Volume 13 Issue 36
Originally issued as J2

Global Journal of Researches in Engineering
General Engineering
Volume 13 Issue 2 Version 1.0 Year 2013
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4596 Print ISSN:0975-5861

Renewable Energy based Agrobot

By R. Krishna
Thiagarajar College of Engineering, India

Abstract - This paper deals with mechanising agricultural process through electronic and embedded components. The aim of the paper is to elaborately explain the processes done by the so called agrobot.

Keywords : *renewable energy, PLC, RF module,vaccum pumps.*

GJRE-J Classification : *FOR Code: 850599*

Strictly as per the compliance and regulations of :

© 2013. R. Krishna. This is a research/review paper, distributed under the terms of the Creative Commons Attribution-Noncommercial 3.0 Unported License http://creativecommons. org/licenses/by-nc/3.0/), permitting all non commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

Renewable Energy based Agrobot

R. Krishna

Abstract - This paper deals with mechanising agricultural process through electronic and embedded components. The aim of the paper is to elaborately explain the processes done by the so called agrobot.

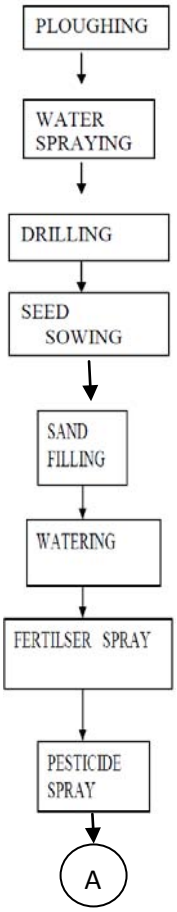
Keywords : *renewable energy, PLC, RF module,vaccum pumps.*

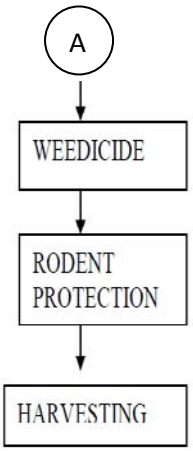
I. Introduction

Agriculture is the backbone of Indian economy. But the state of agriculture is in its decreasing trend. This is due to lack of mechanization. Moreover there is a need for a combination of electrical and agricultural scientists working together for the development. This increases the per hectare productivity of the agricultural land.

Electricity for this can be obtained from renewable energy resources like solar energy. Thus this robot is a clean energy based farmer friendly device.

II. Agricultural Processes





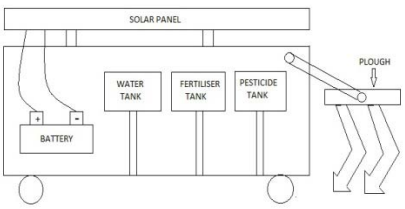
III. Design of Robot

A robot has to be designed to do all these jobs in an efficient as well as marketable manner such that it helps farmers from hectic workforce. For a case study this paper aims at designing a agrobot for vegetable crops.

IV. Ploughing

The robot has a transmitter and receiver circuit with which remote controlling activities can be done.

The robot has two notches on either of its lateral surfaces ,upon which a multi teeth plough can be attached .The robot can be moved using the remote according to wish of the farmer .Hence the entire farmland can be ploughed.



Author : Thiagarajar College of Engineering.
E-mail : krinampad@gmail.com

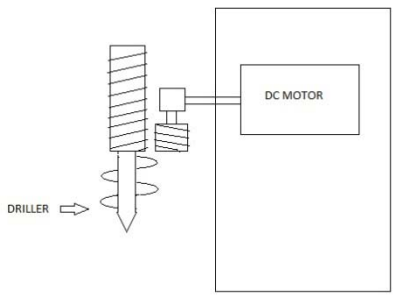
© 2013 Global Journals Inc. (US)

