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Multipurpose agriculture six-legged robot for seeding and watering

P.Janagarathinam[1], S. Naveen[2], R.Navaneethan[2], S. Karthick raja[2], K. Prakash[2],

[1]Assistant Professor, [2]UG Students

Department of Mechanical Engineering, SNS College of Technology, Coimbatore -35, Tamil Nadu, India.

[1]*janagan12345@gmail.com*, [2]*mail2navii@gmail.com*

Abstract - Over 70 % of the rural households depend on agriculture. Agriculture is an important sector of Indian economy as it contributes about 8.4% to the total GDP and provides employment to over 60% of the population. Indian agriculture has registered impressive growth over last few decades. In the subject of our research we have selected a six legged robot which is biologically inspired by insects. We are focusing mainly on locomotion on uneven terrain using opposite gait of locomotion. The six legged Robot has been designed to navigate smooth and irregular terrain. The stabilization of legs is inspired by biomimetic stepping leg transferences with an active balance control so as to reduce the propagation of instability while performing rapid stepping actions for a fast walking gait. Robotics has borrowed from nature with varying degrees of abstraction, from physical appearance to observed behaviors. This paper describes the proposed design and construction for the six legged normally called as hexapod robot to navigate on the uneven terrain. This robot is mainly used in agricultural purposes which can seed and spray the water automatically.

Index words - Agriculture, Six legged robot, seeding, watering

I. INTRODUCTION

Agriculture being one of the major occupation in India, it is very essential to discover andimplement new idea in this field, though lot of work has been done in this area. It is unfortunate that, these ideas are not been implemented properly in actual field. This is due tohigh cost and is complicated for rural people.The hexapod is an insect inspired robot which has six legs that enables to move flexibly on various terrains. The main advantage of this type of robot is its stability.

The nature inspired the researchers and new innovative ideas come in mind but sometimes they are simple and effective, sometimes cumbersome and critical. One of the first walking machines was developed in about 1870 by Russian Mathematician Chebyshev. This walking machine had four legs arranged into pairs. Legged machine have been used for at least a hundred years and are superior to wheels in some aspects.

Legged locomotion should be mechanically superior to wheel or to tracked locomotion over a variety of soil conditions and certainly superior for crossing obstacles.

Fig No.:-1.1 Hexapod

The main aim of agricultural robotics is apply robotics technologies on the field of agriculture as well as the agricultural challenges to develop new techniques. Now days, no one can end up the day without using any kind of embedded system products. It makes our human life very robust and makes work comfortable. A robot which performs manual and automatic operation, this is useful for the humans.

At the same time there is urgency to better exploit potential of rain fed and other less endowed areas. Given the wide range of agro ecological setting and producers, Indian agriculture is faced with a great diversity of needs, opportunities and prospects. All the processes are advance to modifying the mechanism in farming which works automatically without the man power requirement.The small machine would be assembled from existing mass produced components without the need of specialized design and tooling. Also energy require to this machine is less as compared with tractors or any agricultural instrument.

LITERATURE SURVEY

[1] Vishnu Prakash.K et al This autonomous vehicle moves through the crop lines of a Agriculturalland and performs tasks that are tedious and/or hazardous to the farmers. First, it has been equipped for spraying, but other configurations have also been designed, such as: a seeding ,plug platform to reach the top part of the plants to perform different tasks (pruning, harvesting, etc.), and a trailer to transport the fruits, plants, and crop waste.

[2] Mahesh R.Pundkar et al High precision pneumatic planters have been developed for many verities of crops, for a wide range of seed sizes, resulting to uniform seeds distribution along the travel path , in seed spacing**.** At a time multiple strips are utilize/used for sowing process. This method will be achieve the great efficiency and accuracy. From this we get idea that if we use the belt having small holes with defined thickness then it is beneficial for our project. As our automatic seed feeder is only for small seeds then using of conveyor belt with motor is useful.

