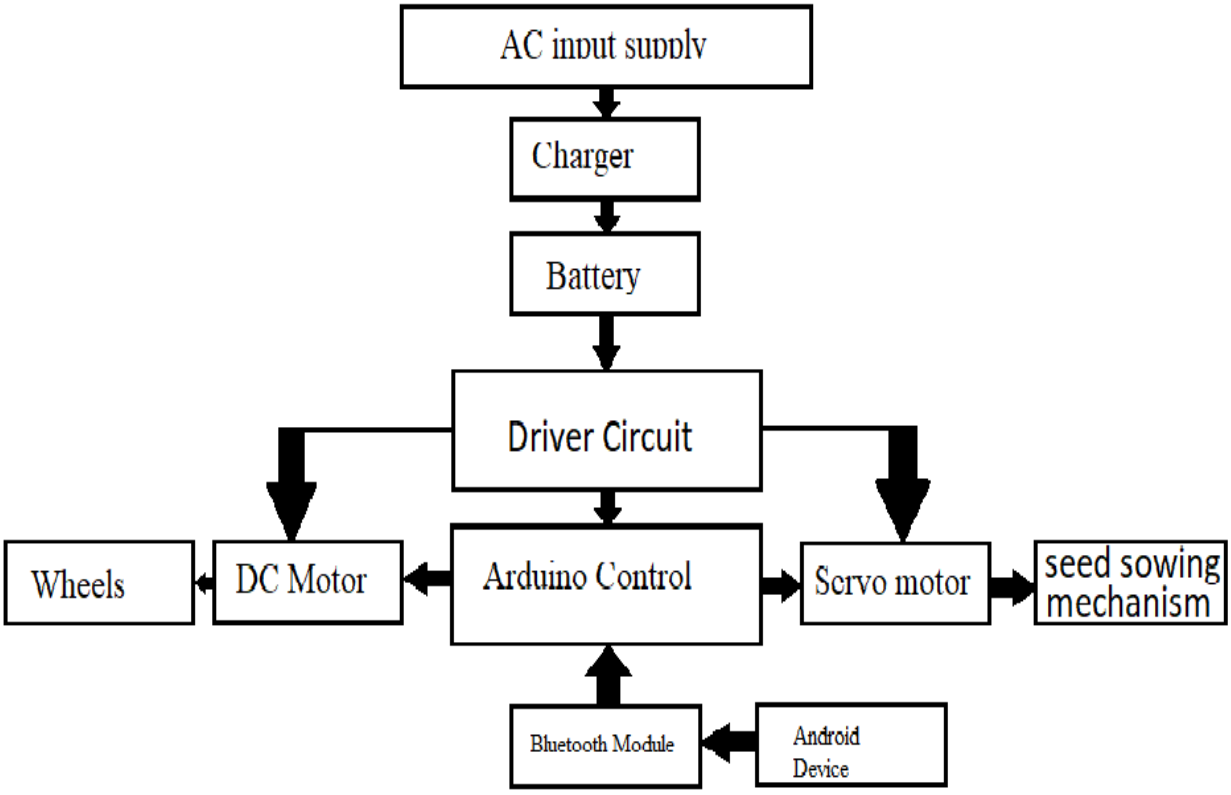
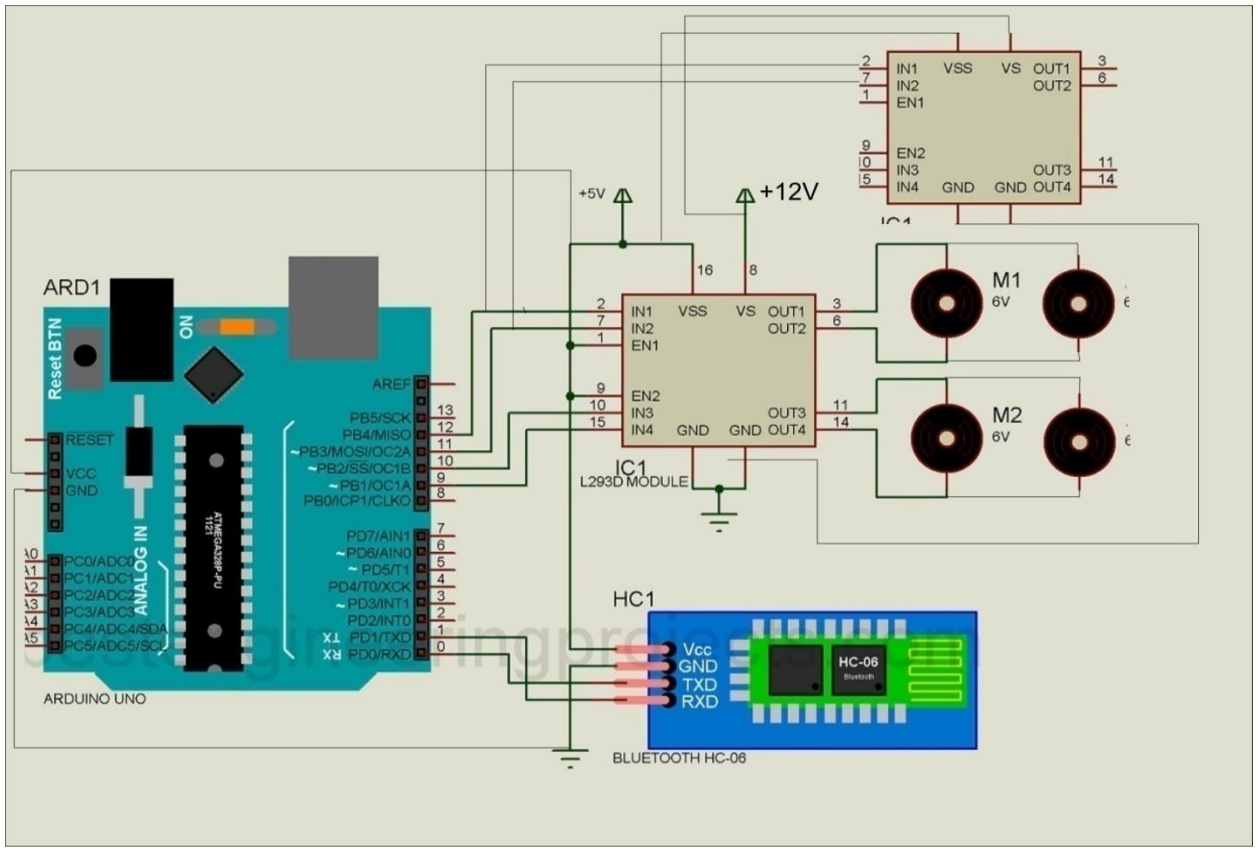
