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# IoT Based Smart Farming System

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**Abstract:** Internet of Things (IoT) technology is a smart technology that has brought revolution in each and every field of common man's life by making them intelligent. The development of IoT Based Process Control in agricultural field is enhancing the agricultural production efficiently. The main aim of this project is to propose the IoT Based Process Control which will assist the farmers in getting Live data from field by integrating different sensors such as Temperature and Humidity Sensor, Soil Moisture Sensor, Dust Sensor, Light Intensity Sensor, Rain Sensor, Wind Speed and direction Sensor, Air Quality Sensor and CO detecting Sensor. Along with Live data Monitoring we have also developed the Live Weather Forecasting System for the farmers for their ease of production. The purpose of IoT Based Process Control System is to present control theory and IoT combined that is relevant for analysis and designing of the system. The proposed system is integrated with Arduino technology, different sensors, Live data feed and weather forecasting using local area network and cloud computing.

**Keywords:** IoT (Internet of Things), Smart Farming, Live Monitoring, Weather Forecasting, Cloud Computing, Arduino.

## I. INTRODUCTION

This is the project from the motivation of the farmers working in the farm lands are solely dependent on the rains and bore wells for irrigation of their land. In recent times, the farmers have been using irrigation technique the manual control in which the farmers irrigate the land at regular intervals by turning the water-pump ON/OFF when required. Moreover, for the power indication they are glowing a single bulb between any one of phase and neutral, meanwhile when there is any phase deduction occurs in other phases, the farmer cannot know their supply is low. If they Switch ON any of the motor, there will be the sudden defuse in motor circuit. They may have to travel so far for switching ON/OFF the motor. To solve this problem, we have proposed are IoT Based Smart Farming System. There is one controller which is stated at the farm area which is connected to internet and continuously sending data to cloud and by the cloud platform or local area network farmer can monitoring and control it. We have used different sensors which will sense the different parameters across the field and on the basis of sensed parameters the controller will take action. The sensed values and the parameters are monitored live by using local network or cloud computing. On the basis of Live Data Monitoring and Weather Forecasting the farmer can access the status of motor and other sensors as per its requirement.

## II. PROPOSED SYSTEM

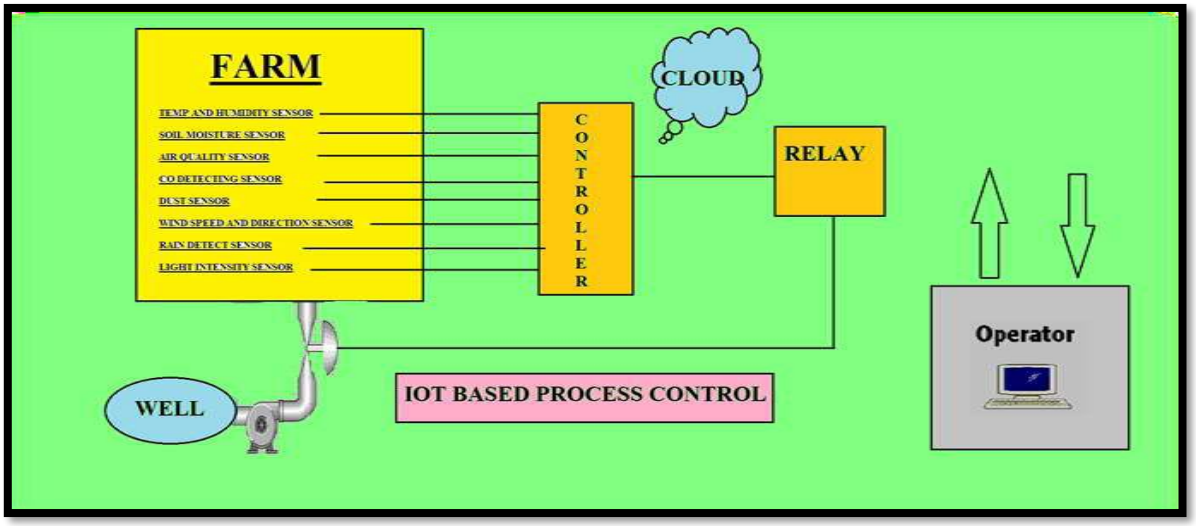


Figure: 01 Block Diagram of the Project model.

