A Study on Smart Irrigation System Using IOT

APARNA SINGH[1], SHADAB SIDDIQUI[2], NIKITA YADAV[3], PRIYANKA SINGH[4], VIGYAAN PRASAD[5], ABHINAV SHUKLA[6]

[1, 2, 3, 4, 5, 6] *Department of CSE, Babu Banarasi Das National Institute of Technology and Management, Lucknow.*

Abstract— In India, agriculture plays an important role for development in food production. In our country, agriculture depends on the monsoons which are not sufficient source of water. So the irrigation is used in agriculture field. Internet of Things (IoT) is a milestone in the evolution of technology. IOT plays an important role in many fields, one of that is Agriculture by which it can feed billions of people on Earth in future. The objective of this paper is aiming to overcome this challenge, the whole system is micro control based and can be operated from remote location through wireless transmission so there is no need to concern about irrigation timing as per crop or soil condition. Sensor is used to take sensor reading of soil like soil moisture, temperature, air moisture and decision making is controlled by user (farmer) by using microcontroller. The data received from sensors are sent to server database using wireless transmission. The irrigation will be automated when the moisture and temperature of the field is reduced. The farmer is notified with the information regarding field condition through mobile periodically. This system will be more useful in areas where there is scarcity of water and will be worth efficient with satisfying its requirements.

Index Terms— Soil Moisture Sensor, wifi module-ESP8266, Android Application .

I. INTRODUCTION

Agriculture plays a major role in the GDP of every country and contributes to the economy of the country as well. It is observed that 70% of India's population depends on agriculture for employment. IoT is helping the farmers to fight with most of the agriculture problems. As India is the second largest country in the growth of population so it is necessary to increase the rate of production of agriculture to meet the population food consumption rate. As mat initiatives have already taken by the Indian government to promote Agriculture.

Nowadays, water shortage is becoming one of the biggest problems in the world. We need water in each and every field. In our day to day life also water is essential. Agriculture is one of fields where water is required in tremendous quantity. Wastage of water is the major problem in agriculture. Every time excess of water is give to the fields. From many surveys, the report is that agriculture uses 85% of the fresh water. If this percentage of fresh water usage continues to grow, then it becomes a serious problem with respect to an increase in population growth and increases in demand for food.

To preserve water resources for future generation and for proper usage of water resources, it is necessary to adopt some strategies so that minimal water is used as per requirement. There should be some techniques which must be implemented to stop the wastage of water resources. . There are many techniques to save or to control wastage of water in agriculture. The objective of the system is to a) conserve energy & water resources b) handles the system manually and automatically c) detects the level of water.

Iot is a technology which enables us to adopt the strategies to monitor the usage of water resources in agriculture fields via connecting with android applications. The soil moisture sensor is placed in the soil with crops, which checks the moisture level of the soil and send signals to Arduino. Arduino takes the decision of whether to switch-on or switch-off the water motor. Using such techniques the wastage of water in agriculture can be stopped.

II. LITERATURE SURVEY

- The agriculture is in the transition from traditional agriculture to modern agriculture currently. Internet of things (IOT) for agriculture will play greater role for the promotion of agriculture informationize, including the construction of agriculture information network, the development of agricultural information technology and the agricultural use of information resources.

- The application of intelli sense, identification technology and pervasive computing, ubiquitous network integration applications of IOT will promote the development of smart agriculture and precision agriculture. The crop monitoring system has its practical significance as a large-scale applications of agriculture IOT. As the global climate is changing, not only a wide range of research and study of the crop growth is needed, the small-scale environment for the growth of crops needs to be understood.

III. PROPOSED SYSTEM

In this Proposed System, the soil moisture sensor is used to sense the moisture level of the soil. Also, a water pump will be used for watering of the crops concerned. Now all the sensors' data will be sent to the atmega16 microcontroller. Atmega16 will send the particular data to the desktop/android phone using Wi-Fi Module- ESP8266. The desktop/android phone has a software running on it based on java. User will be able to control the system and also monitor the sensors, data displayed on user's phone/desktop screen in graphical /tabular form.

