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Portable Centre Pivot Irrigation System with Advance Control Through Sensors

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***Abstract*:- Sensor has been used to detect the moisture content of the soil, which are used to improve the performance and at the same time saving nature's one of importance gift i.e ,Savage of water. In this project sensors like Rain sensor, Moisture sensor has been used which main function is control the water supply for the specified crops as per their requirement, And hence with the help of these sensors the centre pivot irrigation has been made fully automatic with luetooth controlled car.**

INTRODUCTION

Agricultre has dependably been a focal point of concern as far as generation and water system .The water system application changes with different fields. The strategy of water system of the fields results in the quality of the product of the centre pivot system and portable makes it more simple to convey and simple to deal with in any field. The framework has fixed centre and a long turning arm joined to it which pivots about the inside with the assistance of sham wheel. The task depends on the idea of making the inside turn water system framework compact and programmed with the help of sensors here range sensors is used to indicate the necessity to irrigate the field and moisture sensor is used by detecting how much percent of moisture content is present in the soil .

Centre pivot irrigation is a method of crop irrigation in which the rotating arm is allowed to rotate a circular path having attached a variety of sprinklers, endguns used in between the rotating arm and at the end of the arms respectively, While at the same time major difficulty is the abundant availability of water and fixed amount of water for the variety of crops.

Earlier farmer and even these days farmers irrigate their field through the pumps which brings water from the river by sucking , Little more water damages the crops and unfortunately a big loss often the farmer have to go through so, our project is based on the concept to have limited loss in terms of money as well as also reduces at the certain level "Water Save" policy.

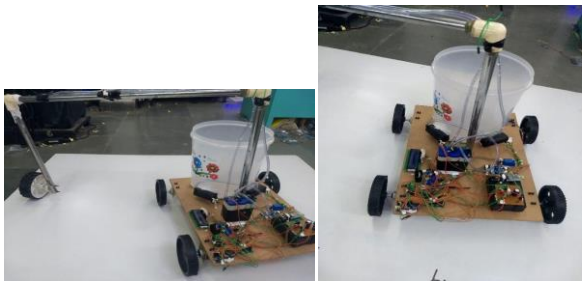

Fig1. Automated centre Pivot irrigation System.

METHODOLOGY

1. This project is based on making the Bluetooth controlled car while at the same time it can irrigate the field as per requirement, with the help of sensors, which are able to detect the soil moisture content.
2. As soon as the soil get already coded moisture content , The rotating arm of the Bluetooth controlled car will stop rotating in its designed circular area and the controlled irrigation as per crop specification and soil requirement can be done easily at optimum cost.
3. The LCD (16x2) has been installed which main function is to show the reading of moisture sensor and the rain sensor which are operated with the help of Arduino Nano Atmega 328 P.
4. Bluetooth module HC05 has been used, which get paired with the mobile Bluetooth controller and used for the movement of the car direction i.e left turn, Right turn, forward, Backward.
5. The rotating arm contains the sprinklers attached in it, while at the end of the arm end guns are attached if required it can also irrigate the field at the same time.

IRRIGATION AREA ANALYSIS (SCALED CALCULATION)

Note: Considered system capacity be 5gpm/acre.
Mathematically: Area of circle computations= πr^2
[1 ft= 2.296 x 10^{-5} acre]

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Table1: Calculation of the irrigation area

Radius (ft)	Total Area (Acres)	Spoke Area	Flow Required (gpm)
120	1.03	1.03	5.15
240	4.15	3.12	15.60
360	9.34	6.42	31.10
480	16.61	10.39	51.95
600	25.96	15.57	77.85
720	37.39	21.82	109.10

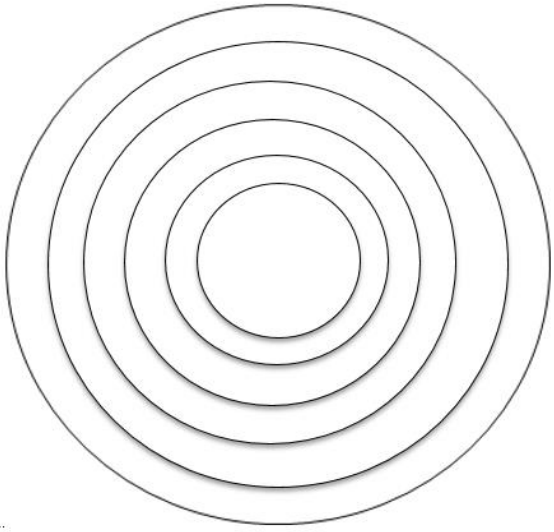

Fig2. Showing irrigated spoke area

HARDWARE COMPONENTS

1. L298N MOTOR DRIVER:-

It is a dual H-Bridge motor driver and we have used it in our project as it allow speed and directions control of the two DC motor at the same time .