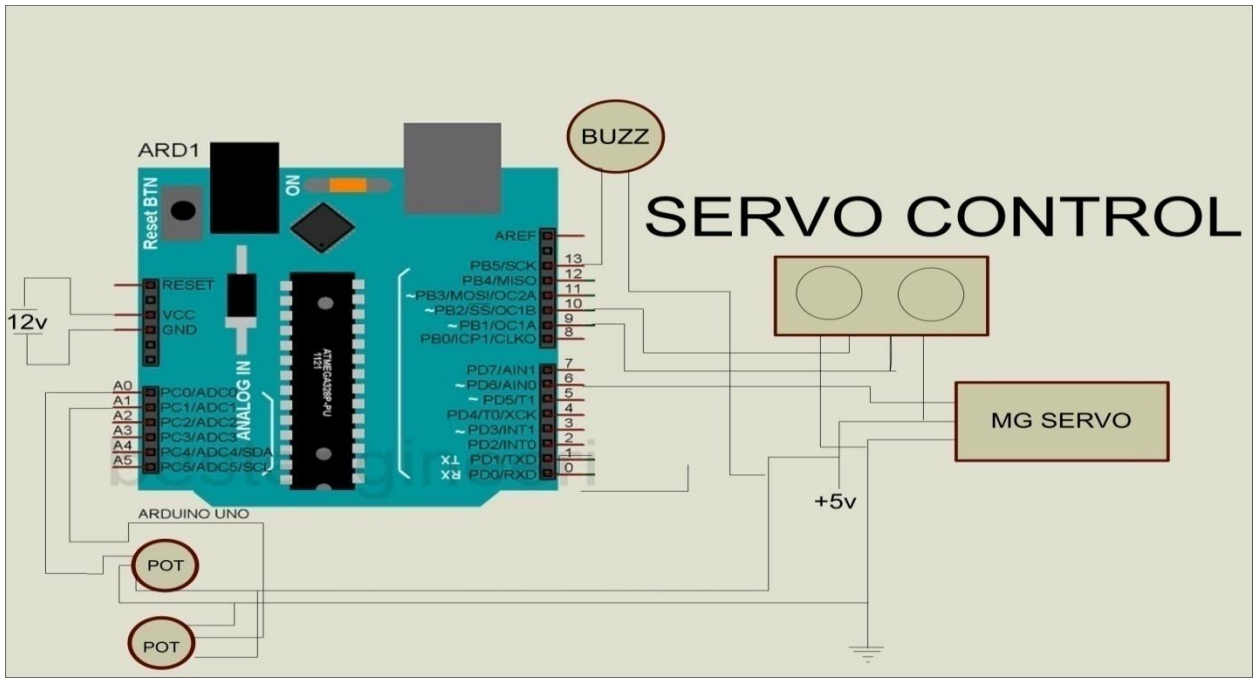


