

Smart Agriculture Management System

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Abstract: *Smart agriculture: farming system is new idea of farming in agriculture. It uses sensors to monitor environmental conditions, such as temperature, humidity, moisture and additional features like measurement of nitrogen, phosphorous, and potassium. It helps farmers to increase crop yields and reduce the costs. The system uses variety of sensors to monitor environmental as well as soil condition and sends the notification to farmer's smart phone when there are discrepancies. Soil moisture and NPK are two basic soil parameters to characterize soil. In India, about 52% population depends on agriculture. In these busy days, monitoring agriculture fields continuously is hectic task. In order to overcome this problem, IOT based smart agriculture management system is employed. Our device is aimed at providing the information about field. The farmers can monitor and control the various operations in field using our application. Farming and agriculture is basic of human life and technology holds an important role in increased product, decreased extra manpower that may play an important role in farmer's daily routine. By using various type of wireless sensors, multiple operations can be done, quality of soil is measured and decision can be taken up for optimum use of input resources like fertilizers and organic carbons. In smart agriculture management system NPK sensor is used for detecting percentage of sodium, Phosphorus and Potassium. Determination of soil moisture is done by using moisture sensor. Temperature sensor is used for measuring temperature of soil*

Keywords: Internet of Things, Soil Temperature, NPK, Soil Moisture

I. INTRODUCTION

Irrigation is a scientific process of artificially supplying water to the land or soil. By using smart irrigation system we can reduce manpower requirement in addition to saving of water and valuable time. This android based automatic farming system is capable of controlling many electrical appliances in the farm. To develop this system we need Wi-Fi module (GSM), Trans receiver and its interfacing, peripherals. Now a days most of the farmers use water resources for their farms and for this they need water pumps. The purpose of smart agriculture management system is to help the farmers to turn ON and turn OFF the motor. By using this system farmer is able to operate the motor from a remote place using mobile phone. The most important content of soil is NPK. NPK stands for Nitrogen, Phosphorus and potassium which are nutrients essential for plant growth. NPK improves the soil fertility, water holding capacity and increases the crop yield quality and resistance to diseases. NPK is used in gardening to promote plant growth, flowering and fruiting. By increasing the quality of compost manure, green manure, bone meal and fish emulsion, we can increase the NPK level which leads to improved soil quality. NPK plays an important role in smart agriculture that can be controlled by using NPK sensor

II. LITERATURE SURVEY

Smart agricultural management system uses modern technology to increase farm efficiency & productivity. In the modern era, various problems in agriculture sector are controlled with the help of technology. In Asian countries like India, there are many problems with traditional farming system. This mainly comes from water changes and chemical fertilizers. Smart agriculture management system is used as an alternative to this which increases the production in agriculture. IOT, AI data analytics drone technology, sensors are used in smart farming. Farmers can get information regarding soil temperature, humidity, PH and weather related with the help of IOT and sensors. This data can be used

for analysis of growth of farm crops so that water, fertilizers can be provided only as per requirement avoiding wastage of precious water & costly fertilizers. Similarly AI and data analytics can be used to detect various farm related issues

III. METHODOLOGY

Smart agriculture management systems use technologies such as the Internet of Things (IoT) and cloud computing to optimize farming systems. These technologies allow farmers to monitor their crops remotely and make informed decisions about water, fertilizer, pest control, and harvesting times. Smart agriculture can help farmers increase crop yields, reduce costs, and improve profitability.

It can also help protect the environment. Smart agriculture, also known as smart farming, is the adoption of advanced technologies and data-driven farm operations to optimize and improve sustainability in agricultural production. Technologies used for smart farming include artificial intelligence (AI), automation and Internet of Things (IOT). The introduction of farm machinery has reduced the need for physical work in farming, while data collection and analysis allowed farmers to improve their crop and livestock outputs.

IV. OBJECTIVE

The objective of the smart agriculture management system is to leverage technology, particularly the internet of things (IOT), sensors & automation, to enhance agriculture practices, optimize resource usage, and improve crop yield. By increasing crop yield, reducing input costs, and promoting efficient resources usage, the system can make farming operations more economically viable. It can help small farmers access the same technological tools used by large-scale agriculture businesses, leveling the playing field. The smart agriculture management system focusing on sustainability, efficiency, economic benefits and the empowerment of farmers through technology.

V. HARDWARE USED

A. Arduino Uno

Arduino Uno [7] is a microcontroller that is referred to as an actual mini- board. It has various types of pins i.e. analog and digital pins. There are 14 digital and 6 analog pins.



Fig 1: Arduino Uno

B. Soil Moisture Sensor:

Moisture detection:

In this sensor there are two electrodes, which are embedded in ground. These electrodes measure the current in the ground. The electrical resistance of the soil varies with the amount of moisture. High moisture indicates low resistance and vice versa. The sensor measures soil moisture and output signal is generated. The operating voltage of this sensor is in the range 7 to 12 volts.

