



Application of Internet of Things (IoT) in Intelligent Irrigation System

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ABSTRACT

The Internet of Things (IoT) is very vast and emerging field now days. Being the base of digital India, IoT can be implemented in almost every part of life which enables the life of common people easy. In this paper, the main focus of application of IoT is in agricultural field. Watering of plants is important activity in agricultural.

Here the concept of intelligent irrigation system is proposed which primarily worked using Internet of Things (IoT) via the Nodemcu controller. The main objective of this paper is to automate and control the irrigation processes remotely using Temperature, Moisture and humidity sensors. The system senses the humidity, moisture and temperature at real time, and controls the irrigation system based on the values of these parameters. The working of system is dual in nature; it controls the flow of water from Tab and at the same time send message to the owner about values of humidity, moisture and temperature along with the details of automated activity.

Keywords: *Internet of Things (IoT), intelligent systems, Nodemcu controller*

1. INTRODUCTION

In the modern era, whole activities are managed and operated automatically. However there are nevertheless some vital sectors in our country in which automation has now no longer been followed or now no longer been placed to a full-fledged use. The possible cause may be the implementation cost. One of the field, come across is an agriculture. Agriculture has been one of the number one occupations which consider the fact that at early civilizations or even these, revolutions in farming are inevitable[1][2].

Plant tracking plays a vital a part in the agriculture and horticulture sector. There is an obvious aim to maximize the vegetation by managing climatic situations. Automating a plant tracking and controlling of irrigation based on climatic parameters, at once or in a round surely increase proper vegetation and reduce the usage of unnecessary resources. Automation of system controls and manages the commercial equipment's and various processes thereby decreasing manual operations. This paper introduces intelligent plant irrigation system with latest microcontroller NODEMCU [1]; it senses the temperature, moisture at real time and sends messages to the user via mobile phone. The computerized gadget surely decreases the need of man strength therefore decreasing the errors. With the implementation of system, it makes enables farmers effortlessly screen the entire farming area with the use of smart phone [3].

2. BACKGROUND

In India, agriculture is the need of most of the Indians livelihood. It is also an important source of livelihood. The growing global population has resulted in exponential growth in meals demand. This ultimately needs extra land to be cultivated. Due to extrude of climate styles becomes unpredictable due to global warming; irrigation becomes the handiest dependable technique of vegetation production. As the land beneath cultivation is increasing there is a need of proper utilization of water[1][2][3].

Since last decade expertise in electronics and computation has been used to resolve modern-day challenges. In the frontline of the electronics revolution is the microcontroller. The microcontroller along with numerous sensors can be used to measure and operate physical quantities like temperature, humidity, warmness and light. With automatic monitoring and controlling of these physical quantities using microcontroller; the deployed systems can be easily automated. Similarly, regular irrigation structure used in crop cultivation can also be upgraded so that one can easily monitor and control all these activities remotely. This contributes to solve the way of means of the unreliability of weather changes and for optimization of water. Automation of the irrigation structures is one of convenient, efficient and powerful approach of water optimization. The structure focuses on saving of excess of water and therefore larger land may be covered under the irrigation. Crops grown under the controlled situations have a tendency to be healthier and produce larger yields [4].

Traditional methods for watering plants are time-consuming and laborious in nature. There is possibility of overwatering and wasteful runoff. Now days not just for outdoor plants, indoor plant at home also becomes difficult to irrigate. To avoid these problems and to boost the growth of the plants intelligent irrigation system is developed [5][6].



3. INTELLIGENT IRRIGATION SYSTEM

In order to build the system with IOT, NODEMCU controller, Temperature sensor, Moisture sensor, Humidity sensor are used. The system makes the use of sensors to sense the real time parameters like temperature, moisture and humidity. A humidity sensor is likewise given to recognise approximately the atmospheric humidity of that place. Moisture sensor checks the soil is dry or wet. If soil is dry routinely water pump gets ON. The corresponding sensor values are given to ADC which gets processes using Nodemcu controller. The temperature sensor LM35 senses the temperature and converts it into an electrical (analog) form which is also processed using micro controller via ADC. The analog sign is transformed into virtual layout through the analog-to-digital converter (ADC)[1][2]. If temp rises to set threshold value, fan turns ON. In all enterprises/organizations, it is hard to handle physical quantities through wires. To overcome the issue, in the system wi-fi module is used which helps to screen the parameters. The read time values of soil moisture, humidity and temperature are displayed on LCD and at the same time utilised by controller for controlling attached devices.