Fig.5.1 Block diagram of arduino based battery operated vehicle for agriculture application

5.2 CIRCUIT DIAGRAM





5.3 METHODOLOGY

In our country farming is done by the traditional way, besides that there is the large development in industrial and service sector as compared to the agriculture. So we want to develop the agriculture sector by applying new technology like battery operated vehicle used in seed sowing mechanism.

Battery operated vehicle works on principle of transforming electric energy into mechanical energy. It stores the electricity in rechargeable batteries and uses them to power an electric motor that turns the wheels. Battery operated vehicle feel lighter to drive because they accelerate more quickly than cars with conventional fuel engines.

Sowing is the most important process in farming. It is a very tiring and time consuming process that requires a lot of human effort. Here we propose the design of battery operated vehicle for seed sowing application that automates this task. The proposed battery operated vehicle uses four motors for running it in desired directions. We use a small container for pouring seeds. The battery operated vehicle consists of a funnel like arrangement in order to pour seeds into a lower container. There we use a rotating part to take up limited quantity of seeds and pour them on the ground in a steady manner in proper quantity. The front of the battery operated vehicle consists of a bent plate that drags on the soil to make a slot ahead of the battery operated vehicle before seeds are poured in it. The back portion of the battery operated vehicle consists of a tail like bent rod that is again used to pour soil on seeds sowed thus covering them with soil. Thus the system completely automates the seed sowing process using a smartly designed battery operated vehicle system.

5.4 HARDWARE DESIGN

5.4.1 Battery charging unit:

DC Charge= The fastest way to charge your EV is DC Fast charger. With this method you can top up your battery charging speed, there are also some ultra-fast chargers.

5.4.2 Battery:

Most electric vehicles use lithium-ion batteries. Lithium ion batteries have higher energy density, longer life span and higher power density than most other practical batteries. Li-ion batteries should be used within safe temperature and voltage ranges in order to operate safely and efficiently. Increasing the battery's lifespan decreases effective costs.

Fig.5.1.3 lithium-ion battery.

Specifications:

- Voltage=3.7V
- Capacity=2.2 Ah.
- Rechargeable= Yes

Calculation:

- 1 Cell = 3.7V
- In Series Connection battery gives =11.1V and 2.2 Ah.
- Three sets of battery connected in parallel gives= 6.6 Ah.

5.4.3 Arduino Controller:

Arduino is an open hardware development board that can be used by tinkerers, hobbyists, and makers to design and build devices that interact with real world. The output of the driver circuitry is given to arduino Controller. The arduino controller is used to run the DC motor taking input command from Bluetooth module which can be controlled by the mobile device and also arduino controller is used to control the servo motor speed.

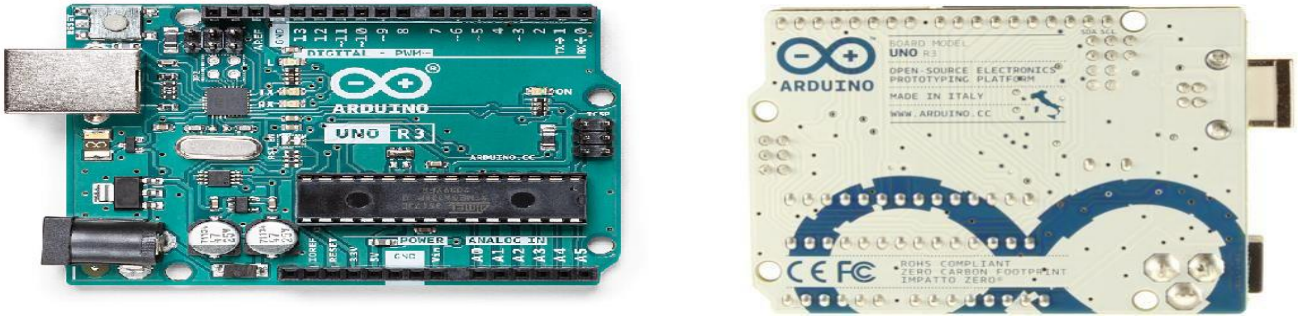


Fig. 5.4.3 Arduino Controller

Specifications:

- Operating Voltage=5V
- Input Voltage (recommended)=7-12V
- Analog Input Pins=6
- Digital Input Pins=14
- Flash memory=32kb

Power Source:

- **VIN.** The input voltage to the Arduino board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.
- **5V.**This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 - 12V), the USB connector (5V), or the VIN pin of the board (7-12V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator,
- **3.3.** 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.
- **GND.** Ground pins.

5.4.4 DC Motor:

A dc motor is a device that converts DC electrical energy into mechanical energy. Here we are using four dc motors to rotate wheels. They take input supply from battery and input signal from Arduino for direction control.

Fig. 5.4.4 DC Motor

Selection of DC motor:

Calculation of torque

T= W* R

Where, W= Weight of the machine

R= Radius of the wheel

W= 5 kg R= 11cm=0.11m

T= 5*0.11= 0.55 kgcm

T =5.5 kg/cm= 53.9365 Nm (1 N*m = 0.1019716213 kg/cm)

The total weight of the machine is approximate 5.5 kg, so selected 7 kg/cm dc motor.

Specifications:

- RPM = 170 rpm
- Torque=7kg/cm
- Input Voltage=12V
- Input Current:0.75 Ah
- Total current =0.75*4=3 Ah

5.4.5 Bluetooth Module:

Bluetooth module will be connected to controller which can take control signal from android device to control the direction of battery operated vehicle.