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Our Model consists of different sensors such as Soil Moisture sensor, Temperature and Humidity sensor, Dust sensor, Light Intensity sensor, Wind Speed and direction sensor, Rain Sensor, CO detecting Sensor, Air quality sensor. All these sensors are connected with controller named Arduino. According to sensor it will detect and measure the corresponding parameters from field. The sensor data is sent and is received by client through Internet connectivity provided by Arduino Module. The data can be viewed by farmers. It maintains the optimal condition for effective irrigation and production of crop. On the basis of sensed values, the motor will automatically switch ON/OFF. The farmer can view each and every information about the functioning of system at any instant of time.

## III. HARDWARE REQUIREMENTS

### *1. ARDUINO MEGA*

The Arduino Mega is a microcontroller. All the sensors are interfaced with Arduino. The sensor will measure different parameters and will provide information regarding environmental condition to Arduino. On the basis of provided data Arduino will take action and this is monitored on webpage by farmer.

### *2. TEMPERATURE AND HUMIDITY SENSOR(DHT11)*

The DHT11 is temperature and humidity sensor. The temperature is measured in degree Celsius and humidity is measured in Relative Humidity. DHT11 makes it easy to add humidity and temperature data in our project. It provides the real time value of temperature and humidity of the agricultural field. DHT11 is perfect for weather station, home environmental control system and farm or garden monitoring. In our project the data received by this sensor is fed to controller and with internet connectivity of Arduino the data is displayed on webpage. So, it becomes easy for farmers to view and understand the current temperature and humidity of field.
Here are the ranges and accuracy of the DHT11:
Humidity Range: 20-90%RH
Humidity Accuracy: ±5% RH
Temperature Range:0-50°C
Temperature Accuracy: ±2% °C
Operating Voltage: 3V to 5V

### *3. SOIL MOISTURE SENSOR (10HS)*

It senses the moisture content of soil. The output can be measured in analog as well digital form. Soil moisture sensor provides good irrigation management. We have used this sensor as it helps irrigators to understand what is happening in root zone of crop. In this system on the basis of different range of moisture the Arduino will take action. Level of moisture indicates the dryness and wetness of soil. We have used soil moisture sensor that gives a percentage or relative content of Soil Moisture. In our project the value measured by sensor will be in terms of percentage so on basis of different range of percentage the water supply for crops can be activated by farmer and the information is also displayed on webpage.

### *4. DUST SENSOR (GP2Y1010Au0F)*

GP2Y1010Au0F is a dust sensor by optical sensing system. An Infrared emitting diode (IRED) and phototransistor are diagonally arranged into device. It detects the fine particles like smoke and can also distinguish smoke from house or field dust. We have used this dust sensor as it has very low power consumption and can easily be interfaced with Arduino. In our project when interfaced it measures the value of density of dust, raw dust signal and even gets the dust voltage. We have used this specification of sensor as it is more sensitive to low values also so we get the accurate values.

### *5. LIGHT INTENSITY SENSOR (BH1750)*

BH1750 is a light intensity sensor. We have used this as all vegetable plant and flowers require large amount of sunlight, and each plant group reacts differently and deals differently with light intensity. It measures the intensity of light in LUX. In this system we require this sensor to know the environmental condition by the means of light intensity. From this we can know the environmental behaviours such as sunny day, cloudy day, Rainy Atmosphere.

### *6. RAIN SENSOR (FC37)*

FC37 is a rain sensor. It is a type of rain switch which is activated by rainfall. The output can be obtained in digital as well as in analog form. In this system by using this we can know the intensity of rain and farmers can take actions accordingly. On the basis of voltage range measured by the sensor it will indicate the intensity of rain. It will wet when there will be decrease in volage and when voltage increases it means its dry. All information will be monitored on webpage by farmers.