[3] Kyada.A et al This research paper presents design and development of manually operated seed planter machine. In this they present objective of seed planter machine design, factors affecting seed emergence, some mechanisms. 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 recommended seed to seed spacing and depth of seed placement vary from crop to crop and for different agro-climate conditions to achieve optimum yields. From this we know that mechanical factors effects on seed germination like uniformity of depth of placement of seed, uniformity of distribution of seed along rows. In this power transmission mechanism, seed meter mechanisms, plunger mechanism etc. mechanisms "are used.

[4] P.P. Shelke et al Concludes that bullock drawn planters are Becoming necessity for sowing as the skilled workers for Sowing are almost diminishing. Planting distance and plant Population are crucial factors in maximizing the yields of Crops**.** **"**Effects of sowing method and seed rate on growth and yield of wheat"

In Pakistan has evaluated three sowing methods and seed rate in a four replicated rcbd method and concluded that drilling method of sowing at seed rate 125 kg/ha is optimal for yield and quality of wheat grains, because the said sowing method and seed rate distribute seed uniformly and desired depth which provide appropriate depth for seed germination and crop establishment.

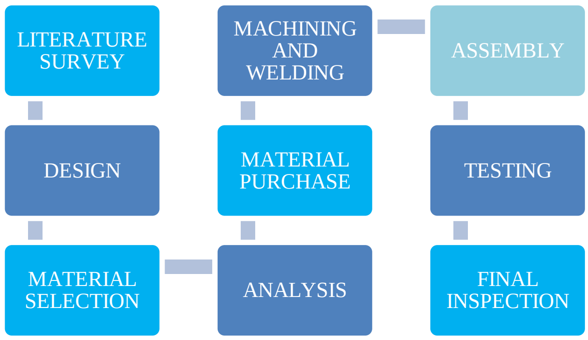
[5] Kannan.A et al This research paper presents design modification in multipurpose sowing machine. In this they present that for sowing purpose we import the machinery which are bulk in size having more cost. To prevent this they design multipurpose sowing machine which consists of hopper, seed metering mechanism, ground wheel, power transmission system, seed distributor, and tiller. In this they design model on PRO-E software. Actually the working is very simple as the tiller rotates it directly transmit motion to ground wheel which directly connected through main shaft. A main shaft has a disc with scoops inside the hopper. When the ground wheel rotates the main shaft also rotates with the help of power transmission system.

The scoops collect the seed from hopper and leave it inside the seed distributor. The tiller is having very good contact with ground.

III METHODOLOGY

The system design is achieved depending upon the requirement. The system has 2 main sections robot and control system. The robotic station possesses the seeds dispenser, seed storage, water storage, water dispenser, the robot system with motor and power supply.

The robotic mechanism played by their internal motor and motor drives that drives the motor in desired direction. Robot will move by forward and reverse direction controlling by switches. The seeds are sowed in 2 rows at a single instance.



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IV EXPERIMENTATION

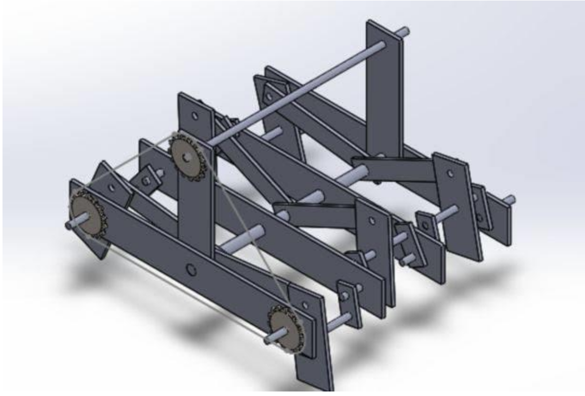
Design calculation

Dimensions of the Bars
(lxbxt)=300mm x 25mm x 5mm
Dimensions of Main leg
(lxbxt) =180mm x 25mm x 5mm
Dimensions of supporting legs
(lxbxt) =45mm x 20mm x 5mm
Dimensions of centre rod
(l x d) =300mm x 10mm
Welding joint plate
(l x b) =70mm x 40mm
Length of the chain
(l) =900mm

Calculation of degrees of freedom
In general, number of degrees of freedom of a mechanism is given by,
(n = 3 (l – 1) – 2 j)
Where,
n – Degree of freedom
l – Number of links
j – Number of binary joints