4. METHODOLOGY

The system implemented includes following steps-

1. Nodemcu board includes the units of virtual and analog input/output (I/O) pins that can be interfaced to diverse enlargement boards (shields) and different circuits. The board's characteristic serial communications interfaces, inclusive of Universal Serial Bus (USB) can be extensively utilized for loading packages from private computers.
2. The Nodemcu incorporates integrated development environment (IDE), through which controller module is programmed.
3. Further temperature sensor, Moisture sensor, Humidity sensor modules are also programmed in which threshold values are set.
4. If moisture level of soil is decreases, the water pump gets ON. Similarly if temp raises than set threshold value, the fan turns ON.
5. The corresponding values are also send to user using message, which are further used for analysis purpose.

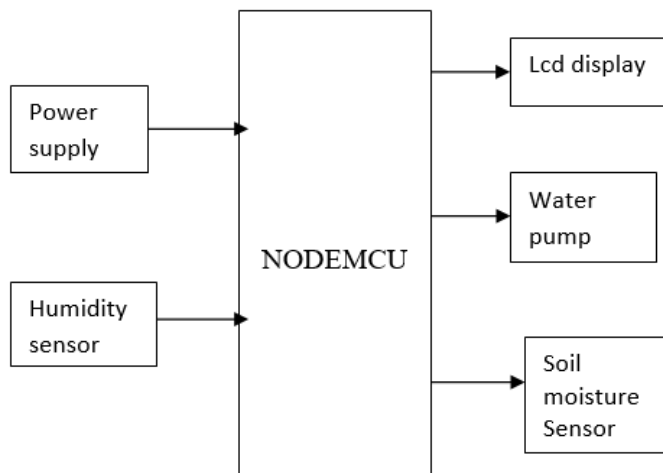


Fig 1: Block Diagram of system

5. IMPLEMENTATION

The soil moisture sensor module used right here have output pins (Digital output and Analog output). The output from the probe of the moisture sensor is compared with a reference value. The reference value may be modified by means of turning the potentiometer within the module. The virtual pin offers an energetic low output while the soil is moist. Here analog output from the module is used which connect to one of the analog pins of Nodemcu. While the usage of the analog output the moist detection value may be set/adjusted within software itself.

Nodemcu reads the voltage dropped throughout the pull up resistor for sensing the extent of water withinside the tank. Two LEDs are linked to the 2nd and 3rd pin of Nodemcu to reveal the moisture fame and tank fame respectively. And the 4th pin hyperlinks to the bottom of a BC547 transistor which in flip drives the 12 V DC motor. A sixteen×2 LCD is attached with Nodemcu in four-bit mode. The LCD module (JHD162A) is used here. It is primarily based at the HD44780 motive force from Hitachi. The JHD162A has sixteen pins and may be operated in four-bit mode (the usage of best four statistics lines) or eight-bit mode (the usage of all eight statistics lines). Here we're the usage of the LCD module in four-bit mode. Control pin



RS, RW and En are without delay linked to Nodemcu pin 6, GND and 0. And statistics pin D4-D7 is attached to 1, 2, 3 and 4 of Nodemcu. This is as shown in figure 2.

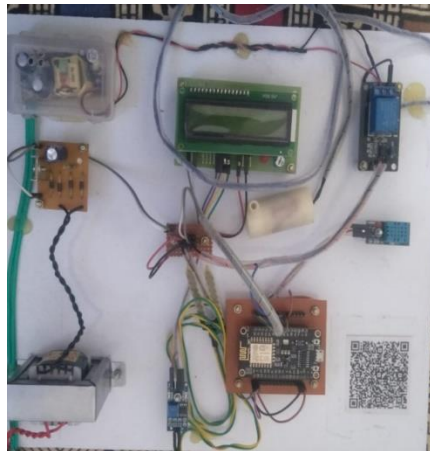


Fig 2: Hardware setup of system

6. CONCLUSION

The system is implemented with first objective to provide insight of intelligent irrigation system, its working and various processes involved in it. The system works on the principle of optimum utilization of water. System automatically controls watering to plants as and when required depending upon the climatic conditions like temperature, humidity and soil moisture level. This work helps farmers by reducing manual efforts, man-power and excess of water. It also increases the vegetation by proper maintaining moisture level of soil. Thus system implemented decreases wastage of water and intake of electricity via motor. The system can worked as a tacking and monitoring gadget with all information available on click through the sensors in fields. The system implemented can be further used to monitor and control irrigation for indoor plantations at homes.

7. REFERENCES

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