

Remote Controlled Agricultural Robot with Sowing Seed Mechanism: A Proposed System

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Abstract –[11]Today 40 % of the world has chosen agriculture as the major profession, during the last decade the development of the automatic vehicles and robots are dynamic. This Research paper described here is moderately useful in the agricultural fields. The idea as an agro robot is new for the maximum Indian farmers and is unknown from them. In agriculture, the opportunities for robot can increase efficiency and the robots are on farms in various appearances and with new technologies are in increasing numbers. The proposed robot design can perform the agricultural operations such as seed sowing and it is a remote controlled robot with reciprocating action of a seeding mechanism.

Keyword: Farmers, Remote control, Agrobot, Seeds, Sowing mechanism, Productivity.

I. INTRODUCTION

Indian agriculture has begun in early days by 9000 BCE as a result of early cultivation of plants, and domestication of crops and animals. Agriculture is the one of the main occupation in INDIA. They were using animals to perform these operations. Our history of agriculture contains many examples of the use of tools, such as the hoe and the plough. Due to rapid development in technology farming become much less labor sensitive and many other problems are occurred in the agricultural field. By this People are tired of doing the agricultural activities in the sunlight and their health is also affected very much by doing the heavy work in the fields. People were Seeding by manual method includes broadcasting the seeds by hand.

The aim of our project is to perform agriculture work, By using this robotic technology the farmer can perform these all operation just by sitting in a cool place and can do plowing, seeding and grass cutting. The basic idea in this paper is to develop a mechanized device that helps farmers to perform operations like seeding/seed sowing at pre-designated distances and depth. So now it's not necessary to do seeding in sunlight. By using robot technology one can easily perform these all operation by providing the input to the robot it performs the operation according to the data given by the user.

[5]Traditional methods of farming are broadcasting, dibbling, drilling, opening furrows by a plough and dropping seeds by hand or dropping seeds in the furrow with a bamboo/metal funnel attached to a plough. [5]For sowing in small areas dibbling i.e., making holes by a stick or tool for dropping seeds by hand has been practiced for

many years. [12]There are also multiple row traditional seeding mechanism with manual scale for measuring the quantity of seeds are most popular with experienced farmers. In manual seeding mechanisms, it is impossible to achieve uniform distribution of seeds.

II. LITERATURE REVIEW

Remote Controlled Agricultural Robot with Sowing Seed Mechanism:

P.Usha et.al (2015) [1] used to development of develop agricultural land without the man power. The aim of this paper is to decrease the man power, time and there is increase in productivity rate. [13]All the automated robot works like seeding, harvesting etc. and the vehicle is navigated are preferred by using microcontroller.

Ramesh & Girishkumar(2014)[2][11]worked for seed sowing equipment. The objective of sowing operation is to insert the seed in the field in a row at certain depth and with equal spacing, covering the seeds with soil and provide proper compacting in soil. [14]The recommended equal row spacing, how much seeds are inserted in soil with spacing and depth of seed which vary in different climatic conditions to achieve optimal yields. Seed sowing devices plays a most important role in agriculture field.

P. Sreelakshmi et.al (2016) [3] proposed for a prototype of an agricultural based robot capable of performing farming activities like sowing seeds. This automatic robot is capable of performing and scanning field operations. The robot is fed with inputs like field dimensions, spacing between the seeds and the tasks are performed

accordingly. This model of the agricultural robot is cost effective and user friendly.

Shriyash Thawali et.al (2017)[4] deals with manufacturing and development of robot in agricultural applications. The main application of this robots in agriculture is of harvesting stage i.e. seeding. This robot is replaces human labour consumption. This paper represents a robot which is capable of performing operation automatic seed distribution and spraying of pesticide. The microcontroller supervises the entire process. The robot for Manual control uses the Remote controller to control the device and helps in the directing of the robot on the field.

Mebrhit et.al (2017)[5] focused on designing and developing prototype of seeding mechanism. [5]For the case of it is economically relevant for poor farmers, the researcher assured to have low cost by conducting cost of the mechanism. [5]Unique features of this new design include seeding mechanism for seeding variable size grains and specify their space, it is controlled by the wheel rotation, it is easy to operate, its minimum damage to the seed in this process, its high level of operational reliable.

Vinay Kumar Tiwari et.al (2017)[6] focused on all the basic automatic of the seeding mechanism for moving it forward and backward and also for putting the plough of seeding mechanism up and down for it to seed at a given depth. [6]The systems of sowing the seeds and directing the vehicle are preferred by this automatic robot using microcontroller, relay switches etc. [6]The seeding technique is now used as an alternate to the old farming techniques and promote to soil and water conservation.

