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Automatic Irrigation using Centre Pivot Irrigation System

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Abstract: ***In most of the agriculture lands the crops are over watered without checking the soil dampness. This leads to the waste of water resource which can be utilized in some other areas where there is in need of water. The project presents the use of correct soil moisture sensors which helps to ease out the pain to monitor and keep records about the changes in soil moisture. Using the Arduino Uno R3 micro controller with, moisture sensor and temperature sensor, temperature are measured and analyzed. The soil moisture sensor for a certain duration, provides information related to the moisture status of the soil. The Arduino Uno will collect and process the data received from the Sensors. When a threshold moisture level of the soil is reached, the water will supply accordingly. This is essential because water must be provided to the plant at a particular time for a good yield. The primary motivation behind the ventures to keep up soil dampness level so that there is no damage to the harvests. Soil dampness sensors fundamentally utilized for estimating the gauge volumetric water content. We are using center pivot irrigation system for application of our project. This project is highly useful for farmers, Nursery professionals for eradicating traditional or Manual method of irrigation system.***

I. INTRODUCTION

Smart irrigation control technology has continuously evolved over the last 15 years. For modern agriculture, a smart irrigation system is one of the best techniques that gives more production in minimum duration. Smart irrigation is fully automated and minimizes manual handling in agriculture. In this we are using Center Pivot irrigation system to irrigate the filed. This spray irrigation is a modern and commonly-used system of irrigating, but it also requires machinery. This system is similar to the way you might water your lawn at home stand there with a hose and spray the water out in all directions. Large scale spray irrigation systems are in use on large farms today. On the Center Pivot system, we require Electric motors to move each frame in a big circle around the field (the tube is fixed at the water source at the center of the circle), squirting water. To execute the project, we have Soil moisture sensor inserted in soil, and which is part of embedded system. Here the soil moisture sensor gives reading of soil moisture on present time of the field and if moisture in soil is decreased to certain level, motor will turn on immediately. And after required amount of water is gained by the field the motor will turn off automatically.

A. Objectives of Project

To understand the basic principle of project

1) Development of the working model of project.
2) To spread the awareness of technology.
3) Use Arduino IDE for coding in Arduino device and various dependencies.
4) Proper research for Arduino device and its circuit.
5) Proper circuit design for the project.
6) Proper testing and debugging of the device configuration.

B. Aim of project

To allow the surveillance of the crops so as to not occur losses. Also maximizing irrigation efficiency and reducing water waste, while maintaining plant health and quality. To improve the utilization of water in irrigation systems.

C. Project Details

Where our project innovation will use? Our project is typically based on Indian farmers. Their efforts and dedication towards their works are not responding to their results, due to change in climatic conditions and irregularities in water supply. So, In order to change this system our project will be much needful for the farmers as well as farming systems.

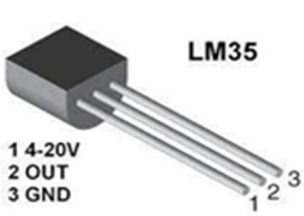
II. WORKING PRINCIPLE

As we are using a soil moisture sensor that,

1) Senses the moisture content in the soil.
2) Send this data to the Arduino that we are using.
3) Soil moisture sensors can send data in both. in analog as well as in digital.
4) So, we are using the analog data here to get the accuracy in the project.
5) We insert the soil moisture sensor in the soil and connect it to the Arduino and the sensor sends the data to the Arduino about the moisture inside the soil.
6) It makes the smart irrigation controller. the Arduino will get the action on the data. According to the condition given in the program, if the soil moisture sensor detects no moisture or very little moisture then the pump will get started and the Center Pivot irrigation system will come in action and it will water the plants. After the field got sufficient amount of water, then the pump will automatically turn off. And the Center Pivot Irrigation system will also get stop.

