Multipurpose Agricultural Robot

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Abstract: This paper is to develop a robot capable of performing operations like automatic seeding, irrigation, fertilization. It also provides manual as well as auto control. The main component here is the ARDUINO that supervises the entire process. At the present time, robots are increasingly being integrated into working tasks to replace humans especially to perform repetitive task. Seeding is one of the first steps in farming. During this process seeding is carried out in all the rows of the farming plot. In irrigation process, the soil sensor used for monitoring the environmental condition. It checks this level and alerts the farmer, then slowly applies small amount of water to the planted seeds in all the rows of the farming plot. The fertilization process is same as irrigation process but some crops need fertilizers when the seed germinates and the plant begins to grow. The robot works on solar energy.

Keywords: Solar panel, ARDUINO, Seeding, Irrigation, Fertilization, Soil sensor.

I. INTRODUCTION

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. The 21st century is said to be century of creation, progress, globalization and so much else, but the second side too, that is nothing but 21st century is century of the population, global warming, drought and cloud burst also helpless health factors! Automation in agricultural robotics system has been developed to implement a number of agricultural productions in many countries. Such as picking, harvesting monitoring, weeding, seeding, fertilizer, irrigation. But in this project functions included are soil based applications of Seeding, Fertilizer, and Irrigation. The purpose of this project is to design, minimize the labour of farmers in addition to increasing the speed of the work as well as increase the yield of agriculture.

A robot which performs manual and automatic operation, this is useful for the humans. In this project, it is shown that the farm cultivation process in autonomous agriculture system which is controlled by ARDUINO. The technique of seed operation in sowing is based on row per column depending on the types of cultivation. The irrigation process slowly applies water to the sown seeds in all the rows and columns of the farming plot. In fertilization process, fertilizer is sprayed on all the plants.

II. PROPOSED SYSTEM

In this system Agribot is a robot designed for agricultural purpose. Here our purpose is to build a system whose data is acquired through the use of X, Y, Z plotter (Open Source System). The robot can be autonomous or controlled manually and can perform variety of tasks with great accuracy. In this project there are two switches, auto and manual.
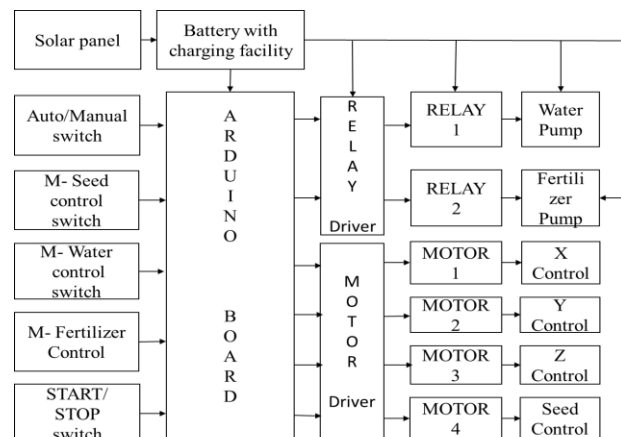

Fig. 1. Block diagram of proposed system

A. Auto / Manual Switch
This switch is used to operate our farm boat in either Automatic Mode or Manual Mode.

B. M- Seed Control
This switch is used for manual Seed Control. If you press this switch then only seeding operation is done automatically.

C. M-Water Control
This switch is used for manual water feed Control. If you press this switch then only watering operation is done automatically.

D. M-Fertilizer Control
This switch is used for manual fertilizer feed Control. If you press this switch then only fertilizer operation is done automatically.

E. Start / Stop Control

This switch is used to start or stop the project operation.

F. ARDUINO Board

ARDUINO does not need separate piece of hardware (programmer). In order to load new code on to the board you can simply used a USB cable. It is a flexible.
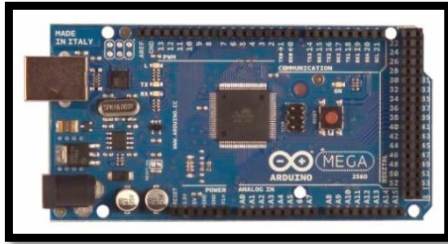

Fig. 2. Arduino board

G. Relay Driver

The operation of relays driver is to switch on or off the relay.

H. Motor Driver

Specially used to drive the DC motors. In our project motors are used to control the direction in x, y, z axis and seeding control.

I. Relay

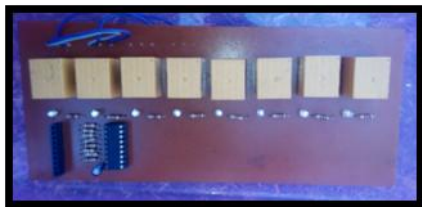This electromechanical switch is used to operate pumps. These pumps operate on 12V DC.

Fig. 3. Relay board

III. WORKING

A. Manual Operation

When manual switch is pressed, manual operation is performed as follows, when M-seed control button is pressed, then seeding is carried out in all the rows of the farming plot. When M-water control button is pressed, then the planted seeds in all the rows of the farming plot are watered. When M-fertilizer control button is pressed, then fertilizer is sprayed on all the plants. Some crops want fertilizers when the seed germinates and the plant begins to grow. Manual operation is best suited for such crops. The other crops can work with automatic operation.