V. Water Spraying

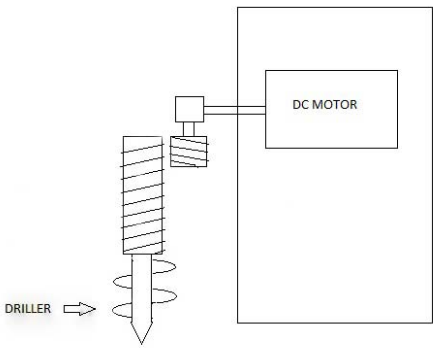
The robot consists of a water tank .The outlet of water tank is passed through a tube that deviates into two passages each electronically controlled. One of the passage is attached with a sprayer at its end during this spraying process the passage one is electronically opened and the water is sprayed throughout the field such that robot can easily drill for further processes as said below.

VI. Driller

In order to perform a drilling mechanism a driller, which is a rod is used. The long rod consist of an upper portion that is manufactured with threads. Another small gear which also consists of threads is placed abut to the rod. During the first sequence the small gear is placed at the bottom position of the rod. The small gear is connected to dc motor. Hence actuating the motor moves the small gear up and the rod down thus performing the driller action. The depth to which the drill has to be produced can be programmed thus running the motor for the stipulated time.



In order to lift the driller from the sand the dc motor is rotated in the opposite direction just by changing the terminals of the motor.

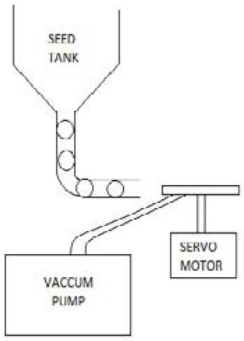


VII. Sowing

The sower mechanism system is at a distance of say **'x'**. This x is loaded to the microcontroller system. After drilling is over, a distance of **"x" is moved** by the robot and sowing is done.

Sowing mechanism consists of following component.

1. **A seed tube** [normally **L** shaped]
2. **A nozzle with air pressure source**
3. **Apivot and a servomotor mechanism.**



VIII. Working

1. Seeds are loaded in the tube (**"X" >size of seed). Where "X" is the diameter of the seed tube.**
2. **A** lengthy tube connected is connected with an air pressure gauge (**"Y"<< seed size).where Y is diameter of nozzle tube.**
3. This tube is upon a pivot connected with a servo motor mechanism .
4. Now air pressure is created using the air pressure gauge and hence the seed is aborbed.
5. Now using servo motor the tube is rotated 90 degrees whose values is loaded in micro controller and then moved a distance downwards depending on the height of the base of the robot.
6. Now the pressure is made zero dropping the seed into the hole created in the sand.

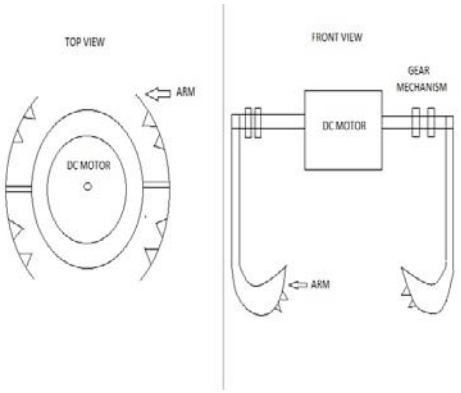
IX. Filling With Sand

The robot consists of sand filling mechanism ,the aim of which is to fill the holes drilled for sowing. This can be done in one of the two ways.

The first method consists of two flat plates with few teeth. The plates are mounted facing each other, on long rods. These rods are connected over a common horizontal axle. The axle is designed in such a way that when rotated by a motor the two long rods move towards each other. This in turn moves the plates towards each other. In doing so the plates displace the sand into the hole. Then a flat plate is pressed against the sand so that it fills the hole evenly.

A **brush with round structure is made to rotate in 360 degrees** 6 to 7 times so that it can move sand into the hole thus filling it.