Dr. K A Sunitha et.al (2017)[7] proposed sowing mechanism actuated with motors and the complete body is divided into two parts the tail part acts as a container for seeds. The successor holds on all the electronics used for automating and actuation. The locomotion is provided with wheels covered under conveyor belts.

Pradeep Gorre et.al (2017) [8]carried on work mainly on seeding mechanism with a DC servo motor which controls a driller and sow the seeds with a simple wheel mechanism and sowing the seeds is planned and the seeds are sowed with equal spaces between them. [8]The issue of a farmer of sowing the seeds is taken and overcome use of fire bird robot. Here, a DC servo motor equipped for drilling is for digging a hole and sow the seeds with a simple wheel mechanism attached to that servo motor.

DeveshBarhateet.al (2018) [9] research work was mainly on the base frame of the agro bot with 4 wheels connected and driven by dc motor. [16]Cultivator is fitted on the one end which is driven by dc motor and is made to dig the soil. Funnel made of sheet metal stores the seeds and the seeds goes through the tube joined to a funnel into a drilled hole on the shaft in digged soil. [16]On the end leveller is

fitted to close the seeds to the soil, and water pump is to spray the water.

Swapnil Umale et.al (2018) [10] [15]proposed research work is mainly on sowing machine should be reliable to all farms, all types of crops and this is basic condition of sowing machine.

From above literature review we conclude that, there are many mechanisms of sowing seeds some are traditional and some are modern. The traditional one is hand driven or human and animal efforts are needed. And the modern mechanism is highly complicated which cannot be used by the small farmers because they are highly automated and also they are more expensive to afford.

III. PROPOSED METHODOLOGY

1) Market Study and Literature review:

2) The different materials there in the market for the fabrication of the machine. The most optimal materials are chosen. This involves the study the current system for such applications

3) The chassis fabrication: The chassis is the important part as it holds all other components. The chassis is fabricated in this. The chassis is fabricate as it becomes light weight but also has satisfactory amount to assemble for all the components.

4) [12]It is a low cost sowing seed device in which seed quantity measurement is done manually by the operator by pouring the seeds in the funnel provided for that purpose. [12]Hence the operator skill determines the seed rate applied. It is a four row sowing device. The drill of mild steel box section, furrow openers cum shanks, funnels with two tubes for feeding seed, hoses are used to connect funnels with pipes mounted on furrow opening, hitch assembly and handle. The distance of the rows can be adjusted by moving the furrow openers. [12]The furrow opener is made of iron, which is pointed at the end. Since the drill doesn't have a separate hopper, seeds have to be carried separately carried in the bag of the operator.

IV. PROPOSED MODEL

The proposed model is used is used for sowing seed of crops in the agricultural area. The body consist of frame in which the 4 wheel attach to it forward and backward motion of model. The power is provided to the wheel by 4 high power dc motor, from lithium battery. In which the seeding mechanism is attached to the frame of body. Seeding mechanism consist of 2 funnel where the crop seed are drop for seeding. At the particular distance in field.

The model is controlled by microcontroller which is our main aim of project. The circuit of microcontroller is attached to the sowing mechanism and to motor. The

whole power source supply to the model is done by lithium battery.