B. Automatic Operation

The other technique used is auto mode. In this system when auto switch is pressed, M-seed control, M-water control and M-fertilizer control operations are performed

automatically. For robot motion X, Y, Z plotter is used by DC-motor. This project is developed to carry out the seeding, watering and fertilization operations for one row at a time within the farming plot. In future system are modified for more than one row at a time.

For seeding operation there are different techniques:

- Hydraulic System

In this system vacuum is used to pick the seed and compressor is used for the digging purpose. By using hydraulic system seeding operation is performed effortlessly and accurately. But the cost of the vacuum and compressor are very high. So this is not purchasable for rural people.

- Funnel Technique

In this technique seeds are gathered in the funnel, then top of the funnel is covered by wood material. We create some slope on wood so that the seed will move out from the funnel. This hole connects to the seeding pipe. To rotate the motor we use dc motor. In this project funnel technique is used for seeding.
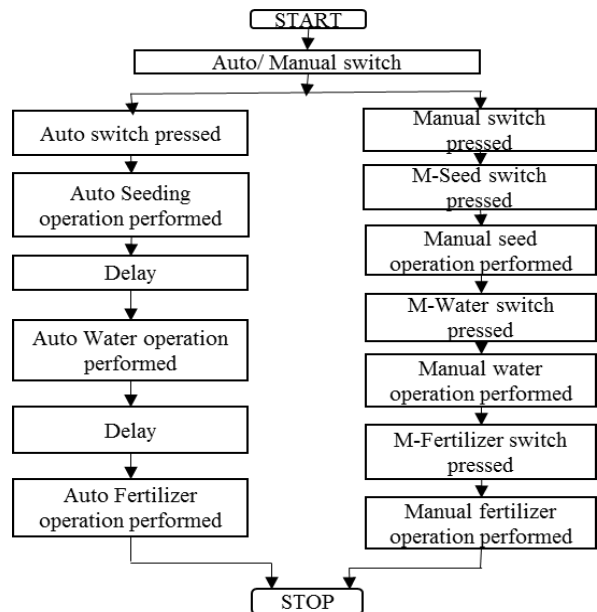
IV. FLOWCHART

Fig. 4. Flow chart

V. EXPECTED RESULT

The robot operates on automated mode as well as manual mode. The main purpose of manual mode is, if you require anyone function then press particular manual switch. Suppose M-water switch is press then watering operation is performed. In auto mode, when auto switch is pressed then all operation like seeding, Irrigation, Fertilization are perform automatically. All manual and auto mode operations are performed on open source system. For power consumption purpose use renewable (Solar) energy.

TABLE I

Switch	Condition	Output
Start	ON	System started working condition.
M-Seed	ON	Seeding is carried out all the rows.
M-Water	ON	Seeds are watered.
M-Fertilization	ON	Fertilizer sprayed on the plant.
Auto	ON	Three function performed is automatic.
Stop	ON	System is at halt.

OPERATION OF OUTPUT

VI. CONCLUSION

This project is mainly based on minimizing man power as well as cost of the equipment. The robot can be with open source system instead of normal robotic car. Automation is needed such as industry, bio-medical, survey line etc. Especially in agriculture field for increasing yield of crops. Flexibility of automation system is high than traditional system. The advantage of this system reduce the labour cost, and time. In this work a robot is built and established to carry out automatic and manual seeding, Irrigation, Fertilization in an agriculture field. The functioning of the robot is performed by renewable energy like solar energy. It is expected that the robot will support the farmers in improving the efficiency of operations in their farms.

It can help the farmers in the initial stage of agriculture.

TABLE II COMPARISON BETWEEN TRADITIONAL AND MODERN METHOD

Sr. No.	Parame Ter	Traditio nal	Tractor	Robo tic
I	Speed	Slow	High	Very high
II	Man power	More	Moderate	Less
III	Time required	More	Less	Less
IV	Sowing technique	Manually	Manually	Automatic ally
V	Required energy	High	Very high	Less
VI	Yield of crop	Low	Moderate	High

VII. FUTURE SCOPE

Apart from seeding, irrigation, fertilization and fruit picking, harvesting, weeding, monitoring etc. can also be implemented in this robot. And one or more system can be, monitoring through the image processing and GSM system. Then it also includes weeding and harvesting in this system.

VIII. ADVANTAGES

- No wastage of water.
- Time consumption.
- Less manpower is required.
- Row to row spacing can be adjusted.

IX. APPLICATIONS

- **Nursery**

The Agribot is used in nursery for row to row spacing can be adjusted, Required seed spacing can be achieved as well as variety of seed can be sowing by this robot.

- **Farm**

In farm Agribot is used for planted seeds in all the rows of the farming plot are watered and fertilizer is sprayed on all the plants. Some crops need fertilizers when the seed germinates and the plant begins to grow.

- **Greenhouse**

In greenhouse the Irrigation and Fertilization operation performed precisely.

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