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***7. AIR QUALITY SENSOR (MQ135)***

The MQ135 gas sensor senses the harmful gases like oxygen, alcohol, ammonia nitrogen, sulphide and smoke. Air Quality sensor senses the harmful gases which may harm this crop. The output can be obtained in digital as well as in analog form. As we know the effect of harmful gases will ruin the crop production so to avoid that we used this sensor. The information is displayed on webpage and live monitoring and controlling can be done easily.

***8. CO DETECTING SENSOR(MQ7)***

It is carbon monoxide coal gas sensor; it is suitable for sensing the concentration of CO gas. It is highly sensitive and can detect from range 20ppm to 2000ppm. It has long life span. By using this we can prevent the crops whenever nearby fire is detected as the sensor will get activated and inform the controller and farmer so the control action can be taken easily.

***9. WIND SPEED AND DIRECTION SENSOR***

It measures the speed of wind and also measures the velocity at which the wind is blowing and gives us the direction of speed. For weather forecasting and prediction of weather we have used this wind speed and direction sensor. It is highly sensitive and possesses long life span.

***10. RELAY***

It is a switch which is electrically operated switch. For controlling purpose, the relay is used. It has particular low power signal.

***SELECTION CRITERIA OF SENSOR***

| | |
|---|---|
| **1. Temperature and humidity sensor**<br>**Specification: DHT11** | • Measures Temp and Humidity<br>• Fast Response<br>• Accuracy is high |
| **2. Soil Moisture Sensor**<br>**Specification: 10HS** | • Measures moisture of soil<br>• Determines volumetric water content<br>• Fast Response |
| **3. Light Intensity Sensor**<br>**Specification: BH1750** | • Measures intensity of light<br>• Determined in LUX<br>• Digital sensor |
| **4. Air Quality Sensor**<br>**Specification: MQ135** | • Highly sensitive to harmful gases<br>• Long life span<br>• Detects ammonia, carbon dioxide etc<br>• Accuracy is high |
| **5. CO Detecting Sensor**<br>**Specification: MQ7** | • Detects the amount of CO<br>• Highly Sensitive to CO<br>• Fast Response Time |
| **6. Dust Sensor**<br>**Specification: GP2Y1010Au0F** | • Detects the particles of dust<br>• Effective in detecting fine particles<br>• Gives output in change in Voltage |
| **7. Rain Sensor**<br>**Specification:FC37** | • Detects the intensity of Rain<br>• Light in weight<br>• Acts as a switch<br>• Gives output in analog and digital form. |
| **8.Wind Speed and Direction Sensor** | • Measures the intensity/velocity of speed<br>• Gives the direction of speed. |

## IV. SOFTWARE REQUIREMENTS

***1. ARDUINO IDE***

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them. All the sensors are connected with Arduino and their interfacing is done using IDE and in this we observed the behaviour of each sensor.

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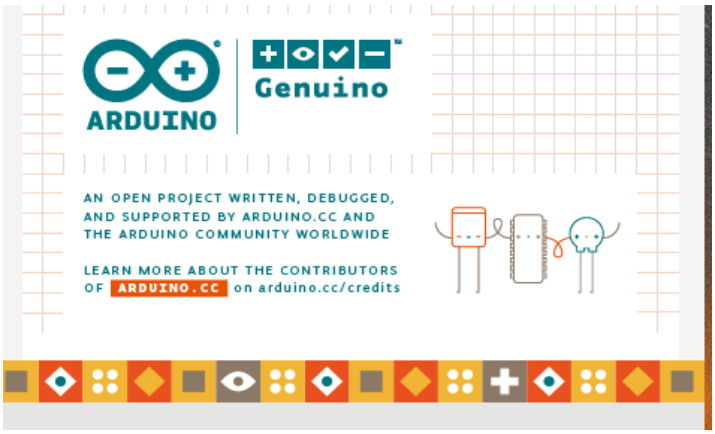


Figure:12 Arduino IDE software

## V. RESULTS

All the sensors are interfaced with hardware. The sensors provide input to controller and the data received from sensor is fed to webpage through local area network by using the internet connectivity enabled by Arduino. The farmer can view the information on webpage as well as on mobile. The information provided by sensor gives the live condition of field crops and accordingly the action can be taken. Along with sensor information the prediction if weather by live weather forecasting can be done. By this information it becomes easy for anyone to understand and take actions for proper and effective irrigation.