Calculation of gears
Pitch Diameter,
d1 = m x Z1
= 1x36 = 36mm
Diametric Pitch,
DP = Z1 /d1
= 36/40 = 0.9mm-1
Outside Diameter,
Do = (Z1+2)/DP
= (36+2)/0.9
= 42.2 mm.
Addendum,
a = 1/DP
= 1/0.9
= 1.08 mm.
Dedendum,
d = 1.157/DP
= 1.157/0.9
= 1.257 mm.
Working depth
=2.25m
=2.25*1.11
=2.49mm
Tooth thickness
=1.5708mm
=1.5708*1.11=1.7435mm
Minimum bottom clearance
=0.25m
=0.25*1.11
=0.2775mm

V 3D MODELLING



VI RESULT AND DISCUSSION

Link parameters		Link 1	Link 2	Link 3
Mass (kg)	**m**	0.152	0.04	0.106
Length (10-3 m)	**L**	85	115	100
Moment of Inertia (10-4 kg-m2)	**Ix**	1.00	0.23	0.22
	Iy	8.28	3.07	10.00
	Iz	9.09	2.91	10.01

In this section, simulation results of the above mathematical model have been discussed in detail shows the physical parameters of each leg of the six legged robot used in computer simulations. The leg stroke of the tripod gait and body height are assumed to be equal to 0.14 m and 0.13 m, respectively
.

VI. **CONCLUSION**

The six legged robot have been carried out in the present study. The direct and inverse kinematic analysis for each leg has been conducted in order to develop the overall kinematic model of a six-legged robot. The problems related to trajectory generation of legs have been solved for both the swing and support phases of the robot. It is important to mention that trajectory planning problem during the support phase has been solved using the least squared method.

An attempt has been made in present study to obtain optimal distributions of feet forces. It has been observed that the middle legs are subjected to more force than corner legs. Joint torques have been calculated using Lagrange-Euler formulation of the rigid multi-body system. The developed kinematic and dynamic models have been examined for tripod gait generation of the six-legged robot. This work can be extended to tackle the problems related to tetrapod and non-periodic gait of the walking robot.

VII REFERENCES

[1] Mahesh R. Pundkar :-"*A seed sowing machine: A review*" IJESS volume 3, Issue 3. ISSN: 2249-9482, International journal of engineering and social science.

[2] A. Kyada **:** "*Design And Development Of Manually Operated Seed Planter Machine*" of Lecture 5th International &26th All India Manufacturing Technology, Design and Research Conference (AIMTDR 2014) , IIT Guwahati, Assam, India. Vol 2.

[3] D. Ramesh :-" *Agriculture Seed Sowing Equipments : A Review*" , ISSN N0.:2278-7798,Volume3.

[4] Priyadarshini.M: "*Autonomous System for Cultivation Process*", Sree Buddha College of Engineering for Women, Elavumthitta, International Journal For Advance Research In Engineering And Technology, ISSN 2320-6802, Vol. 2, Issue VI, June, 2014.

[5] P.P. Shelke:-"*frontline demonstration on bullock-drawn planter enhances yield of soya bean crop* ." International journal of farm science 1(2):123-128, 2011.

[6] R K Bhansal ,SOM, Lakshmi Publications, ISBN 9788131808146, pg 237-294.

[7] A.Kannan JAN 5014 "*Design And Modification Of Multipurpose Sowing Machine*" VOL:2 ,ISSN (ONLINE): 2321-3051.

[8] B.Shriprasad, 2010 "*Design And Implementation Of Seeding And Fertilizing Agriculture Robot*" , Volume 1(3)190-213.

[9] Roshan V.Marode OCT 2013 "*Design & Implementation Multiseed Sowing Machine*", Vol : 2,No. 4, ISSN No.: 2278-0149, patented.

[10] Rohokale , 2004 "*International journal of advanced agriculture system with proper seed spacing*".

[11] Nithin P V. "*Multipurpose agricultural robot*" Volume No.5 Issue: Special 6, pp: 1129 – 1254, International Journal of Engineering Research.