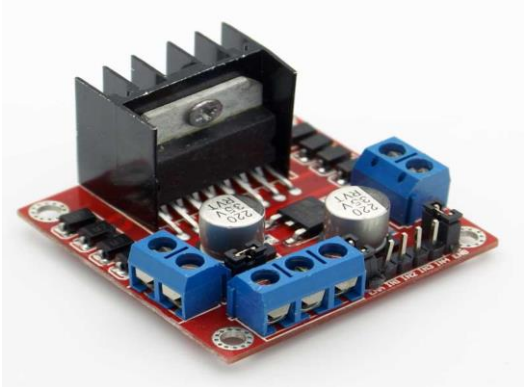

Fig 3. L298N Motor Drive

2. DUMMY WHEEL:

This wheel so called as dummy in our project as its main function is to cover the circle ,for which it has been singed a specified path, without affecting the movement of the automated Bluetooth controlled car.

Fig 4 . (a) Dummy Wheel

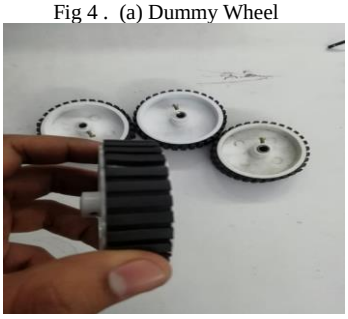

Fig 4 . (b) Operating Wheel

3. LCD(16 X 2):

The main function of LCD is to display the already entered data, But also is has the register i.e command and data . We have displayed the project name, names of the student but here the main purpose of LCD is to display the reading of the sensors i.e Rain Sensor and Moisture sensors. Because the automated car will further only more when the selected area get already specified moisture content in the soil , Various LCD like 20 x4 , 32 x8 are also available in market.

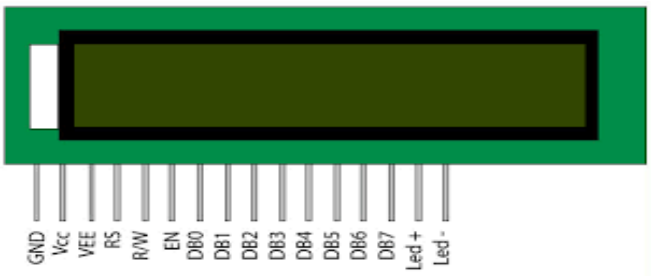

Fig 5. LCD (16X2)

4. ARDUINO NANO ATEMGA 328P-

It is an important component used to control various sensors with the help of programming Arduino Nano atmega 328p is used to control rain and moisture sensor to check the availability of water and its requirement for the irrigation.
Arduino Nano and Arduino Uno are very similar to each other the only difference between them is that of the size of the Uno is twice as large and henceforth consumed more space.

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Table 2: Pin Explanation

Category	Pin Details	Description
1.Power Supply	Vin,3.3v,5v,Ground	Vin- It is the input voltage given to Arduino when utilizing and outer power source (6-12 v).
2.Reset	Reset	Reset the microcontroller
3.Analog Pins	A0-A7	Used to calculate analog voltage in the scope of 0-5 v.
4.I/O Pins	D0-D13	Utilized as input or output pins , 0 volt low and 5 v high
5. Serial	Rx-Tx	Used to get and transmit complete sequential information
6. Inbuilt LED	13	To turn on the inbuilt LED

Fig 6. Arduino Nano Atmega 328p

5. RAIN SENSOR :-

Rain sensor is used in this project to check for the requirement of irrigation in the field of to much rain is not falling . To view its working put few drops of water on the swore it will detect the water and sense the signal to the Arduino to stop the irrigation by stopping the rotating arm of the centre pivot irrigation system . The sensor board present with the rain sensor module act as variable resistor that will change from 100 k ohm when wet to 2 M ohm when dry thus the board the more current that will be conducted.

TESTING – Testing is done by connecting the Vcc to 5v power source and ground try placing few drops of water on the sensor detecting board and both LED should light up.

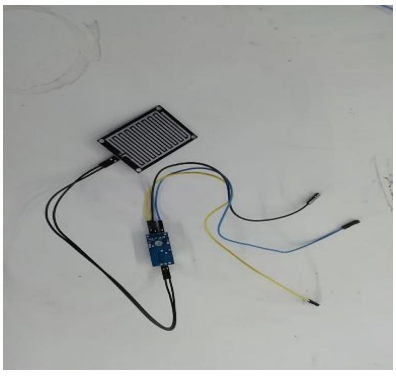

Fig 7. Rain Sensor

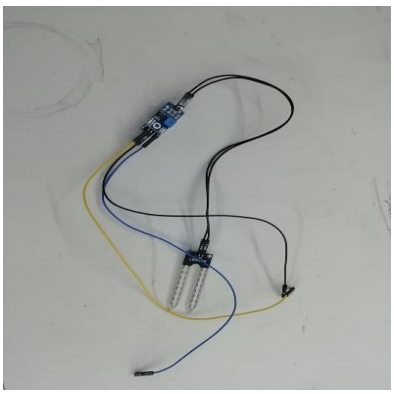

Fig 8. Moisture Sensor

6. MOISTURE SENSOR:

The moisture is used to calculate the water percentage of the soil it is sensed as rain sensor governed by Arduino.