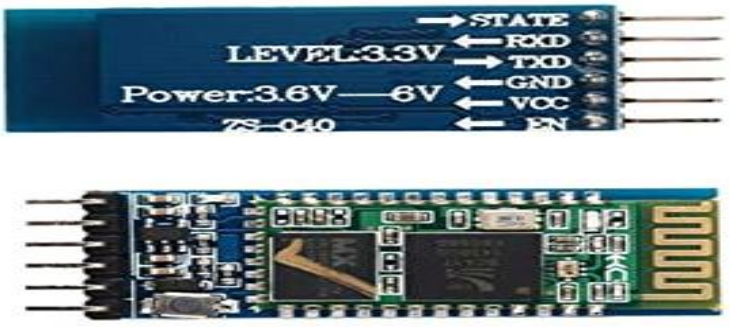


Fig. 5.4.5 Bluetooth Module

Specifications:

- Frequency=2.4 GHz
- Operating Voltage=5V
- Operating Current=50mA
- Standby current=2.5mA
- Interface=UART
- Operating Temperature=-20 degree Celsius to 75 degree Celsius.

5.4.6 Servo motor

Servo motors or “servos”, as they are known, are electronic devices and rotary or linear actuators that rotate and push parts of machine with precision. Servos are mainly used on angular or linear position and for specific velocity, and acceleration. Here we using servo for control the speed of the seed mechanism.

Fig. 5.4.6 Servo motor

Specifications:

- Operating Voltage=5V
- Torque= 2.5Kg/cm
- Input Current:1 Ah
- Gear Type= plastic
- Rotation=0 – 180 degree

5.4.7 Motor Driver Module

The motor driver module is use to controlling DC motor direction and it takes input supply from direct battery at 12V and it converts it into 5V which is given for Arduino as input supply.

Fig. 5.4.7 Motor Driver Module

Specifications:

- Model:L298N
- Input Voltage: 5-35V
- Input Current: 2A
- Max power:25W

5.4.8 Wheels

Wheels reduce friction. Instead of simply sliding over the ground, the wheels dig in and rotate, turning around sturdy rods.Here we used 5.5 cm radius wheels with rubber grip coated which can give good grip.

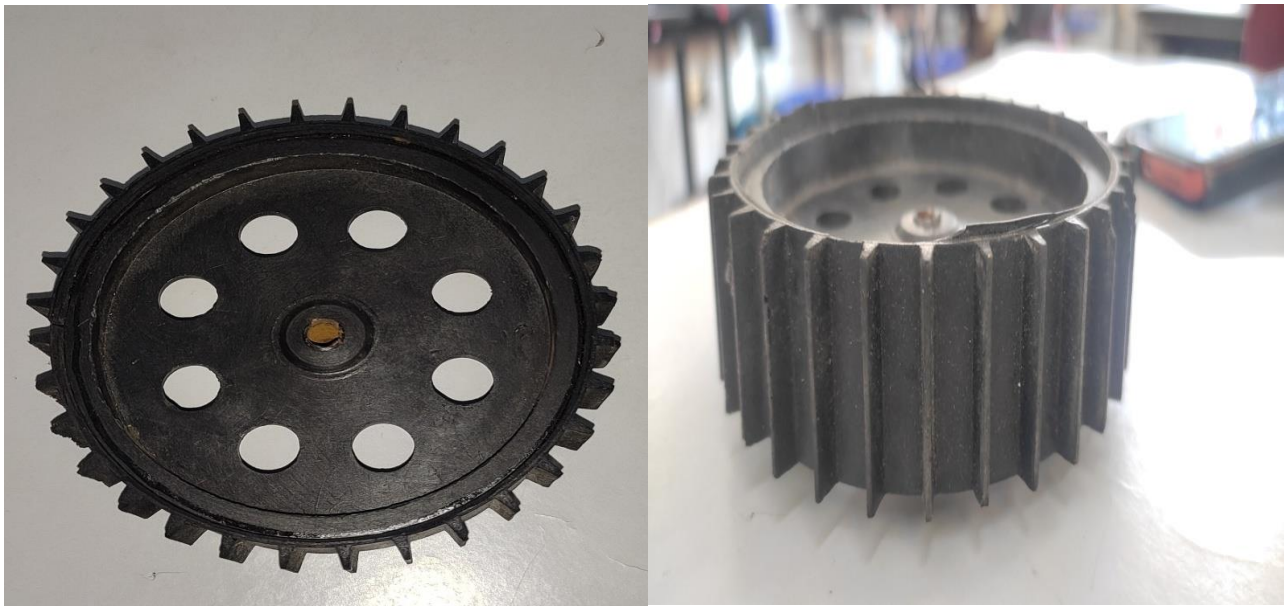


Fig. 5.4.8 Wheels

5.5 FACTORS AFFECTING SEED EMERGENCE

Mechanical factors, which affect seed germination and emergence, are:

- Its depth should be uniform with regard to placement of seed
- It should be distributed uniformly along the rows.
- Its transverse displacement with regard to row also considered.
- Loose soil getting is also prevented.
- Soil is covered uniformly over the seed.
- Fertilizer is mixed with seed during placement in the furrow.

