Design and Implementation of Intelligent Irrigation system based on IoT

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ABSTRACT

Farming is the backbone of Indian economy. Population growth results in demand for increasing water supply as India is known as an agricultural area. In the production of agricultural land, agriculture plays an important role. In India, about 70% of the population is agriculture-based, and one third of the country's capital is farm-based. This is why the project aims to make agriculture intelligent using robotics and IoT technology. The Smart Irrigation System has wide scope for automating the whole irrigation system. Using the ESP8266 NodeMCU module and DHT11 sensor, we are developing an IoT powered irrigation system here.

Keywords: Smart Irrigation System, IoT, ESP8266 Node MCU module, DHT11 sensor.

INTRODUCTION

Nutrition is the basic human need, and livestock is the principal source of food and other raw materials. It plays an important role in economic growth in the region. It also provides the population with a large number of employment opportunities. Agricultural sector growth is important for the country's economic situation to improve. Sadly, many farmers tend to use traditional farming methods that result in poor yields of fruit and cropsNevertheless, the yield was improved wherever the technology was applied and people were replaced with robotic machines. New science and technology in the agricultural sector therefore need to be applied to raise the production. When farmers use large portions of farming land and it becomes very challenging to get to and map any corner of big land. There is sometime the chance of irregular sprinkling of water. This results in crops of poor quality and contributes to further financial losses. The Smart Irrigation System utilizing IoT technology is useful in this situation and contributes to farming easiness. The Smart irrigation system has sufficient room for automating the whole irrigation system. Using ESP8266 NodeMCU module and DHT11 sensor, we are developing an IoT powered irrigation system here. Not only will it periodically irrigate the water depending on the soil's moisture content, but it will also send the data to Thing-Speak Server to keep track of the soil. The machine would consist of a water pump used to spray water on the field depending on the condition of the land, such as precipitation, temperature and humidity.

LITERATURE REVIEW

The paper proposes a self-designed wireless humidity sensor based on research in precise agriculture and establishes a wireless sensor network for monitoring water content and the height of the ground water. The network infrastructure of the wireless sensor was established and the network based intelligent irrigation control system was scheduled. The irrigation work was carried out using evidence from real-time rainfall and expert tests [1]. An enhanced automatic irrigation system with placed humidity requires feedback into the control feature. A hose with a valve within it has a sprinkler head attached to a supply of water under load. In the soil adjacent to the sprinkler head, a moisture sensing probe is positioned for the production of an electrical signal reflecting the moisture content of the local soil [2]. Thermal imaging has shown ability to assist other facets of smart irrigation management. This review addresses important technical and legal concerns and conditions that allow the use of Cloud of Things to handle data related to water supplies before discussing potential solutions [3]. This paper focuses on a cost-effective smart irrigation system and it is used in farm field by a middle-class farmer. We are present today in the 21st century, where the role of robotics in human life is significant. Automation helps us to control the machines automatically. This offers not only warmth but also reduces electricity, productivity and time savings. Industries are now using a high-cost automation and control unit that is not appropriate for use in a farm field. And here we are also developing a cost-effective, intelligent irrigation technology that can be used by Indian farmers [4].The scheme included a GSM-SMS-powered Greenhouse control system in a remote measurement and control system with a PC-based database system connected to the base station. The base station is assembled with a microcontroller, a GSM monitor, sensors and actuators. The central station receives and sends messages through the GSM module in the interactive service [5]. The amount of internet-connected devices grows explosively rising. The interconnection of smart objects equipped with sensors enables them to communicate with the world, and create a Wireless Sensor Network (WSN) among themselves. Such network nodes conduct data acquisition, compilation and study, such as temperature and humidity in the soil. Such data can be used in agriculture to simplify the irrigation cycle thus decreasing water consumption, resulting in monetary and environmental benefits [6]. When water supplies are limited and contaminated, in order to optimize water usage, there is a pressing need to irrigate more efficiently. We present a WSN-funded, intelligent home irrigation system with heterogeneous motes, special sensors and control systems in this paper. The system is fully adaptable not only to environmental conditions but also to the diverse water needs of different plants. It thus achieves effective home irrigation thus offering an IPv6-capable control system [7]. This device, together with the IC-S8817BS and the Zigbee Protocol Wireless Transceiver module, uses sensors to monitor various environmental factors including water level, moisture, temperature etc. This paper aims to build a basic controller for the water pump using a sensor for soil moisture and Esp8266 NodeMCU-12 [8]. Agriculture plays a very important part in India. The Indian economy is also greatly affected by agricultural production, as nearly 50 per cent of the total population relies directly or indirectly on the activities related to agriculture. A farmer must go to the farm to test the field water level and turning on and shut off the water pump, sometimes even in the middle of the night. This issue can be surmounted by developing old farming methods [9]. To automatically trigger contact

with a data server, an irrigation controller is designed to execute at least one of the following functions: (a) share irrigation data; (b) receive control data; and (c) receive synchronization data. Irrigation details may include background of station runtime, data on evapotranspiration (ETo), rainfall, weather-related information, irrigation failures, and any other irrigation statistics. Control details may include station runtime, cycle and soak settings, irrigation scheduling, and any other data on irrigation control [10].

