DESIGN AND DEVELOPMENT OF ARDUINO BASED BATTERY OPERATED VEHICLE FOR AGRICULTURE APPLICATION

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ABSTRACT:

In the farming process, the broadcasting method of seed sowing operation takes more time and more labor. The seed feed rate is more but the time required for total operation is more and the cost is increased due to labor, hiring of equipment. Today's era is marching towards the rapid growth of all sectors including the agricultural sector. To meet the future food demands, the farmers have to implement the new techniques which will not affect the soil texture but will increase the overall crop production. Thus we proposed battery operated vehicle for seed sowing process which is operated by using battery and it reduces the efforts of farmers and also it increases the efficiency of seed sowing and also reduces the problem encountered in manual planting. From this we can sow different types and different sizes of seeds and also we can vary the space between two seeds while seed sowing. This also increases the efficiency and accuracy. Thus the seed sowing operation becomes cheap and very usable for small scale farmers.

Keywords: Cotton seed oil, Bio-fuel, Engine Performance, Emission

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.
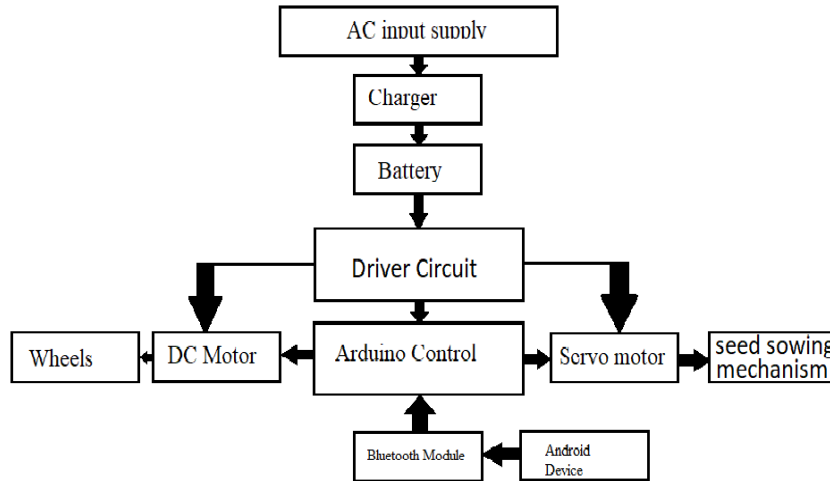
2. METHODOLOGY

2.1 BLOCK DIAGRAM

Fig.1. Block diagram of arduino based battery operated vehicle for agriculture application
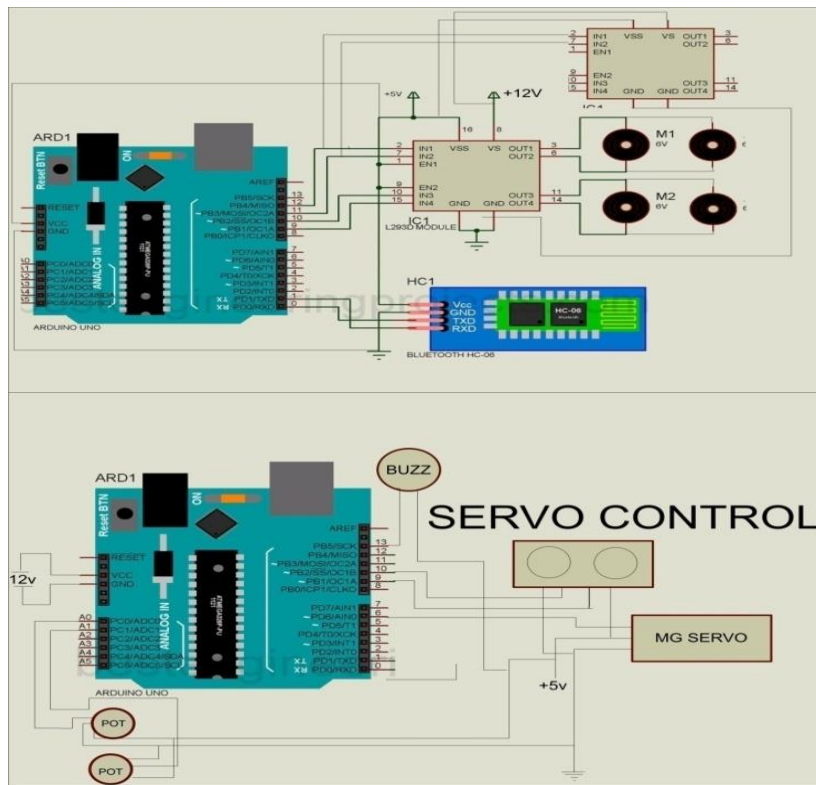
2.2 CIRCUIT DIAGRAM

Fig.2 circuit diagram of arduino based battery operated vehicle for agriculture application

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.

3. DESIGN AND IMPLEMENTATION

3.1 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.

3.2 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.

Table.1 seed spacing practices

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

3.3 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

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

   =   2021.57 /0.2137

   =   9459.85

Time required for 1 acre

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

$$= 9459.85/60$$

$$= 157.66 \text{ min}$$

In hours,

$$= 157.66/60$$

$$= 2.52 \text{ hrs}$$

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

3.4 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

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

$$= 47.13/20$$

$$= 2.3565$$

Time setting of servo motor for 1 rotation

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

$$= 1/2.3565$$

3.5 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 kgcm= 53.9365 Nm (1N*m = 0.1019716213 kgcm)

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

4. RESULTS AND DISCUSSIONS

In this paper a battery operated vehicle for agriculture application has been designed. A 12V battery is connected to driver circuit to reduce the voltage as per requirement of Arduino UNO. Arduino UNO has been programmed in C language. Arduino UNO is programmed to run servo motor and dc motor. DC motor uses 12V and is used to run the vehicle. Servomotor is used for seed sowing mechanism. In this way the battery operated vehicle is used

for seed sowing application.

Fig.3 Prototype model

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.

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