5.6 SEED SPACING PRACTICES

In order to obtain maximum yield of crops, seed sowing process must be done at optimum distance. Hence while sowing different types of seeds distance between the seeds has be standardized for all types of seeds. The following table gives the distance between the sowed seeds in cm for different types of seeds

Seeds	Distance between seeds (cm)
Corn	12-25
Wheat	15-22.5
Soybean	30-45
Rabi Jawar	15-20
Peanut	10-60

Table 5.6 seed spacing practices

5.7 CALCULATION OF TIME REQUIRED FOR SEED SOWING PROCESS IN 1 ACRE LAND:

The following calculation shows the time required for seed sowing process for 1 acre land

Let us assume,

The moving speed of the vehicle is n=60 rpm

Time Consumption for 1 acre land:

Let us assume,

Diameter of the wheel:

d=15 cm

Circumference of wheel :

$C=2\pi r$

$C=2 * \pi * \frac{15}{2}$

C=47.12cm (Since, 1cm =0.01 meter)

C= 0.01*47.12

= 0.4712mtr

1 acre= 40gunta

For 1gunta=1088sq.feet

=1088*40

=43520sq.feet

To maintain column to column distance in uniform way, we sow first column, next column will be skipped and third line will be again sown. This process will continue till the end of sowing process.

Therefore to neglect skipped part we are dividing by 2

$=\frac{43520}{2}$

=21760sq.feet

=21760* 0.09290304 (Since, 1sq.feet=0.09290304sq.meter)

=2021.57sq.mtr

Distance between two seed lines

=18 inch

= 0.0252*18=0.4536 meter (Since, 1 inch=0.0251meter)

1 rotation of wheel will cover

=0.4536*0.4713

=0.2137 meter

Number of wheels rotation for 1 acre

$$= \frac{\text{sq.mtr/acre}}{\text{Area covered for 1 wheel revolution}}$$

= 2021.57 /0.2137

= 9459.85

Time required for 1 acre

$$= \frac{Number\ of\ wheels\ rotation\ for\ 1\ acre}{n}$$

= 9459.85/60

= 157.66 min

In hours,

= 157.66/60

= 2.52 hrs

Therefore, for 1 acre (2021.57 sq.mtr) land, seeds can be sown in 2 hours 31 minutes 12 seconds

5.7.1 CASE STUDY: SEED SOWING PROCESS OF CORN

Servo motor time calculation

Wheel diameter=15 cm

Circumference of wheel=47.13 cm

Distance between two seeds=20 cm

Rate of seed sowing per rotation

$$= \frac{\text{Circumference of wheel}}{\text{Distance between two seeds}}$$

$$= 47.13/20$$

$$= 2.3565$$

Time setting of servo motor for 1 rotation

$$= \frac{1}{\text{Rate of seed two seeds}}$$

$$=1/2.3565$$

$$= 0.5 \text{ sec}$$

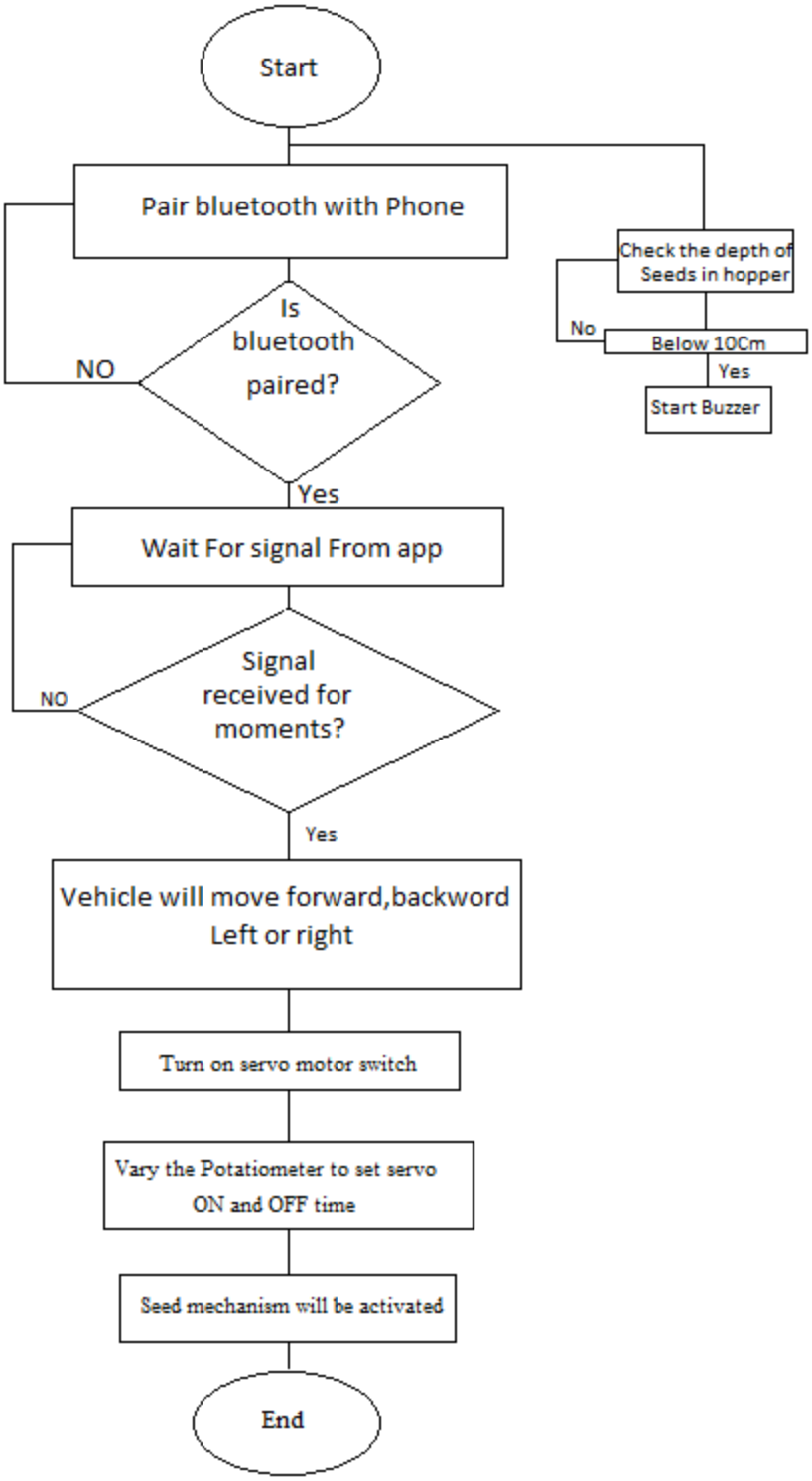
5.8 SOFTWARE DESIGN:

5.8.1 Program:

```
const int pwm = 2 ;//initializing pin 2 as pwm
const int in_1 = 8 ;
const int in_2 = 9 ;//For providing logic to L298 IC to choose the direction of the DC motor
void setup()
{
pinMode(pwm,OUTPUT) ;//we have to set PWM pin as output
pinMode(in_1,OUTPUT) ; //Logic pins are also set as output
pinMode(in_2,OUTPUT) ;
}
void loop()
{
//For Clock wise motion , in_1 = High , in_2 = Low
digitalWrite(in_1,HIGH) ;
digitalWrite(in_2,LOW) ;
analogWrite(pwm,255) ;
/*setting pwm of the motor to 255
we can change the speed of rotaion
by chaning pwm input but we are only
using arduino so we are using higest
value to driver the motor  */
//Clockwise for 3 secs
delay(3000) ;
//For brake
digitalWrite(in_1,HIGH) ;
digitalWrite(in_2,HIGH) ;
delay(1000) ;
//For Anti Clock-wise motion - IN_1 = LOW , IN_2 = HIGH
digitalWrite(in_1,LOW) ;
digitalWrite(in_2,HIGH) ;
delay(3000) ;
//For brake
digitalWrite(in_1,HIGH) ;
digitalWrite(in_2,HIGH) ;
delay(1000) ;
 }
```