III. MATERIALS REQUIRED

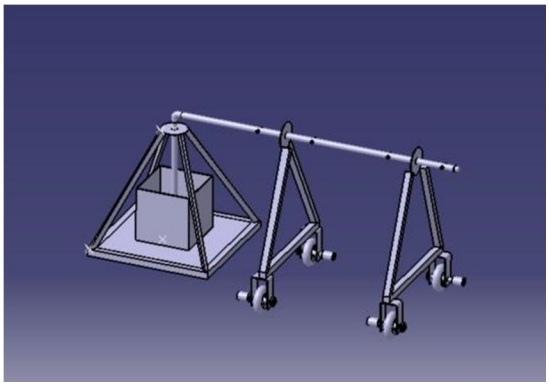
1) Tyre
2) Water Sprinkler
3) 3)Humidity sensor
4) LM 35
5) Jump wires
6) 5V relay
7) Resistor 1K ohm
8) Arduino UNO R3
9) Soil moisture sensor
10) Submersible pump
11) Pipes
12) DC Motor
13) Water tank

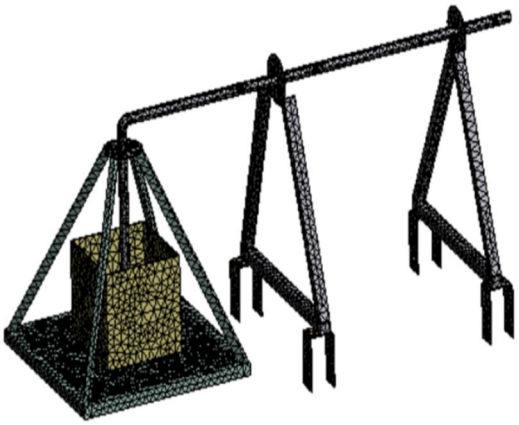


IV. DESIGN CALCULATION

In view of making small model, we are taking
1:20 ratio specifications of actual model of Center Pivot Irrigation System.
Let us assume, Force acting on each wheel= 45N Radius = 80mm
Torque required
r = F × r
= 45 × 0.08
= 3.6 Nm
Power required (P) = $r \times \omega$ Angular velocity (ω) = 2πN

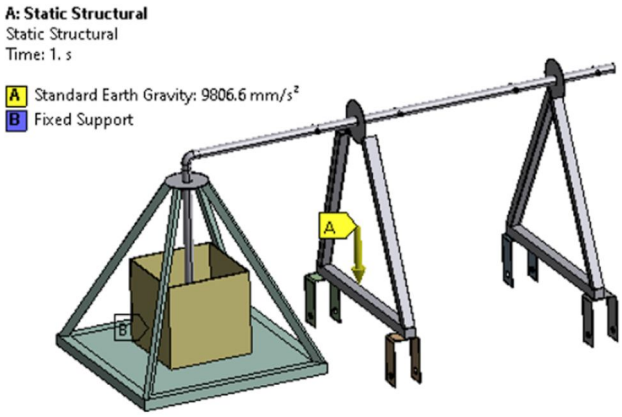
If the system has to make one revolution in one minute, then wheel has to make 24 revolution per minute N = 24 rpm
□ $\omega = 2\pi N$
= $(2\pi \times 24) \div 60$
= 6.28 ÷ 60
= 2.51 rad/sec
Now,
P = $r \times \omega$
= 3.6 Nm × 2.51 rad/sec P = 9.03
Johnson gear motor specification Speed = 10 to900rp
Voltage = 5V to 12V
Output torque = 1Nm to 12Nm Power = up to 12W Pump specification:
Let's say we have to transport 3 litre of water in 1 min.
□ Q_{th} = 2÷60
= 0.050 litre/sec Now,

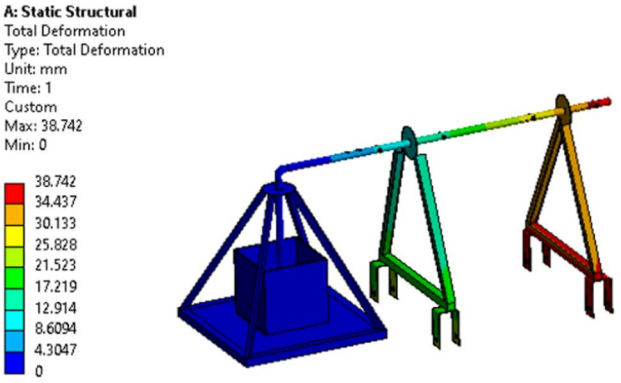


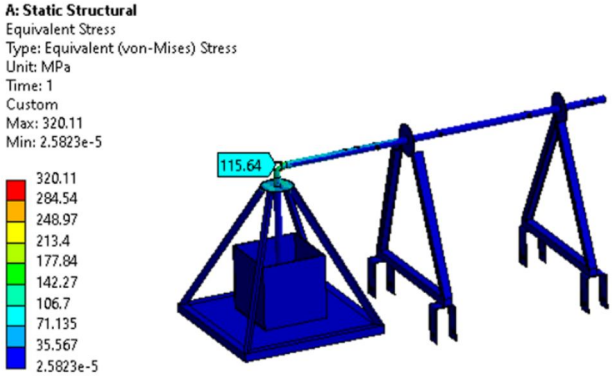


V. RESULT AND DICUSSION

Through this project at the end, we are able to irrigate our farm automatically and efficiently with the help of pivot system and embedded.