© 2013 Global Journals Inc. (US)



X. Ramping of Soil

Once the soil is heaped towards the hole and covered using a brush, it has to be ramped such that surface is even. For this purpose a big ramp is used. The ramp is a round structure, it is connected with a metal rod on the top with some spikes. A gear is in abut to it.

First in order to move the ramp the gear is in the bottom of the rod of the ramp. The gear is connected to a dc motor that is actuated when necessary using a microcontroller .The ramp is moved a distance greater than that of the distance between the base wheel and

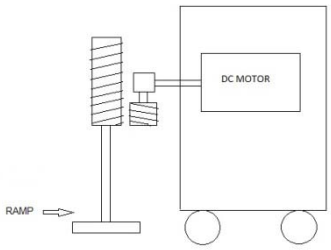
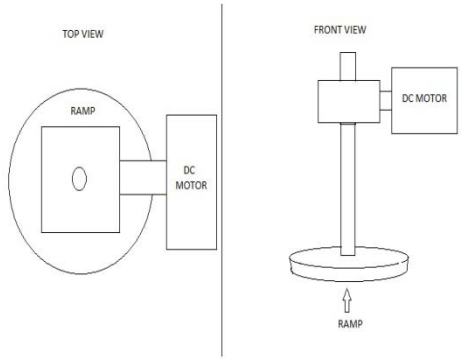


Figure : Ramp Moving Down

inner structure of the robot so as to give a pressing action.



The ramp is moved up after completing the pressing action by changing the polarity of the motor.

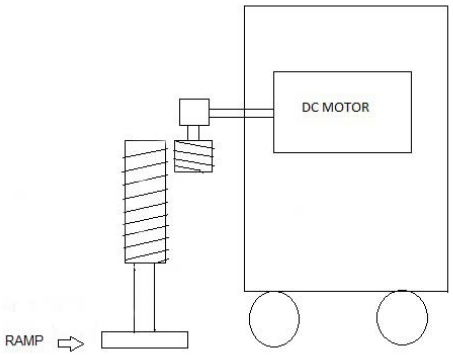


Figure : Ramp After Pressing

XI. Watering of Plants

Soils are of many types namely sandy ,loamy, clayey in nature .Different soil requires different quantity of water to be added for better growth of plants and to avoid water logging. For eg.)the sandy soil require daily watering whereas loamy soil requires water once in 2 days and clayey soil soil requires watering once in 3 days.

Watering can be done in following ways:

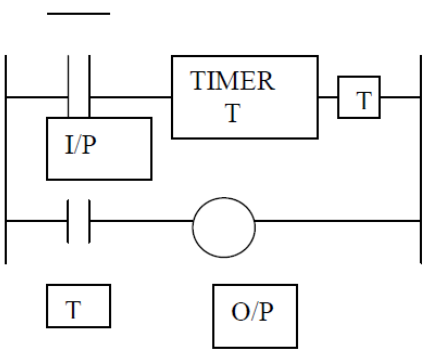
Let the flow rate of water for particular tube depending on design

="R"

Let the quantity of water incase of a vgetable in a particular place

= "Q"

Then time = R x Q ="T" is calculated.This "T" is loaded in the timer of PLC.



I/P =Input

O/P =Output

Here the output is the water flowing out of the pipe. The water coming out is given to plant through passage 2as mentioned previously.

Watering is done using a tank mounted on the robot. The valve that controls the water flow is actuated from a remote control thus giving the farmer freedom to water places of his wish.