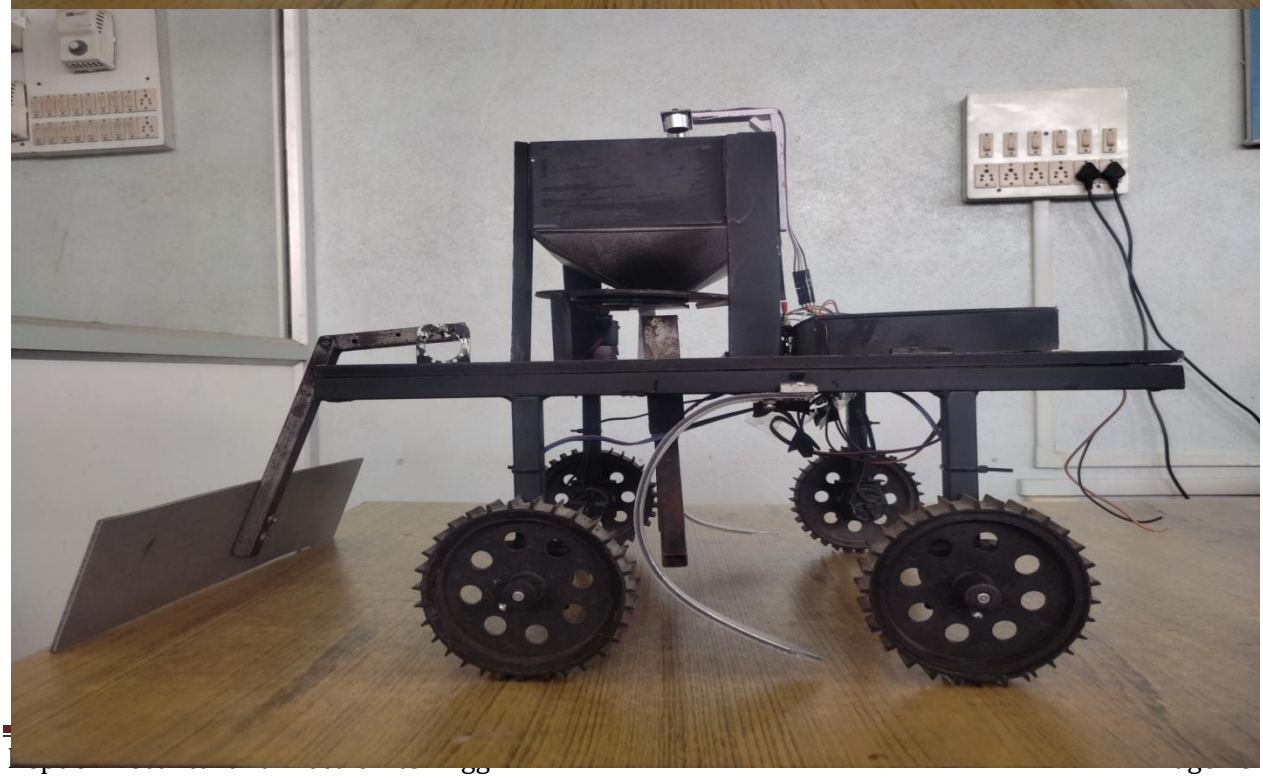
```
#include <Servo.h>
const int servoPin = 11;
const int trigPin = 9;
const int echoPin = 10;
long duration;
Servo myservo;
int distance;
const int ledPin = 13;
const int buzzer = 12;
const int onTimePin = A0;
const int offTimePin = A1;
void setup() {
  myservo.attach(servoPin);
  pinMode(onTimePin, INPUT);
  pinMode(offTimePin, INPUT);
  pinMode(ledPin, OUTPUT);
   pinMode(buzzer, OUTPUT);
  pinMode(trigPin, OUTPUT);  // Sets the trigPin as
an Output
  pinMode(echoPin, INPUT);   // Sets the echoPin
as an Input
  Serial.begin(9600); // Starts the serial
communication
}
void loop() {
  // Clears the trigPin
  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);
  // Sets the trigPin on HIGH state for 10 micro
seconds
 digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);
  // Reads the echoPin, returns the sound wave
  travel time in microseconds
  duration = pulseIn(echoPin, HIGH);
  // Calculating the distance
  distance = duration * 0.034 / 2;
  // Prints the distance on the Serial Monitor
  // Serial.print("Distance: ");
  // Serial.println(distance);
  if (distance <= 10) {
    // Turn on the LED
    digitalWrite(buzzer, LOW);
    //delay(1000);
  } else {
    // Turn off the LED
    digitalWrite(buzzer, HIGH);
  }
  int onTimeValue = analogRead(onTimePin);
  int offTimeValue = analogRead(offTimePin);
  float onTimeSeconds = map(onTimeValue, 0,
1023, 1, 5);
  float offTimeSeconds = map(offTimeValue, 0,
1023, 1, 5);
   int onTimeMillis = onTimeSeconds * 1000;
  int offTimeMillis = offTimeSeconds * 1000;
Serial.println(onTimeMillis);
  Serial.println(offTimeMillis);
digitalWrite(ledPin, HIGH);
  myservo.write(75);
delay(onTimeMillis);
 digitalWrite(ledPin, LOW);
 myservo.write(10);
 delay(offTimeMillis);
  }
```

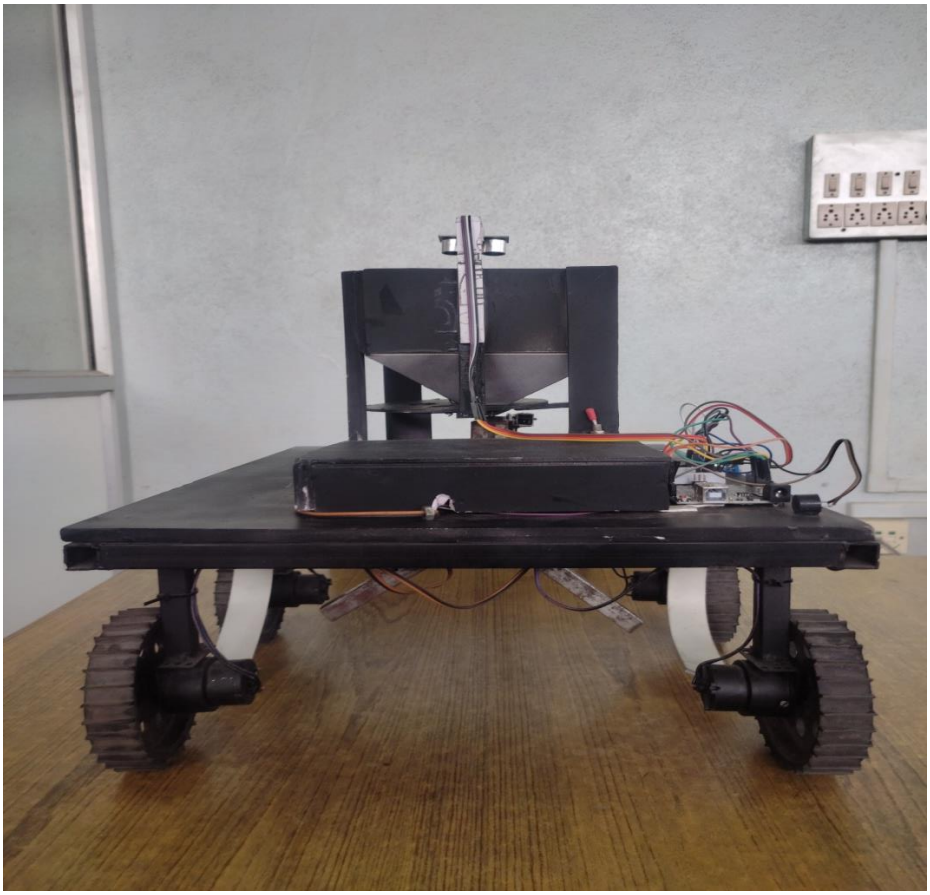
5.8.2 Flow Chart:

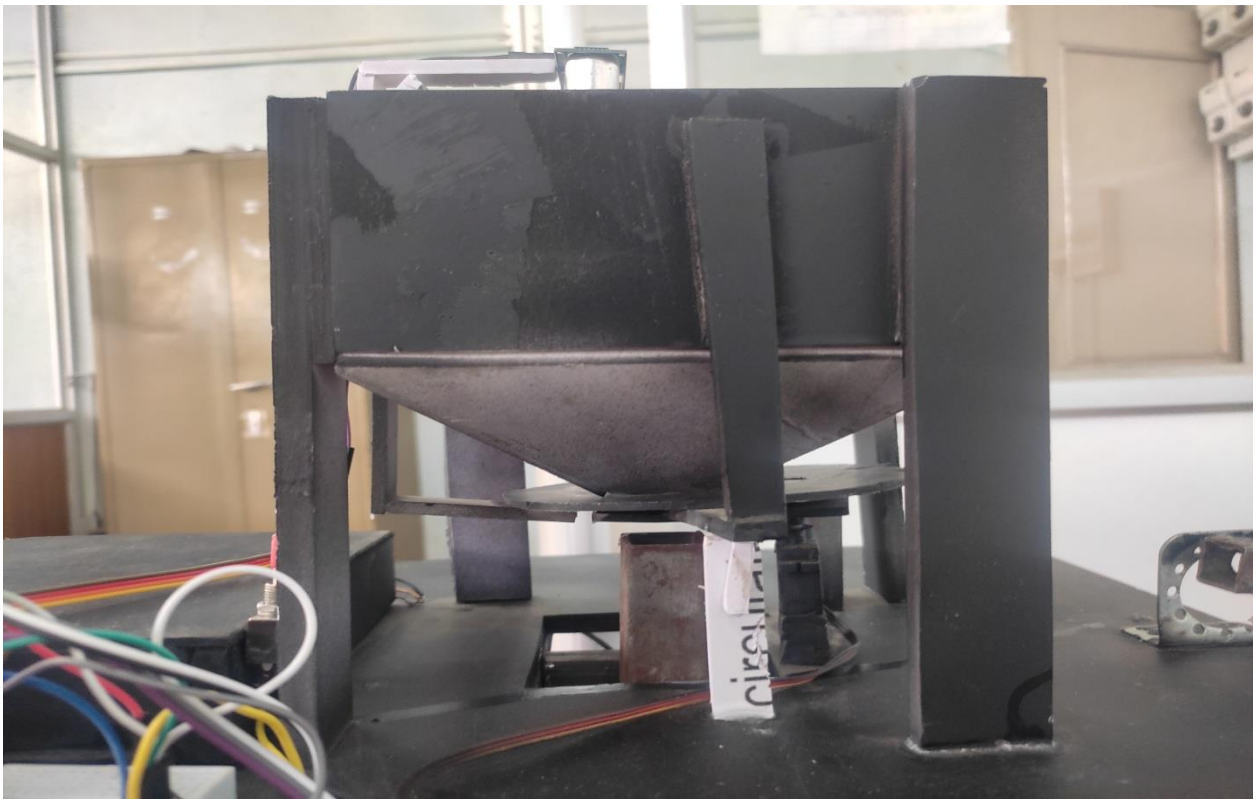


CHAPTER 6

RESULTS







CHAPTER 7

7.1 ADVANTAGES

- Fully automatic seed sowing
- Efficient and fast farming
- Cost efficient.
- Save energy, money and time of a farmer
- Due to small size, machine is portable.
- Seed planting accuracy
- Less maintenance cost
- Many types of seed sowing can be done by this vehicle

7.2 DISADVANTAGES

- Suitable for small Farms Only
- Machine will be loaded more during seed sowing in hard soil.
- It will use man power to run the machine

CHAPTER 8

APPLICATIONS

- It is used in agriculture for seed sowing at fixed distance and with more accuracy
- Used for sowing of different types of seeds.

CHAPTER 9

CONCLUSION

The system is beneficial to the farmers for the basic seed sowing operation. Low germination percentage leading to wastage of seeds can be reduced by the use this system. Creation of gap due to non-germination of seeds can be avoided. Total yield percentage can be increased. As compared to the manual seed sowing process, time and energy required for this battery operated vehicle is less. Also wastage of seed is less. So this system will be a better option for the farmers who want to perform the seed sowing operation in well-organized manner.

CHAPTER 10

Future Scope

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GUIDE BIOGRAPHY

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