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IOT BASED PLOUGHING and SEEDING ROBOT for AGRICULTURAL APPLICATIONS

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Abstract This project is based on an agricultural model used for ploughing and dropping seeds into the ploughed land using an IoT controlled robot controlled via Wi-Fi module which helps in making an interconnection between the user and the robot allowing him to control over very large distances.

***Key Words*— ploughing, IoT, seeding, agriculture.**

I.INTRODUCTION

This project maintains a bond between modern technology with the old fashion techniques i.e. using IoT and many other emerged technologies used for performing the agricultural activities. This robot helps the farmers in ploughing and as well as seeding removing their stress and in terms increasing/maintaining their product output constantly.

We used the Wi-Fi module (**ESP8266**) to form a bridge between the internet and the model to perform tasks from even far distances which enables this robot to be flexible at working and a 4-channel relay is used for performing the switching operation i.e. **ON** or **OFF** with controls the robot actions/activities on the field. This model is a combination of different components and materials which is required for a specific task. This model basically drills the land in a required manner and drops seeds in a sequential manner and the dropping interval can be changed as per required which is controlled with a solenoid lock.

Also this project deals with watering the land in a controlled fashion by measuring the moisture levels of the land which helps in proper germination of the seeds and spraying pesticides to help in crop production by killing the germs without decreasing the fertility levels of the soil.

DIFFERENT KINDS of SOWING/SEEDING METHODS

There are different types of sowing techniques. That are used in irrigation the below are the techniques used:

a. *Broadcasting*

It involves random scattering of seed on the surface of seedbed which can be done either manually or mechanically.

Advantages-

- It is rather a less time consuming process.

Disadvantages-

- 100% germination is not possible.
- Requires skilled person at the field.
- Seeds can't reach the required depths in the seedbed.

b. *Dibbing*

This is the process of placing seeds in the holes made in the seedbed and covering them. In this method seeds are placed in holes made at definite depth at fixed spacing. The equipment used for dibbing is called *Dibbler.*

Advantages-

- Good germination % is found.
- Seeds can be dropped at required depths.

Disadvantages-

- Time consuming.

c. Drilling

This method consists of dropping seeds in furrow lines in a continuous flow and covering with soil. This can also be done both manually and

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mechanically. This method is very helpful in achieving proper depth, proper spacing and proper amount of seed to be sown in the field.

Advantages-

- *Good germination percentage.*
- *Lesser time consumption than the dibbing.*

Disadvantages-

- *Equipment complexity.*

d. *Seed dropping behind the plough*

It is a very common method used in villages and is used for seed like maize, gram, peas, barley and wheat. A man drops seeds in the furrow behind the plough. Sowing behind is done using *Malobansa*.

Disadvantages-

- Slow process and requires labour.

e. *Transplanting-*

It consists of preparing seedlings in nursery and then planting these seedlings in the prepared field. It is commonly done for vegetable and flowers. Plants are placed using the equipment called a *Transplanted.*

Disadvantage-

- It is very time consuming process.

f. *Hill dropping*

In this method, seeds are dropped at fixed spacing.

g. *Check row planting*

In this method of planting row-to-row and plant-to-plant distance is uniform and seeds are planted along straight parallel furrows. The rows are always in two perpendicular directions. A machine is used for checking row planting called as *Check Row Planter*.

In this project we have implemented the DRILLING method as we found it close enough for our idea.

II.BLOCK DIAGRAM and SIMULATION

The Proteus and the Arduino IDE software's are used for modeling the hardware and to test whether the hardware will function or not. The Proteus software is used to implement the electronic design. The overall block diagram can be shown in the fig **2.1** and the schematic diagrams can be shown in the fig **2.2** and fig **2.3**.

