CROP MONITORING USING IOT

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Abstract: This examination explores a prototyping of incorporated framework of Internet of Things based Wetting front identifier (IOT-WFD) which centers on how to upgrade the IOT based Wetting front finder outline for smart irrigation framework. The exact investigation was led with 2 sensors compose to detect the wetting fronts which are the Frequency Domain Reflectrometry sensor (FDR) and Resistor-based sensor (RB) coordinated and outline with low-cost WFD. The aftereffects of this investigation point toward the IOT-WFD as an appropriated innovation giving ongoing wetting front data in soil decidedly for application regarding rural water management, with exactness horticulture and proficient water system area with related decision information that matches with the innovation pattern and shrewd farmer requirements. Proof of positive consequences of this prototyping synopsis has been given.

Keywords: Internet of Things, Smart Irrigation System, Smart Farming, Precision Farming.

I. INTRODUCTION

Capable utilization of water in the agrarian territory is a crucial topic of open significance in a farming based country such as Thailand [1]. The environmental change criteria has an impact on the horticultural division [2], therefore making people looking for a need to change and rotate the production technique for relieving and adjusting to atmosphere change[3].The Internet of Thing is a received innovation that can be applied in numerous fields, The Internet of Things (IOT) focuses on associating with every single related gadget (Things) to the Internet using low vitality arrange network that is inserted with sensors [4], the pattern of Internet and versatile communication network has been as of late actualized as the development of a clever framework. It is additionally for the agribusiness industry where the exactness of farming winds up modernized in the form of shrewd horticulture [5]. Accuracy agribusiness is a concept for indirectly watching, assessing, and monitoring crops and hardware [6], with a referral towards genuine time information on the climate, soil, air quality, and other factors to make some expository models that help the ranchers be more ingenious in their exercises, and supporting precise decisions on making the tasks with the products [7]. Water is the fundamental assets for horticulture [8]. Water and irrigation management are the key achievement of farming in the climate change criteria.

On the rule of flow line union. Water system water moving downwards through the dirt is consolidated when the water atoms enter the wide end of the channel [10]. WDF was produced and patented in 1997 by the CSIRO Land and Water in Australia. It is doable for water system plan, on the grounds that the time it takes for water to achieve a specific profundity relies upon the underlying water content of the specific soil [11]. IOT innovation is also applied in water and water system administration [12], it will implement the logical checking and logical irrigation optimization [13]. In this paper, the scientists centered on how to screen and control the framework for a keen and adaptive water system administration by utilizing the IOT sensors in the soil; this is displayed as the Internet of Things based wetting front identifier (IOT-WFD). The principle focus of this study concentrated on the control water system framework in the Longanfarm arrive which are the primary effect esteem organic products in northern Thailand; natural product creation is touchy with the water supply in the root zone. The capacity for agribusiness to become resilient amidst cataclysmic events and getting entrance to information of water and water system in the farmland are very crucial. Wetting front indicator (WFD) is a straightforward mechanical irrigation exhortation apparatus for supporting the correct information on assessing the best circumstance for water system [9]. WDF is focused on how to oversee water system that is connected with the level of saturation point in soil. The finder works.

II. OUTLINE OF THE PROPOSED SYSTEM

From the pilot think about, this venture intends to look at the efficiency and adjusts the business soil sensors to make an appropriated WFD. The framework is contained 2 subsystem: WDF equipment sensors framework is packaged with an experiment sensor to distinguish the wetting front in soil, the WDF and IOT cloud server benefit framework are planned as the principle mind of detector sensors for observing and controlling that equipment, WDF sensors are isolated into two sort of sensors as took after;

A. System Modules

PIC 16F877A is one of the most advanced microcontroller from Microchip. This controller is widely used for experimental and modern applications because of its low price, wide range of applications, high quality, and ease of availability. It is ideal for applications such as machine control applications, measurement devices, study purpose, and so on. The PIC 16F877A features all the components which modern microcontrollers normally have. The figure of a PIC16F877A chip is shown below.

General Features

- High performance RISC CPU.
- ONLY 35 simple word instructions.

- All single cycle instructions except for program branches which are two cycles.
- Operating speed: clock input (200MHz), instruction cycle (200nS).
- Up to 368×8bit of RAM (data memory), 256×8 of EEPROM (data memory), 8k×14 of flash memory.
- Eight level deep hardware stack.
- Interrupt capability (up to 14 sources).
- Different types of addressing modes (direct, Indirect, relative addressing modes).
- Power on Reset (POR).
- Power-Up Timer (PWRT) and oscillator start-up timer.
- Low power- high speed CMOS flash/EEPROM.
- Fully static design.
- Wide operating voltage range (2.0 – 5.56) volts.
- High sink/source current (25mA).
- Commercial, industrial and extended temperature ranges.
- Low power consumption (<0.6mA typical @3v-4MHz, 20µA typical @3v-32MHz and <1 A typical standby).