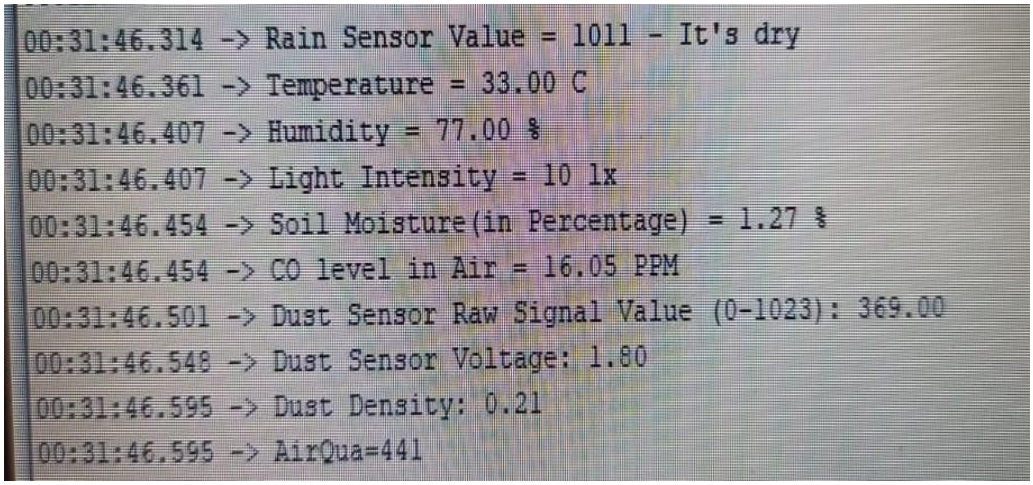


Figure:13 Parameters with live data.

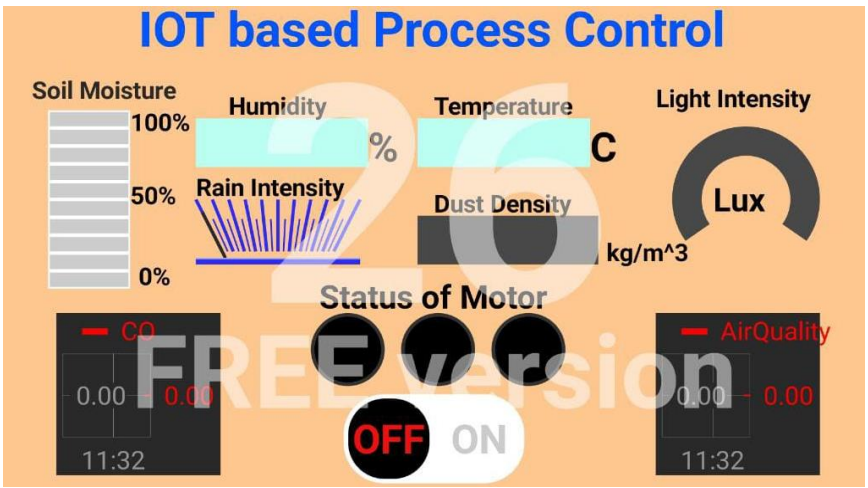


Figure:14 Pictorial view.

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## VI. CONCLUSION

We proposed a IoT Based Smart Farming System which provides Live Monitoring, Live Controlling of different parameters such as Soil Moisture, Temperature, Humidity, Quality of Air, Rain Condition, Speed of Wind, Intensity of Light and it also provides the prediction of weather on the basis of sensor data. So along with Live Monitoring, Live Weather Forecasting is provided. This system is accurate and efficient in fetching these live data. This system assists the farmers to increase the agricultural production by taking absolute care of crops.

## ACKNOWLEDGEMENT

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