

Design and Fabrication of Multi-purpose Automatic Seed Sowing Machine

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Abstract— Agriculture is the backbone of Indian economy. About half of the total population of our country has chosen agriculture as their chief occupation. As centuries passed, certain modern techniques were invented in agriculture due to the progress in science. Agro-Technology is the process of applying the technology innovation occurring in daily life and applying that to the agriculture sector which improves the efficiency of the crop produced. Hence in this work of project we decided to design a better mechanical machine which is available to the farmers at a cheaper rate and also which can sow and seed the crop at the same time. This project consists of the better design of the machine which can be used specifically for sowing of soybean, maize, pigeon pea, Bengal gram, groundnut etc. For various agricultural implements and non-availability of sufficient farm labor, various models of seed sowing implements becoming popular in dry land regions of India. The success of crop production depends on timely seeding of these crops with reduced dull work of farm labor. The ultimate objective of seed planting using improve sowing equipment is to achieve precise seed distribution within the row.

Keywords: Seed-sowing, Arduino ATmega328, Bluetooth interface, Battery operated wheels, Sprinkler

I. INTRODUCTION

India record of progress in agriculture over the past four decades has been quite impressive. The agriculture sector has been successful in keeping pace with rising demand for food. New technologies are needed to push out yield frontiers, utilize inputs more efficiently and diversify to more sustainable and higher value cropping patterns. Traditional method of sowing is not suitable for growing the crop. The result is very low production. There are many faults such as not proper seed rate, fertilizer rate, seed spacing, problem in inter cultivation and consume more time. Agriculture, largely as a means to enhance the productivity of human labour and often to achieve results well beyond the capacity of human labour. There are three sources of farm power utilized for these tools, machines and equipment, manual and animal draft, and motorized power. Sowing is one of the important agricultural operations for raising crops. The robotic systems play an immense role in all sections of societies, organization and industrial units. The objective of the project is to develop a microcontroller based system at helps in on-farm operations like seeding and fertilizing at pre-designated distance and depths. The plantation of seeds is automatically done by using DC motor. The distance between the two seeds are controlled and varied by using Arduino programming. It is also possible to cultivate different kinds of seeds with different distance. When the Robot reaches the end of the field it can change the direction without any help. The whole process is controlled by Arduino.

II. PROBLEM STATEMENT

In the present scenario most of the countries do not have sufficient skilled man power in agricultural sector and that affects the growth of developing countries. Therefore farmer have to use upgraded technology for cultivation activity (digging, seed sowing, fertilizing, spraying, etc.).

So its time to automate the sector to overcome this problem which in turn also eliminates the requirement of labour and reduce wastage of seeds.

III. WORKING

It works on simple mechanism, a battery operated D.C. motor is used transmits the rotary motion to the shaft with the help of chain drive, and there is another connection of servo motor to the seed meter for the rotary motion. When the farmer puts seeds into the hopper, seed drops into the seed meter which is control by the servo motor arrangement mounted on the assembly. As the seed meter rotates, seed drops in the seed pipe, which is connected to the furrow opener for the seeding; there is furrow closer for covering the seeds by soil. The basic objective of sowing 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 proposed seed sowing machine works on the concept of "string and plate" to reduce the seeds and fertilizer wastage, to sow them of wheels changed.

Seeds are empty alarm is detected.

IV. DESIGN & CALCULATION

A. Resistive Force Exerted on Soil:

$$F_s = (Y * w * d)$$

Where, F_s = Resistive force experienced in Kg

Y = Soil Resilience in Kg/cm²

w = Width in cm

d = Depth in cm

But the Soil resistance is taken as 3 times higher the original as a factor of safety

Heavy soil is chosen for safe design.

So, consider $Y = 0.25 \text{ kg/cm}^2$

w = width or diameter of seed = 8mm = 0.8cm

d = Maximum operating depth = 10 cm

(Here, we are considering the maximum depth of cone up to which we can sow the seeds. So, we consider the maximum depth = 10 cm.

In our project the cone will go in the soil which is having a lower diameter as 8mm so, the width is considered as 8mm)

So, the force exerted is given by:

$$F = 0.25 * 3 * 10 * 0.8 = 6 \text{ Kg}$$

$$F = 6 * 9.81 = 58.86 \text{ N}$$

So, the force required to sow the seed is 58.86 N

B. DC Motor:

Voltage = 12V, Current = 5Amp, Speed = 60 RPM

We know that, $P = V \cdot I = 12 \cdot 5 = 60 \text{ W}$

$$P = 2 \cdot \pi \cdot N \cdot T / 60$$

$$T = 9.59 \text{ Nm}$$

1) Motor:

Voltage = 12V, Current = 5Amp, Speed = 10 RPM

We know that, $P = V \cdot I = 12 \cdot 5 = 60 \text{ W}$

$$P = 2 \cdot \pi \cdot N \cdot T / 60$$

$$T = 57.3 \text{ Nm}$$

V. CONCEPTUAL MODEL

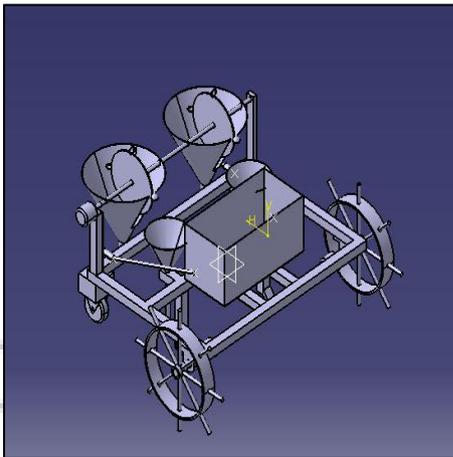


Fig. 1: CATIA Model

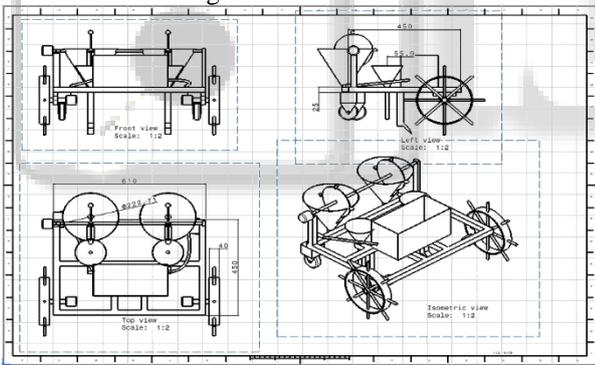


Fig. 2: Drafting of Model

VI. ACTUAL MODEL

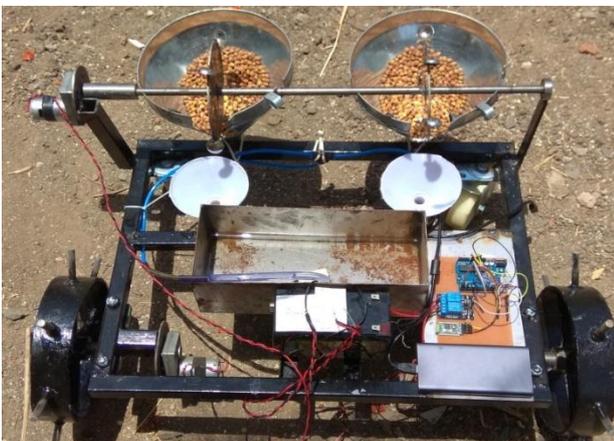


Fig. 3: Working Model

VII. HARDWARE IMPLEMENTATION

A. Arduino:

The ATmega328 is a single-chip microcontroller created by Atmel in the megaAVR family (later Microchip Technology acquired Atmel in 2016). It has a modified Harvard architecture 8-bit RISC processor core.



Fig. 4: Arduino(ATmega328)

B. Bluetooth Terminal HC-05:

HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. Serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband. The HC-05 Bluetooth Module can be used in a Master or Slave configuration, making it a great solution for wireless communication. This serial port bluetooth module is fully qualified. A Bluetooth module is a short range device of around 10 meters which provides both sound and data transmission.

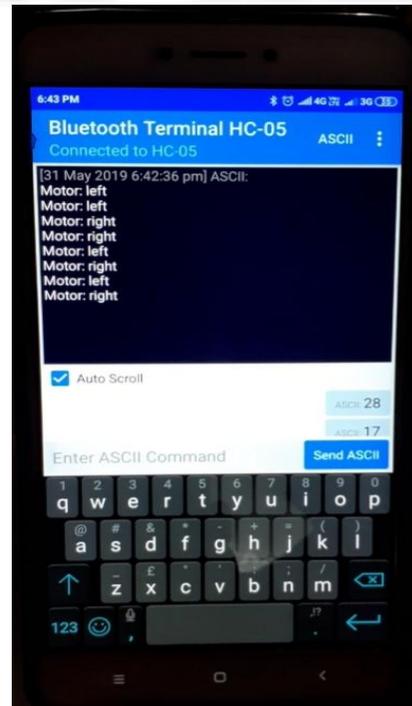


Fig. 5: Bluetooth Interface

VIII. CONCLUSION

The main focus of this system is its Automatic way of sowing the seeds. This automatic way of sowing seeds using automation reduces the labor requirement. Here the wastage of seeds is also been reduced to a greater extent. This system has been developed for the sowing of seeds in an automatic way. Here with the help of automation the seeds are been dispensed in the soil in a proper sequence here by reducing the wastage of seeds. The planting process becomes very easy using automation in the field of agriculture. The Automation will help the farmers to do the farming process efficiently. The project can be enhanced to any other kinds of seeds. The seed sowing machine can designed with various sensors for better control of seeding process. Hence, it can be applicable to agricultural-field. This system is run by sewing motor. The mechanism used in automatic seed feeder helps to reduce manual efforts and also reduces the time required for seed feeding. This results in the increase rate of plantation.

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