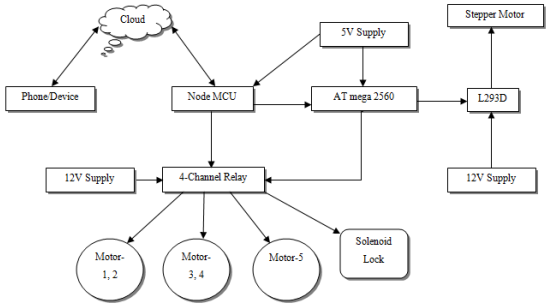

Fig 2.1 Functional block diagram of robot

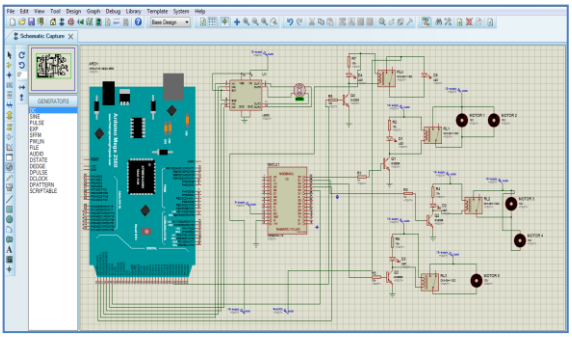

Fig 2.2 Overall schematic diagram

The above block diagram and schematic diagrams represent the circuit connections and the overall model representation related to the functioning based on signals received by the NodeMCU. The NodeMCU receives command from a mobile which is interlinked with a cloud server where the code for the NodeMCU is stored, based on the command the NodeMCU sends signals to the output pins and based on the connections made at the output a specific task is performed. The table below shows the tasks performed by the robot.

Table 1

S. No	Pin Turned HIGH (1)	Relay's Turned ON	Actuator's Turned ON	Motion of the Robot
1	D0	RL 1	Motor-1, Motor-2	LEFT
2	D1	RL 2	Motor-3, Motor-4	RIGHT
3	D2	RL 3	Motor-5	-
4	D3	-	Stepper Motor	-
5	D4	RL 4	Solenoid Lock	-
6	D0, D1	RL 1, RL 2, RL 3, RL 4	Motor-1, Motor-2, Motor-3, Motor-4	FORWARD

III.HARDWARE

The below table consists the components used in the hardware model

Table 2

S. No	Component	Specifications	Type	Quantity
1	Wooden Base	60cm*35cm	-	1
2	DC Motor	Operating Voltage- 12V Operating Current- 4.36 mA Operating Torque- 5 kg-cm Operating R.P.M- 10	-	4
3	DC Motor	Operating Voltage- 12V Operating Current- 0.4363 Amps Operating Torque- 5 kg-cm Operating R.P.M- 1000	-	1
4	AT mega 2560	Operating Voltage- 5V Input Voltage (Recommended) - 7-12V Input Voltage (limit)- 6-20V Digital I/O Pins- 54 (of which 15 provide PWM Output) Analog Input Pins- 16 DC Current per I/O Pin- 20mA DC Current for 3.3V Pin- 50mA+ • Flash Memory- 256 KB of which 8	-	1

		KB used by Boot Loader SRAM- 8 KB EEPROM- 4 KB Clock Speed- 16 MHz		
5	L293D	Motor Voltage Vcc2 (Vs)- 4.5V to 36V Maximum Peak Motor Current- 1.2A Maximum Continuous Motor Current- 600mA Supply Voltage to Vcc1(Vss)- 4.5V to 7V Transition Time- 300ns (at 5Vand 24V)	-	1
6	Stepper Motor	Operating Voltage- 12V Operating Torque- 10 kg-cm	Bi-Polar	1
7	Clamps	-	L	As Per Requirement
8	Wheels	10cm (Diameter)	-	4
9	Battery	Voltage- 12V Energy- 12 Ah	-	1
10	Drill Bit	8mm (Diameter)	Granite	1
11	Solenoid Lock	Operating Voltage- 12V Draws 650mA at 12V, 500mA at 9V when activated Designed for 1-10sec Long Activation Time	-	1
12	Relay	Operating Voltage- 12V	4-Channel	1
13	Nuts and Bolts	-	-	As Per Requirement
14	Funnel	-	Steel	1
15	Connecting Wires	-	-	As Per Requirement

The robot is controlled through a phone which sends a signal to the NodeMCU which in turn sends signals to the output pins, the devices connected at the output respond to the corresponding signal at the output. MOTOR-5 is used to drill the field (MOTOR-5 and the DRILL BIT are coupled) and the seeds are dropped through the funnel at regular intervals. The seed dropping through the funnel is controlled by a solenoid lock which opens and closes at regular intervals allowing the seed dropping to be uniform throughout the process. The stepper motor is used to control the MOTOR-5's position i.e. the angle at which the driller is positioned with respect to the WOODEN BASE. When the drill process isn't necessary the stepper motor will pull back the driller's position in parallel with the wooden base. Likewise the remaining motors are used for controlling the robot's direction.

CONCLUSION

The main focus of this system is automatic way of sowing seeds. The seeds are being sowed in a proper sequence which results in proper germination. The automatic way of sowing seeds using a robot reduces the labour requirement. Here the wastage of seeds is also being reduced to a greater extent. Here with the help of a robot the seeds are been dispensed in the soil in a proper sequence. This robot will help the famers to do the farming process more effectively and efficiently.
Most of the present successful agricultural robot models represent the use of powerful fuel based IC engines and heavy machinery, which requires a skilled technician and causes unnecessary environment pollution and also a reduction in fossil fuel. In order to solve this problem, the use of automation unmanned agricultural is implemented by this model.

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