Fig1: PIC Microcontroller

Liquid Crystal Display (LCD)

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD.

Fig2. 16x2 LCD.

Temperature sensor

Temperature is the most-measured process variable in industrial automation. Most commonly, a temperature sensor is used to convert temperature value to an electrical value. Temperature Sensors are the key to read temperatures correctly and to control temperature in industrials applications. A large distinction can be made between temperature sensor types. Sensors differ a lot in properties such as contact-way, temperature range, calibrating method and sensing element. The temperature sensors contain a sensing element enclosed in housings of plastic or metal. With the help of conditioning circuits, the sensor will reflect the change of environmental temperature.

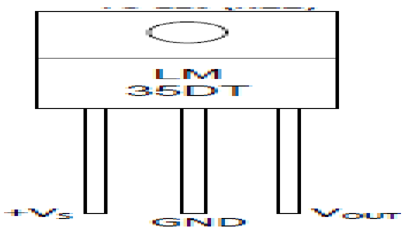

Fig3: Temperature Sensor

Humidity Sensor

Humidity sensor is an instrument used for measuring the moisture content in the environment. Humidity measurement instruments usually rely on measurements of some other quantity such as temperature, pressure, mass or a mechanical or electrical change in a substance as moisture is absorbed. By calibration and calculation, these measured quantities can lead to a measurement of humidity.

Features

- Relative humidity sensor
- Two point calibrated with capacitor type sensor, excellent performance
- Frequency output type, can be easily integrated with user application system
- Very low power consumption
- No extra components needed

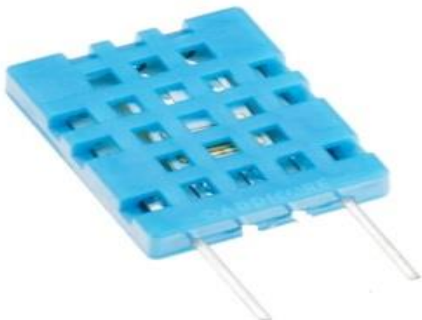

Fig4. Humidity Sensor

Resistor-based sensor

A resistive type sensor is the easiest of soil moisture sensor but it is considered as being highly crude. It is suitable for an inaccurate measurement such as the soil being wet or not. The sensor uses the soil as the resistance medium and passes the current through the soil between the two electrodes. The resistance value represents the moisture content of the soil. By accumulating more water this makes the soil to have more conductivity; the moisture soil will be less resistive than the dry soil. Fig 2 shows a simple and very low-cost circuit of a resistor-based sensor.

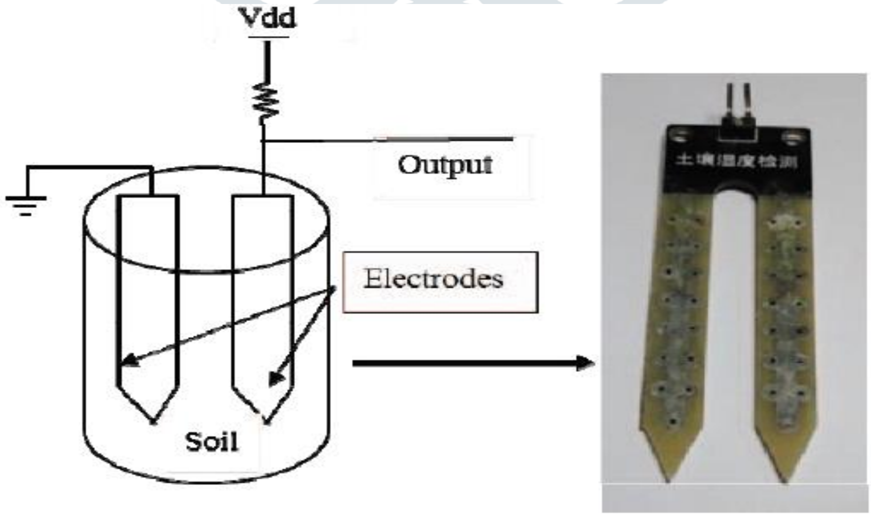

Fig 5: Resistor-based sensor.

Internet of things (IoT)

Internet of things (IoT), is another advance technology in IT sector, provides internetworking for numerous of devices such as sensors, actuators, PLCs and other electronic embedded smart devices and controls, and various software’s’ and provides systems network configuration and connectivity, which enables communication between these numerous devices for information exchanging. In 1995, "thing to thing" was coined by BILL GATES. In 1999, IoT (Internet of Things) was come up by EPC global. IOT interconnects human to thing, thing to thing and human to human. The goal of IoT is bring out a huge network by combining different types connected devices. IoT targets three aspects Communication, automation, cost saving in a system. IOT empowers people to carry out routine activities using internet and thus saves time and cost making them more productive. IOT enables the objects to be sensed and/or controlled remotely across existing network model. IOT in environmental monitoring helps to know about the air and water quality, temperature and conditions of the soil, and also monitor the intrusion of animals in to the field. IOT can also play a significant role in precision farming to enhance the productivity of the farm.