PROBLEM STATEMENT

Many farmers continue to use traditional farming methods which result in low crop and fruit yield. If farmers use large portions of farming land and it becomes very difficult to get to and track every corner of big land. There is sometime the chance of irregular sprinkling of water. This results in crops of poor quality and contributes to further financial losses. The Intelligent Irrigation System using IOT technology is successful in this scenario and contributes to ease of farming.

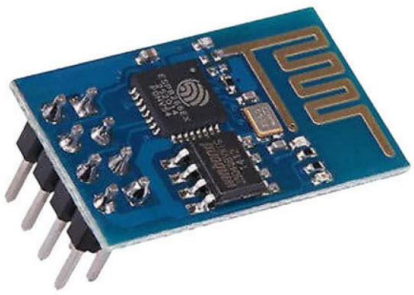
OBJECTIVES

- In agriculture, monitoring soil moisture is important in order to improve farmers management of their irrigation systems.
- In addition, farmers can not only use less water to grow a crop, but they can also increase yields and efficiency of crops by better ground humidity management.
- Increase the productivity while saving the water.
- Design and assemble the system using comact sensor that can be installed within the fields.
- Graphical analysis of Moisture, temperature, humidity with irrigation data

COMPONENTS REQUIRED:

ESP8266

The ESP8266 WiFi computer is a low-cost, microprocessor-interface package. There is a RAM of 96 KB of data and a RAM of instruction of 64 KB.



Relay Module:

The relay module is an electrically operated system that allows a circuit utilizing voltage and/or a power that is much higher than a microcontroller to be triggered or reconnected. There is no relation between

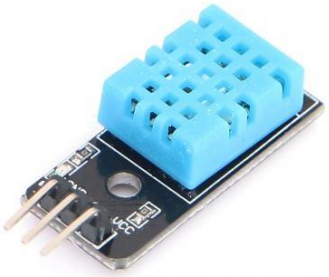
the low voltage circuit controller and the high power circuit. Each circuit is regulated by the relay. In the module called NC, COM and NO each channel has three connections. Depending on the input signal source step, in active high-level mode the jummer limit can be set to closing the normally open (NO) switch at high-
level entry and low-level input stage.

DHT11

This DHT11 moisture and temperature display offers a balanced digital signal output with temperature and humidity sensor power.

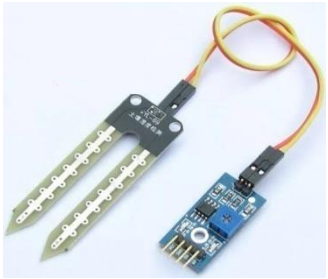
Specification

- Supply Voltage: +5 V
- Temperature range :0-50 °C error of ± 2 °C
- Humidity :20-90% RH ± 5% RH error