3.1 Algorithm

The steps that the system undergoes:

Step 1: Soil moisture sensor senses the moisture level of the soil (less than or more than).

Step 2: If the moisture sensed value is greater than the fixed threshold value than no need to switch on the motor.

Step 3: If the Moisture level is less than the threshold value, then the water motor is switch-on automatically.

Step 4: Once moisture level comes equal to the threshold value, it moves to its initial state (switch-off the water motor).

Step 5: End the process.

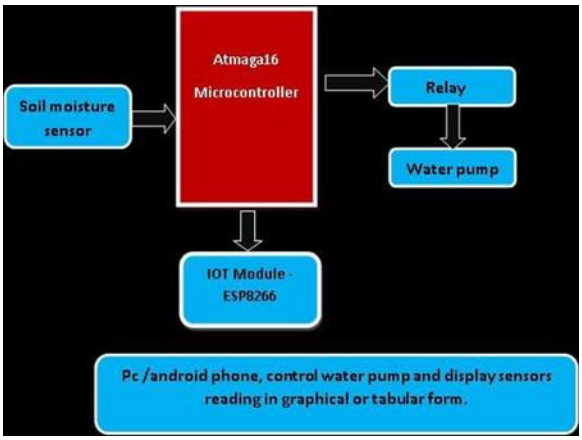


Fig. 1: Flowchart of proposed smart irrigation system.

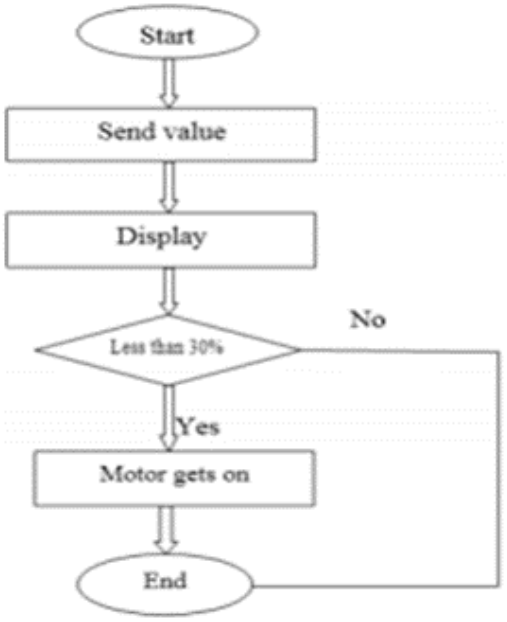


Fig. 2: State transition diagram of proposed smart irrigation system

IV. COMPONENTS DESCRIPTION

4.1 Microcontroller atmega16: -

It is an 8-bit high performance microcontroller from the Atmel's Mega AVR family. Atmega 16 is a 40-pin microcontroller based on enhanced RISC (Reduced Instruction Set Computing) architecture with 131 powerful instructions. It has a 16KB programmable flash memory, static RAM of 1 kb and EEPROM of 512 bytes.

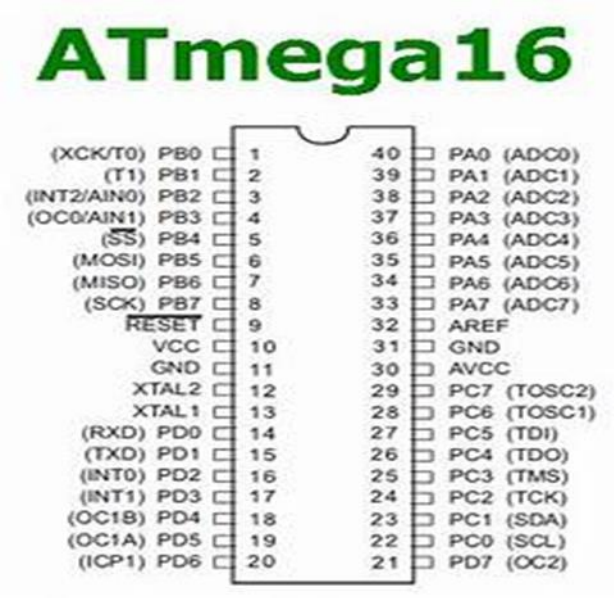


Fig. 3: Atmega 16 microcontroller

4.2.1 Soil moisture sensor:

Soil moisture sensor has two probes which are used to sense the water level of the plants. The current is passed from these two probes them it estimates the resistance value of the moisture level. If the water level of the soil is then the resistance value is less and vice versa.