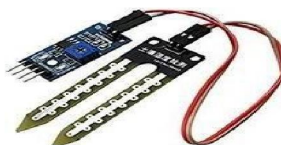


Fig 2: Soil Moisture sensor

C. PH Sensor

A pH sensor is used to measure how acidic or alkaline a solution is. These sensors mainly measure concentration of hydrogen ions in liquid and indicate pH value. Based on that the pH scale ranges from 0 to 14, where 7 is neutral PH. If PH value is between 0 to 7 given solution is acidic and PH between 7 to 14 indicates solution is alkaline.



Fig 3: pH Sensor

D. NPK Sensor

An NPK sensor is a sensor that measures the level of three main nutrients Nitrogen (N), Phosphorous (P), and Potassium (K). These elements are essential for proper growth of plants. The NPK sensor measures the amount of nutrient deficiency or excess in the soil.



Fig 4: NPK Sensor

E. Color Sensor:

It is a device that detects the color of an object or surface by measuring the intensity of light in different wavelengths. It consists of a light source, a photo detector and the processing unit that interprets the reflected light to determine the color.



Fig 5: color sensor

F. Water level sensor:

A water level sensor is a device that measures level of liquid in tank. Water level sensors are used in many industries including municipal water and waste water treatment plant, industrial process plant, agriculture irrigation system and marine operation.



Fig 6: Water Level Sensor

G. GSM module:

A GSM module is a device that allows electronic devices to communicate with each other over GSM network. GSM is a standard for digital cellular communications, which means that it provides a platform for mobile devices to communicate with each other wirelessly. GSM module is a specialized device that enables a device to send and receive data over the GSM network



Fig 7: GSM Module

H. Light intensity sensor:

A light intensity sensor is a device that measures amount of light present in an environment. It detects intensity of light in a given area and converts it into an electrical signal that can be read and interpreted.



Fig 8: Light Intensity Sensor

I. DHT11 Sensor

DHT11 is commonly used digital sensor in smart agriculture system for measuring environmental parameters particularly temperature and humidity. It can help farmers monitor and manage conditions like temperature and humidity levels in greenhouse, soil moisture or outdoor weather conditions, contributing to effective decision making in agriculture.