B. Design, Development and testing of system

To attain our proposed system need to use PIC16F877A, controller to monitor the field. In this temperature sensor, humidity sensor, water level sensor is used to monitor the field environment and flooding of the fields. If any abnormalities means send SMS to the owner. The PIR sensor is used to identify the animals enter into the field. Nutrition sensor used to identify the nutrition level in the soil. The disease and birds enter into the field is identify using camera. Controller status and everything is displayed in LCD. The whole process is controlled by microcontroller.

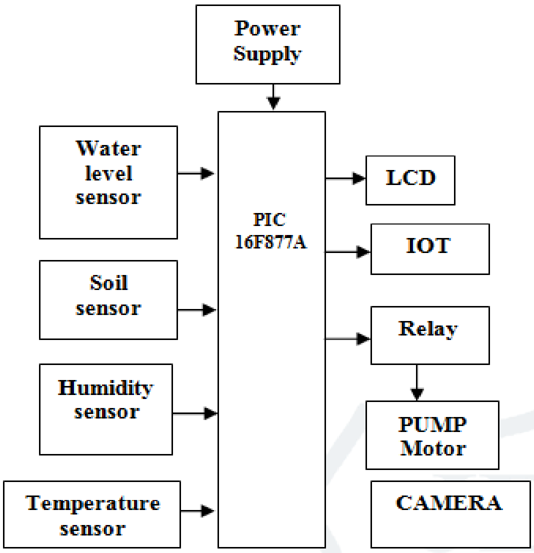

Fig 6: System architecture diagram.

C. Experimental setup

The prototype of sensor node and the experimental setup for the system is shown in fig. 4. It contains a controller and Wi-Fi module at the top of the tube and three sensors at the Bottom. The soil sample with a dry soil at 4.5 liters is measured at a 20 cm. depth. A temperature sensor is included to the system to test the temperature effect to the moisture content sensing value. Then the system collects data for every10 minutes.

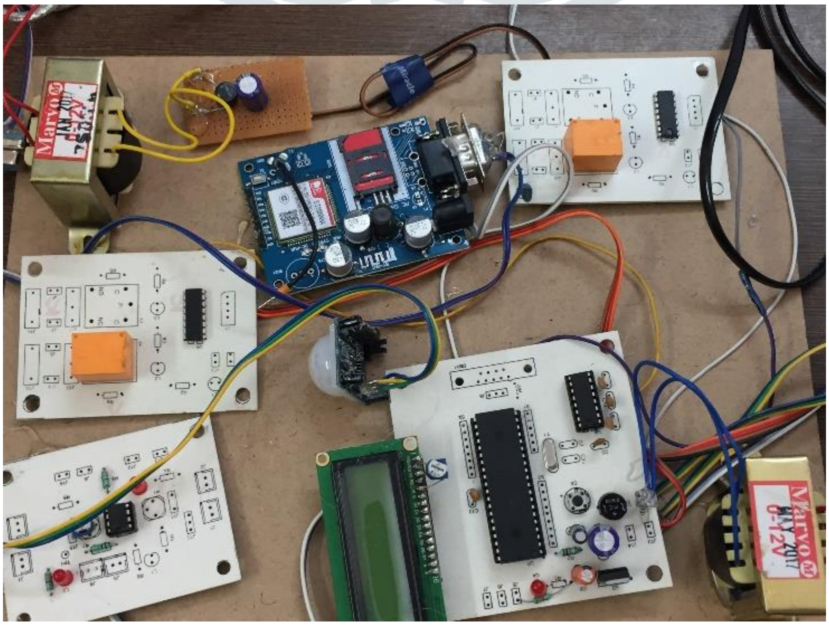

Fig 7: The prototype and experimental setup.

III. RESULTS DISCUSSION AND CONCLUSION

This study reveals the positive comparison results from the adaptive WFD from two type sensors: Resistant-based and FDR sensor. The results confirmed the potential of how to develop a prototyping of IOT- WFD. This tool is performed with the stable detection value, however for the Real implementation of WFD in the farmland the authors need to do further work with the eco-system. Also, more evaluation and performance test is required on how reliable the system is for application. Moreover, it is expected that the data collected from farmland soil cases will comprise of data analysis method for improving precision irrigation and supporting precision agriculture in the future.

Fig 8: System Results.

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