When the soil is having the water shortage the model is at high level and it's sends the signal to Arduino to irrigate the field else output is at low the sensor reminds the user to water the plant and also monitor the moisture content of the soil by displaying it on LED.

SPECIFICATION –

a. Working voltage 5v
b. Working current < 20 mA.
c. Interface type – Analog (may be digital also)
d. Working temperature- 10-30. C

NOTE- If the percentage of moisture is less than 50 % it will sinks the soil and the rotating arm of the centre pivot irrigating system will be irrigating the field for 360 complete rotation .

7. RELAY MODULE :-

A Relay is an electrically worked switch. Many transfers utilize an electromagnet to precisely operate a switch, yet other working standards are additionally utilized, for example, solid state relays. Relays are used when it is important to control a circuit must be constrained by one flag. The first relays were utilized in long separation broadcast circuits as enhancers.

Transfers with adjusted working qualities and now and then numerous working loops are utilized to shield electrical circuits from over-burden or faults. In present day, electrical power frameworks these capacities are performed by advanced instruments still called defensive relays.

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Fig 9. Relay module

8. PUMP-

In our project we have used two pump which main function is to lift water and provide to the sprinklers which can further irrigate the field. As same different number of pumps can be used as per the desired.

SPECIFICATION:

1. **After closing motor valve, pressure above 190kpa.**
2. **450ml/10s large displacement.**
3. **High temperature resistance, above 80 degrees.**

Fig 10. Pump

9. BLUETOOTH MODULE HC05:

In this project we have used Bluetooth module to control the movement of Bluetooth controlled car, which moves right, left, forward, backward. The Bluetooth module is controlled with the help of mobile whose complete control is setup with already coding with the help of ARDUINO NANO Atmega 328P.

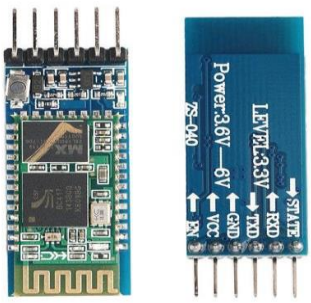

Fig 11. Bluetooth Module HC05

10. FEMALE TO FEMALE CONNECTOR-

Jumper wires are electrical wires with a connector pins at each end which is typically used to interconnect the segments of a breadboard or other model or test circuits, inside or with other gear or parts, without patching.

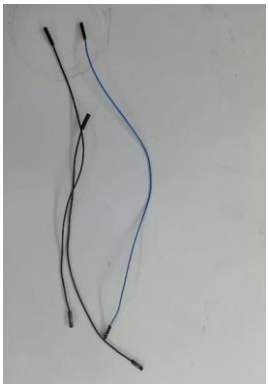

Fig 12. Female to Female Jumper

11. SPRINKLER:

In our project we have used two sprinkler whose direction so setup that it covers the concentric circle that about 78% area of the square theoretically, however when we need to cover more area we can use more number of sprinkler and the type of sprinkler depend upon the area of the field which is to be irrigated.

Also at the end of the rotating arm of irrigation system can include the end guns which can be used to covered the area like hexagon, rectangle, pentagon etc.

Fig13. Sprinkler

ADVANTAGE OF CENTRE PIVOT IRRIGATION SYSTEM :

1. Reduction in wastage of water supply.
2. Adequate and controlled water supply as per the soil and crops requirement.

APPLICATIONS OF CENTRE PIVOT IRRIGATION SYSTEM :

1. In pollutary farms for providing water to the hens in the summer season.
2. For spraying pesticide, spray drift etc. for the crops as per requirement of the soil.

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CONCLUSION

In this project we analysed the working of automated centre pivot irrigation system with Bluetooth controlled car under various different condition of field, environmental conditions, and together with the various modification that can be possible to control the limited and desired amount of water supply as per requirement of crops.

This kind of framework is a decent answer for condition observing of agriculture setups as it is low in expense. This thought ought to be executed to huge scale cultivates as sensor matrices in which every sensor will be treated as a Zig Bee hub.
Proposed framework can likewise be adjusted and utilized so that it can detect the water dimension of the tank and at whatever point this water level is too low then the framework can quickly give a sound caution, at that point it consequently switches on the motor.

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