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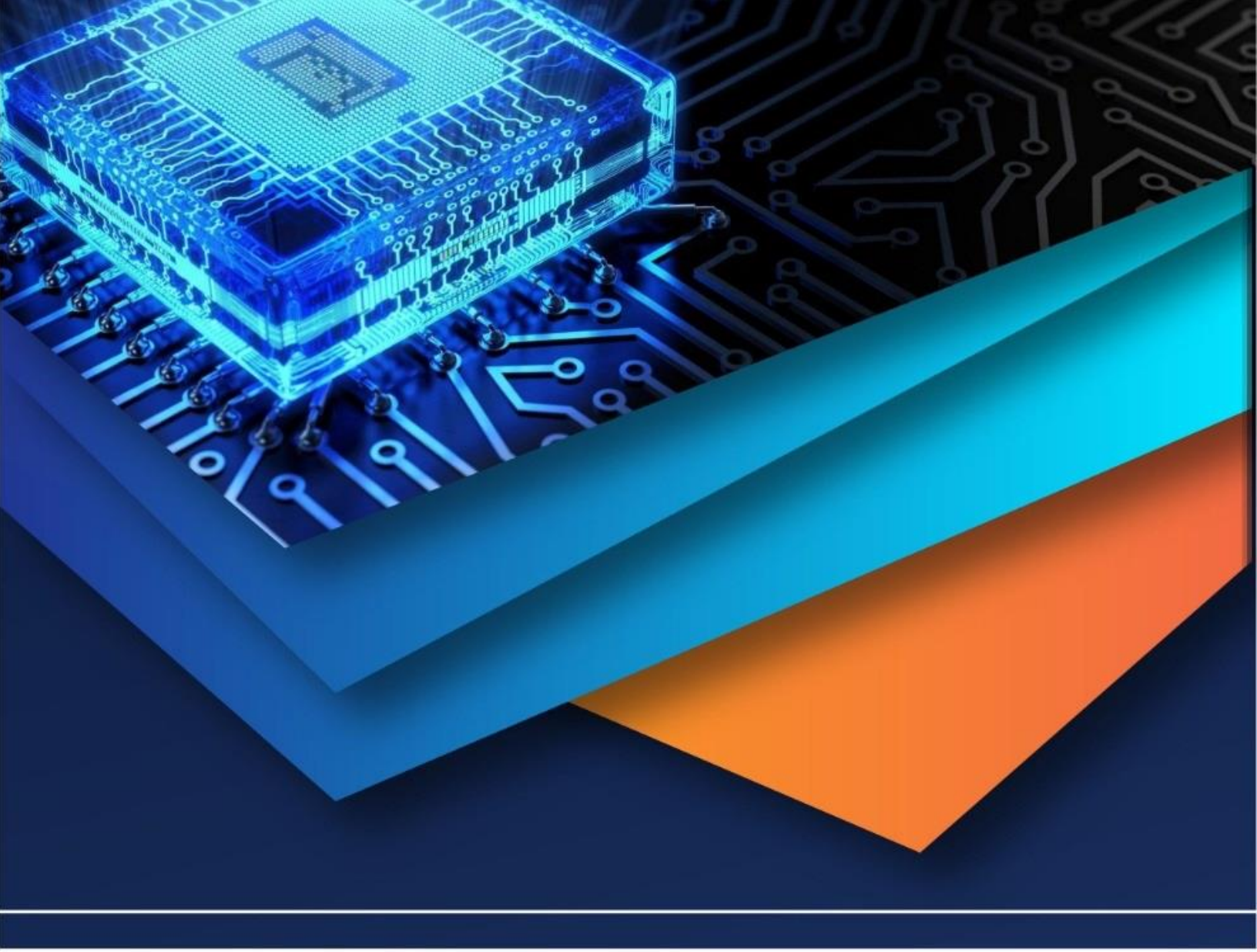

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