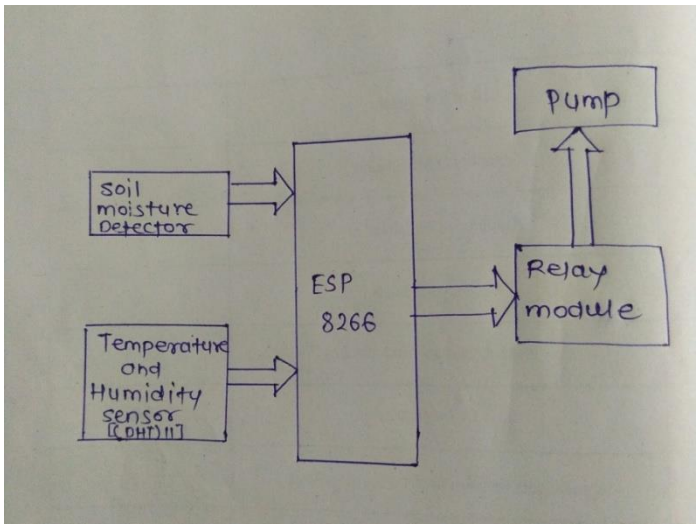


Soil Moisture Sensor

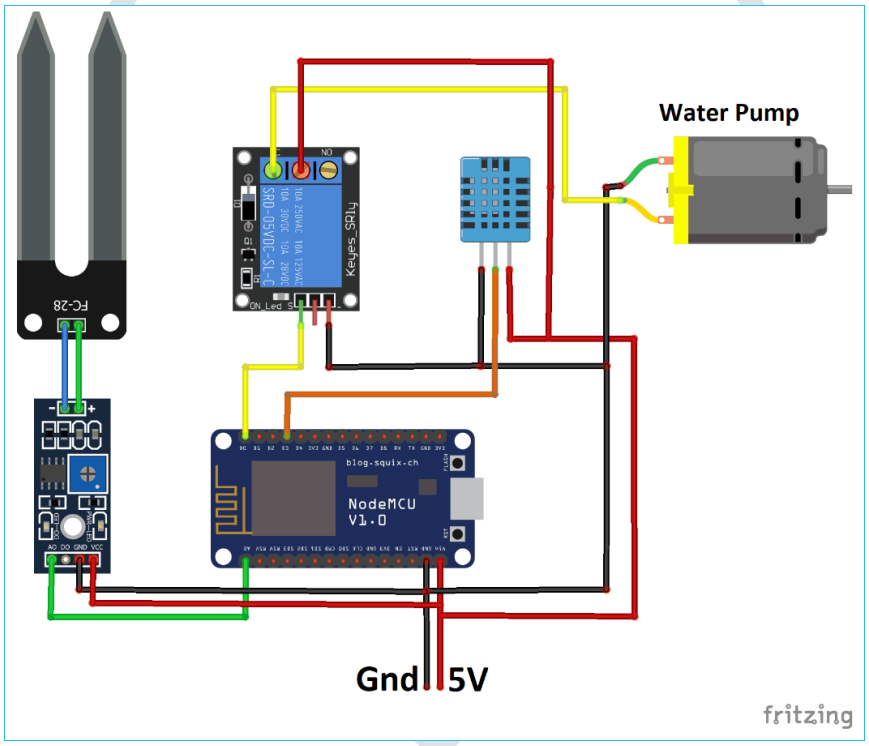
To determine the quality of the soil moisture, a moisture sensor is used. Two components, including analog source and optical output, are present in this unit. It is possible to change the digital o / p permanently and the analog o / p amount. The surface moisture sensor is transparent and short circuit operating principle. The low or high output LED is here. The current flow won't pass through when the soil is poor in water. It functions as a transparent line, therefore. Consequently, the o / p is maximized. The current flow from one terminal onto the other functions as a closed-circuit when the soil moisture level is high. Therefore the o / p will be weak.



BLOCK DIAGRAM:



CIRCUIT DIAGRAM:



SMART Irrigation is irrigation that is sustainably controlled, open, cooperative, and Trusted. By effective use of water, SMART irrigators strive to reduce their environmental footprint and also have to operate a profitable business. The key priorities of these advances are sustainability in water use and flexibility in electricity use.

System configuration:

ESP8266is used to configure all hardware devices. Soil moisture sensor, Temperature and Humidity sensor, Pump.

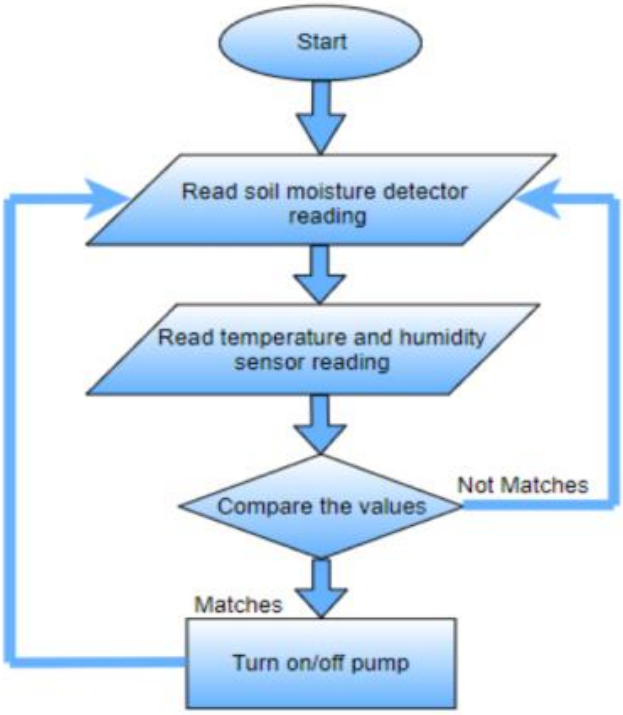
Soil moisture and temperature sensing:

In this step we evaluate the soil's moisture content and its temperature. More decision is taken according to sensor values.

Send the results:

When temperature and humidity values are produced and even notifiy of the maximum. The pump automatically activates if the humidity, temperature, and moisture levels are below the threshold value, and if the pressure, temperature and moisture level increases to the field level, the pumps will automatically turn OFF.

FLOW CHART



ADVANTAGES OF SMART IRRIGATION SYSTEM

- Reducing the risk of electrical shocks and mortality in the night as a consequence of wild animal assaults.
- Visual display.
- The starting of the water pump depends on the amount of precipitation on the field.
- Moisture, temperature, humidity in graphical notation can be viewed online.
- Efficient, cost-effective architecture.
- Nice to consumers.

CONCLUSION

Our goal in this project is to create an intelligent irrigation system using soil moisture sensor and DHT 11. This intelligent irrigation system allows to effectively access, use and conserves water for irrigation as per crop need, resulting in better crop yield compared to traditional farmers' process. The intelligent irrigation system just turns on the farm's irrigation when it is required and that's what we can conserve water.

Also, this smart irrigation system:

- Eliminates individual intervention in the irrigation cycle
- Avoids over irrigation
- Avoid under irrigation
- Reduce the wastage of water

FUTURE SCOPE

We can have a computer to monitor our farms in the coming days and a fully automated irrigation system to identify the crop in the field and to maintain the moisture level necessary for the particular crop automatically.

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