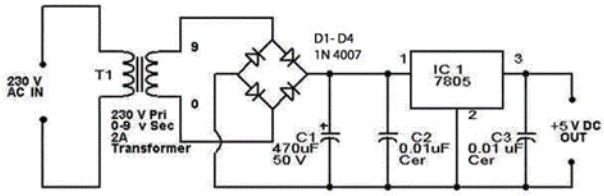
Fig. 4: Soil moisture sensor

Table 1: Soil moisture sensor specification

Input voltage	3.3-5v
Output voltage	0-4.2v
Input Current	35mA
Output Signal	Both Analog and Digital

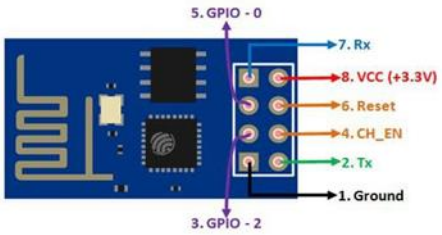
4.2.2 Power supply

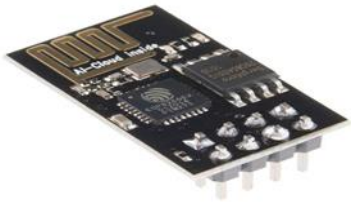
Working- design is based around 4 main parts. A transformer, bridge rectifier, a smoothing capacitor and the LM7805 chip which contains a; linear voltage regulator. Capacitor is used to filter ripples from dc. 7805 voltage regulator is used to regulate voltage to 5VDC. LED is used for indication of power supply if it is working or not.



4.2.3 WIFI module ESP8266 pin out

The ESP8266 is a very user friendly and low cost device to provide internet connectivity to your projects. The module can work both as a Access point (can create hotspot) and as a station (can connect to Wi-Fi), hence it can easily fetch data and upload it to the internet making Internet of Things as easy as possible.





V. SOFTWARE USED

5.1 programming of microcontroller in c language.

- all the software developed for this project will be loaded into the memory of the Atmega 16 microcontroller.
- the language must be supported by the Atmega1 compiler.

➢ the atmega16 compiler supports C and assembly.

- Reasons for selection of c programming language.

- Vast amount of online resources.
- Ease of development.
- Team members have experience of coding in C.

5.2 AVR studio is used for compiling the code.
AVR studio is an Integrated Development Environment (IDE) developed by ATMEL for developing different embedded applications based on 8-bit AVR microcontroller.

5.3 DIP trace is used for PCB designing.
Dip Trace is an EDA/CAD software application for creating schematic diagrams and printed circuit boards with a multi-lingual interface and tutorials.

5.4 eclipse desktop software.
The Eclipse IDE is famous for our Java Integrated Development Environment (IDE), but we have a number of pretty cool IDEs, including our C/C++ IDE, JavaScript/Type Script IDE, PHP IDE, and more.

CONCLUSION AND FUTURE SCOPE

This automated Smart Irrigation System using IoT is found to be cost-effective for enhancing the techniques to preserve water resources and to optimize them for agriculture production. This system helps the farmer by working automatically and smartly. With placing multiple sensors in the soil, water can be only provided to the required piece of land. This system requires less maintenance so it is easily affordable by all farmers. This system helps to reduce water consumption. With using this system, the crop production increases to a great extent.

As per future perspective, this system can be the more intelligent system which predicts user actions, nutrient level of the plants, time to harvest, etc. With using Machine Learning algorithms more advancements can be done in the future which will help farmer a lot and water consumption can also be reduced in agriculture.

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