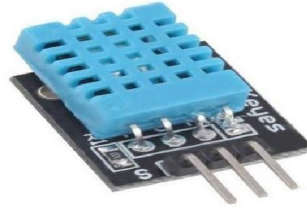
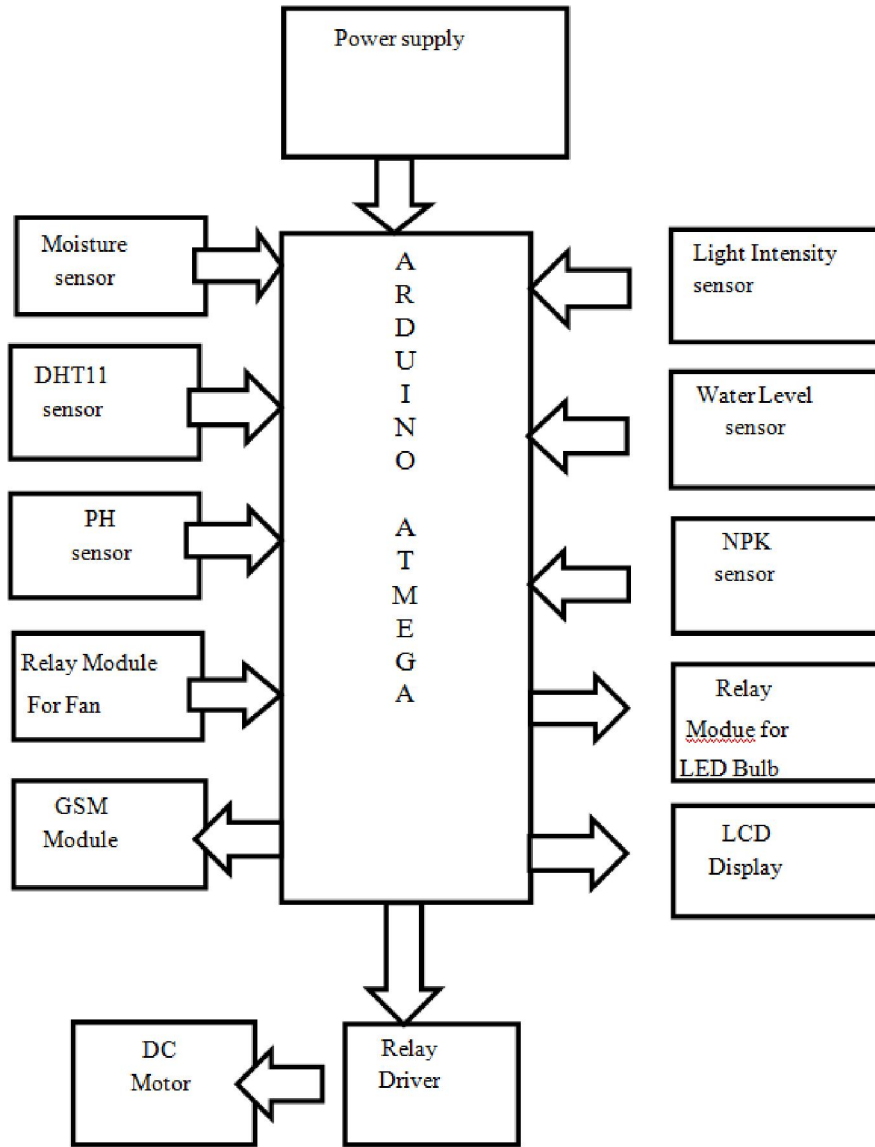
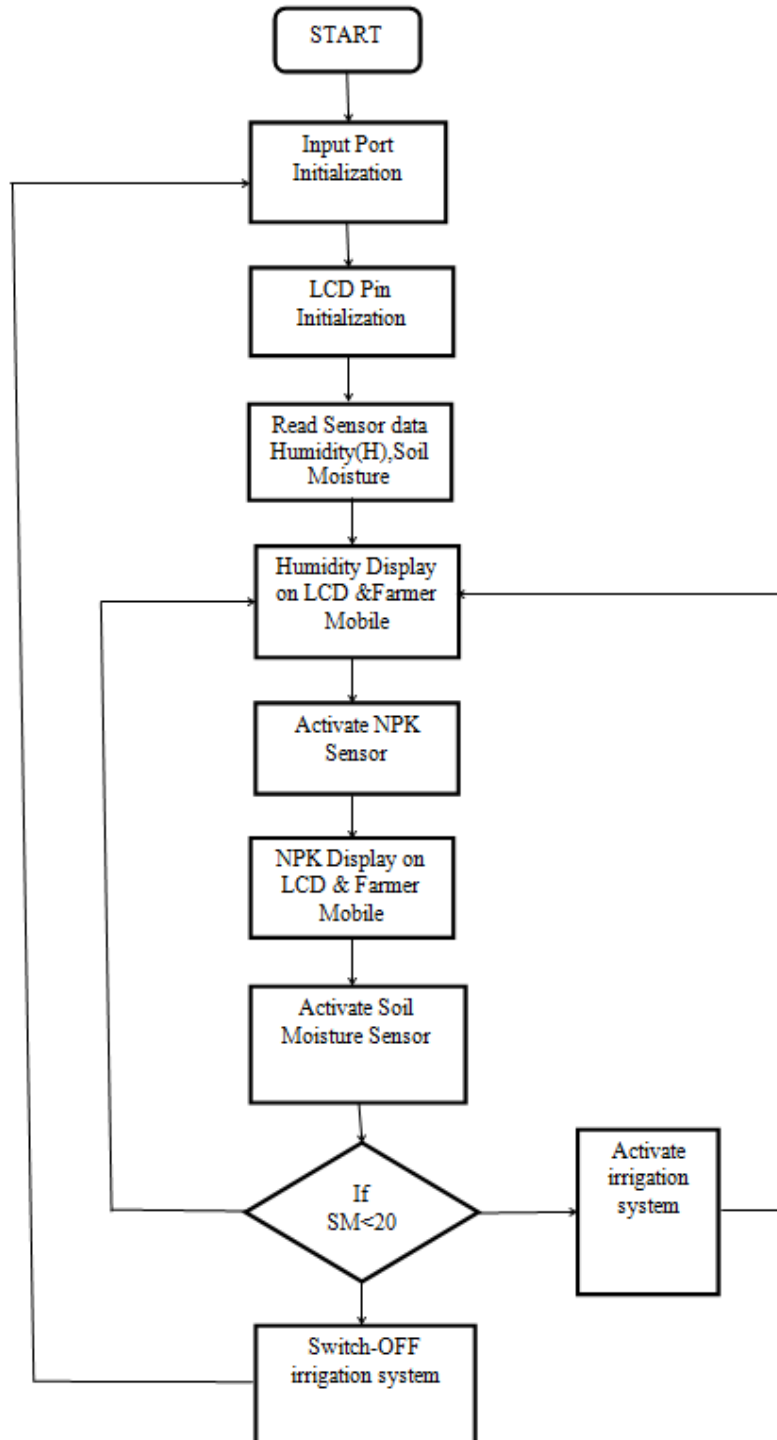


Fig.9: DHT11 Sensor

VI. BLOCK DIAGRAM



VII. FLOW CHART



VIII. ADVANTAGES

1. It allows farmers to maximize yields using minimum resources such as water, fertilizers, and seeds.
2. It is cost effective method.

3. It delivers high quality crop production.
4. Controlling water and other natural resources.
5. Increasing the amount of real-time data on the crop.
6. Improving livestock management.
7. Accurate evaluation of soil and crops.

IX. CONCLUSION

Smart agriculture management system is an important tool for making agriculture more efficient, productive and sustainable. Using modern technology this system gives farmers the ability to monitor their crops in real time. This helps to increase production, reduce cost and protect the environment. With the help of different technologies, farmers can make more correct decisions and increase the production in agriculture. As a result, this system improves the financial condition of farmers. Smart Agriculture Management System is an effective tool for farmers, which helps them to do smart and efficient farming.

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