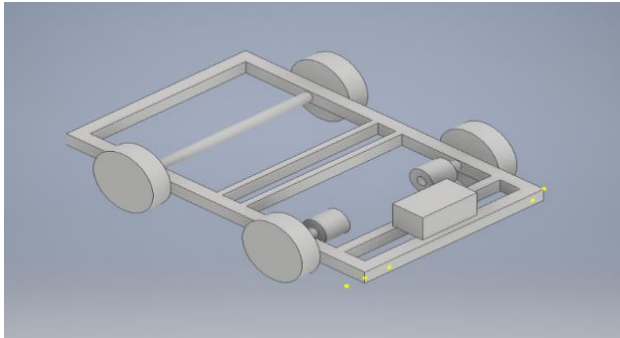


FIG 1. CAD MODEL OF BODY FRAME

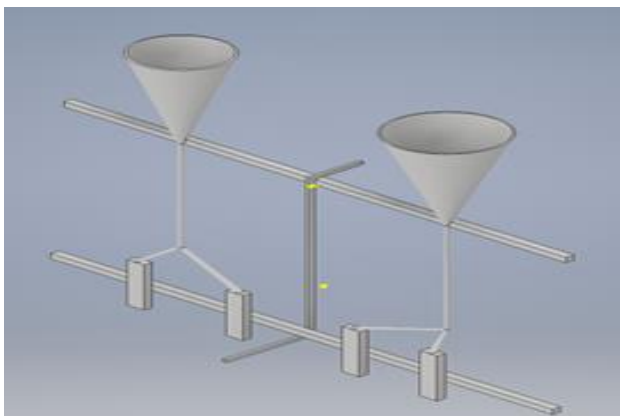


FIG 2. CAD MODEL OF SOWING MECHANISM

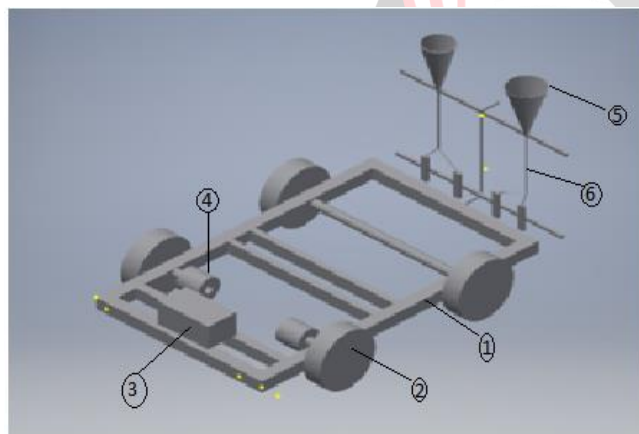


FIG 3. CAD MODEL OF AGROBOT

V. STANDARD COMPONENTS USED

The model mainly consist of few main part

1. Frame
2. Wheel
3. Power source (battery)
4. Motor
5. Funnel
6. Connection pipes
7. Microcontroller circuit

VI. DESIGN CALCULATION

MATERIAL	SPECIFICATIONS
Frame	Rectangular (60x40) cm

Motors for wheels	200 rpm and high torque
Motors for mechanism	60 rpm
Wheels	20 cm
Frame material	Aluminum 6063 T6
Seed Sowing Mechanism	Nozzle type
RF Transmitter and Receiver	2.4 GHz 6 channels
Battery	12V rechargeable

Table no 1. Material Specifications

Weight (W) = 30kg

Frame weight = 10kg

Mechanism weight = 15kg

Battery weight = 5kg

FOS = 20% (for weight)

For maximum conditions,

$30 + (20 \times 20 / 100) = 34\text{kg}$

Bot based on 4 wheels,

Therefore,

For 1 wheel thrust = $34 / 4 = 8.5\text{kg}$

$F = m \times g$

$F = 8.5 \times 9.81 = 83.385\text{N}$

i.e. approx. 86N

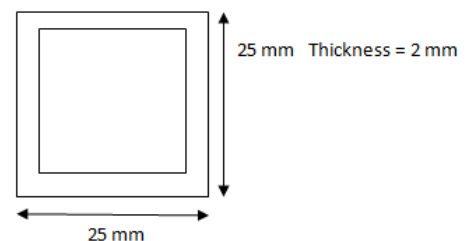
Max speed of bot (assumed) = 6 km/hr

Velocity = $6 \times (5 / 18) = 1.67\text{ m/s}$

Power = $86\text{N} \times 1.67\text{ m/s}$

Therefore, Power = 143.62 watt

DESIGN FOR BENDING STRESS:



Calculation:

$[\sigma_b]_{\text{permissible}} = 124\text{MPa}$

Aluminum 6063 T6

FOS = 02

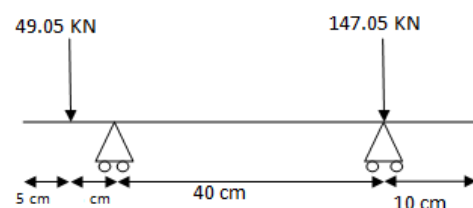
$$I = \left[\frac{BD^3 - bd^3}{12} \right]$$

$$= \left[\frac{25 \times 25^3 - 21 \times 21^3}{12} \right]$$

$$I = 8.172 \text{ mm}^4$$

Battery load = $5 \times 9.81 = 49.05 \text{ KN}$

Mechanism Load = $15 \times 9.81 = 147.05 \text{ KN}$



Bending Moment = $M = 63.705 \text{ Nm}$

$$[\sigma_b] = \frac{M}{I} \times Y$$

$$[\sigma_b] = \frac{63.705}{8.172} \times 12.5$$

$$[\sigma_b] = 97.44 \text{ MPa}$$

$$[\sigma_b] \leq [\sigma_b]_{\text{permissible}}$$

Hence Design is Safe

VII. CONCLUSION

The following are the expected results from the proposed system.

- The main focus of this system is its Automatic way of sowing the seeds. The seeds are been sowed in an appropriate routine which results into a suitable growth of seeds.
- This automatic way of sowing seeds using a robot reduces the labour 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 a robot the seeds are been dispensed in the soil in a proper sequence hereby reducing the wastage of seeds.
- This robot will help the farmers to do the farming process efficiently. The main thing about the project is to make an efficient and low cost robot which can be afford by the small farmers.

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