© 2013 Global Journals Inc. (US)

XII. Accurate Fertiliser Mixing

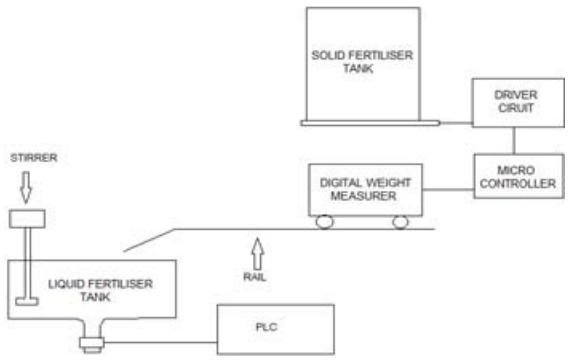
The fertiliser if is a solid a premeditated addition of the fertiliser and mixing of it in the water has to be done. this is done by the robot in the following ways.

The robot consists of a small tank that can hold solid fertiliser. The end of the tank consists of a movable plate that can be easily actuated using a microcontroller coupled with a driver circuit. This facilitates open close operation of the tank whenever necessary.

The receiving end consists of a digital weight measurer plate. This plate can weigh exact amount of solid fertiliser as required by the user. The requirement can be fed through programme codes.

The plate is magnetically coupled to a small rail and has motors and wheels that makes it to move on the rail when necessary. The rail ends into an inclined fall. The end of the rail has a big open tank from the top ,as the comes in the inclined part of the rail the calculated fertiliser amount is dropped into this tank.

This tank consists of a stirrer that mixes calculated amount of water with the fertiliser. Thus the fertiliser is ready to be applied to the field.



a) *Fertiliser Aplication*

If the fertilizer to be used is a liquid it is manually poured in the fertilizer tank. The same logic as that of water pouring is used to give fertilizer to plant.

b) *Pesticide Application*

The amount of pesticide to be applied to plants is also done the same way as that of water irrigation, The pesticide is present in pesticide tank.

In addition the pesticide coming out is poured through a sprayer .since the pesticide has to be sprayed to the whole plant, a small rail is placed vertically upon which the sprayer can move.

c) *Solar Panel*

A solar panel is placed at a height from base cliffs along with a manual tracker system. The solar panel is capable of producing 30 V and output of the panel is used to charge a lead acid battery placed inside the robot. This is also used to run other appliances inside.

The tracker can be placed in three positions manually they are 45 degrees towards south,180 degrees , 45 degrees towards north.

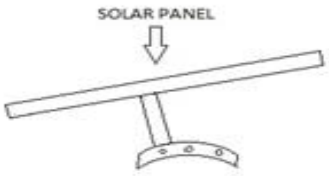


Figure 1 : 45' SOUTH

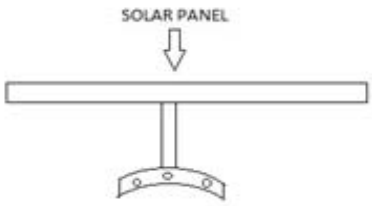


Figure 2 : 180' NOON

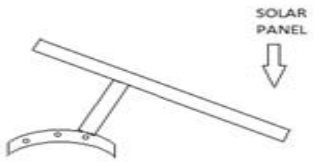
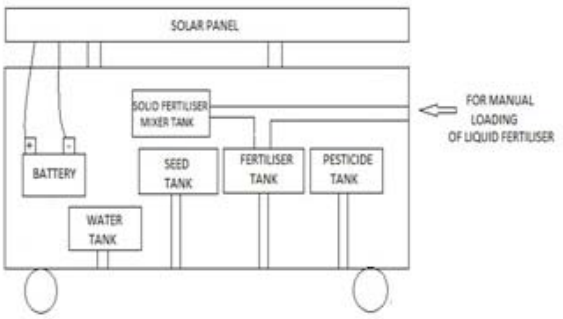


Figure 3 : 45' NORTH

d) *Future Improvements*

1. Weed removal by robot
2. Rodent protection
3. Harvesting

XIII. Overall View



XIV. Conclusion

Hence this robot has centralized automated system to perform almost all agricultural applications.

References Références Referencias

1. www.agrobot.com
2. www.wikipedia.com
3. www.google.com

© 2013 Global Journals Inc. (US)