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Smart Agriculture Monitoring System based on Internet of Things

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Abstract- *This is the project from the motivation of the farmers working in the farm lands are solely dependent on the rains and bore wells for irrigation of their land. In recent times, the farmers have been using irrigation technique through the manual control in which the farmers irrigate the land at regular intervals by turning the water-pump ON/OFF when required.*

1. INTRODUCTION

According to 2011 census around 70% of people are from villages in India and they depend upon agriculture. Agriculture in Indian villages has been the foremost profession for the people since the ancient period, as they earn their livelihoods from agriculture. Many farmers reduced cultivating due to migration of people from rural to urban, lack of interest, scarcity of agriculture fields and water. One of the major challenge in agriculture is the proper monitoring of Soil health, the air temperature and humidity, proper irrigation at right time, protecting crops from birds and animals.

Measuring soil moisture is important in agriculture to help farmers manage their irrigation systems more efficiently. Not only are farmers able to generally use less water to grow a crop, they are able to increase yields and the quality of the crop by better management of soil moisture during critical plant growth stages. Embedded system for automatic irrigation of an agriculture field offers a potential solution to support site- specific irrigation management that allows producers to maximize their productivity while saving the water.

As the talk, the number of companies to help enable their IoT (Internet of Things) ideas. And as a result, we hear about new ideas and solutions that are already solving business challenges with M2M (Machine to Machine) communication. In one of our recent posts, we discussed some of our favorite industrial IoT applications. And today, we want to highlight some of the most compelling IoT applications in another industry—agriculture. Agriculture IoT is becoming one of the fastest growing fields (pun intended) within the IoT. Today, more than ever, farmers have to more effectively utilize and conserve their resources. That's where the need for data comes in, and M2M communication has made the ongoing collection of that info easy. Check out these five wireless sensors in agriculture and farming that are making it possible to obtain the meaningful data they've been missing out on.

2. PROPOSED SYSTEM

In this project, we are using Internet of Things (IoT). It means that all the collected data will send to Arduino Uno board and it sends to Web portal (Online view) through wifi. This monitoring can be done through any devices like Mobile, Tab, Laptops and PCs.

The proposed technique has many advantages like

- Reducing the risk of electric shocks, deaths due to poisonous creatures in the fields
- Watering depends on the moisture level present in the field.
- All the farm parameters can view through online web portal.
- Efficient and low cost design.
- Fast response.
- User friendly.

2.1 AT mega 328:

The ATmega328 is a single-chip microcontroller created by Atmel in the mega AVR family.

Specifications:

The Atmel 8-bit AVR RISC-based microcontroller combines 32 kB ISP flash memory with read-while-write capabilities, 1 kB EEPROM, 2 kB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D

converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts. The device achieves throughput approaching 1 MIPS per MHz.

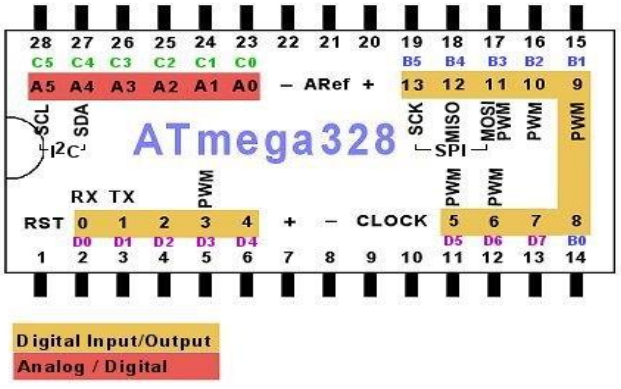
Serial alternative:

A common alternative to the ATmega328 is the "picoPower" ATmega328P. A comprehensive list of all other members of the megaAVR series can be found on the Atmel website.

Key parameters:

	Value
CPU type	8-bit AVR
Processor	**20 MIPS at 20 MHz**
Flash Memory	**32 kB**
SRAM	**2 kB**
EEPROM	**1 kB**
Pin Count	**28-pin PDIP, MLF, 32-pin TQFP, MLF**
Maximum Operating Frequency	**20 MHz**
Number of touch Channels	**16**
Hardware QTouch Acquisitions	**No**
Maximum I/O Pins	**23**
External Interrupts	**2**
USB Interface	**No**
USB Speed	**-**

Pin Diagram:



Applications:

As of 2018 the ATmega328 is commonly used in many projects and autonomous systems where a simple, low-powered, low-cost micro-controller is needed. Perhaps the most common implementation of this chip is on the popular Arduino development platform, namely the Arduino Uno and Arduino Nano models.

2.2 PIR sensor (passive infrared sensor):

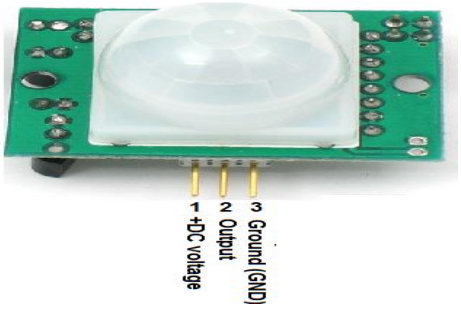
A passive infrared sensor (PIR sensor) is an electronic sensor that measures infrared (IR) light radiating from objects in its field of view. They are most often used in PIR-based motion detectors.

Operating principal:

All objects with a temperature above absolute zero emit heat energy in the form of radiation. Usually this radiation isn't visible to the human eye because it radiates at infrared wavelengths, but it can be detected by electronic devices designed for such a purpose.

The term *passive* in this instance refers to the fact that PIR devices do not generate or radiate energy for detection purposes. They work entirely by detecting infrared radiation emitted by or reflected from objects. They do not detect or measure "heat".

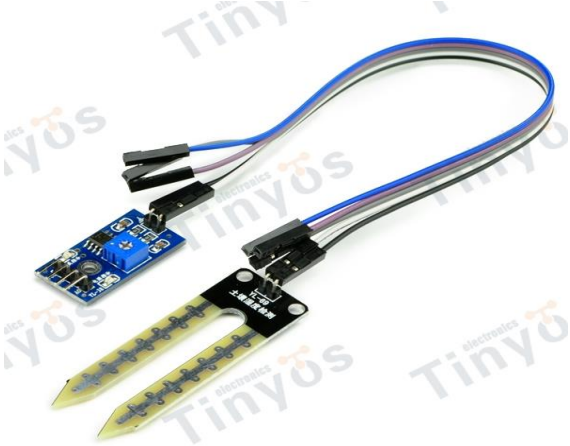
Pin diagram:



Applications (PIR based motion detector):

A PIR-based motion detector is used to sense movement of people, animals, or other objects. They are commonly used in burglar alarms and automatically activated lighting systems. They are commonly called simply "PIR", or sometimes "PID", for "passive infrared detector".

2.3 Soil moisture sensor:

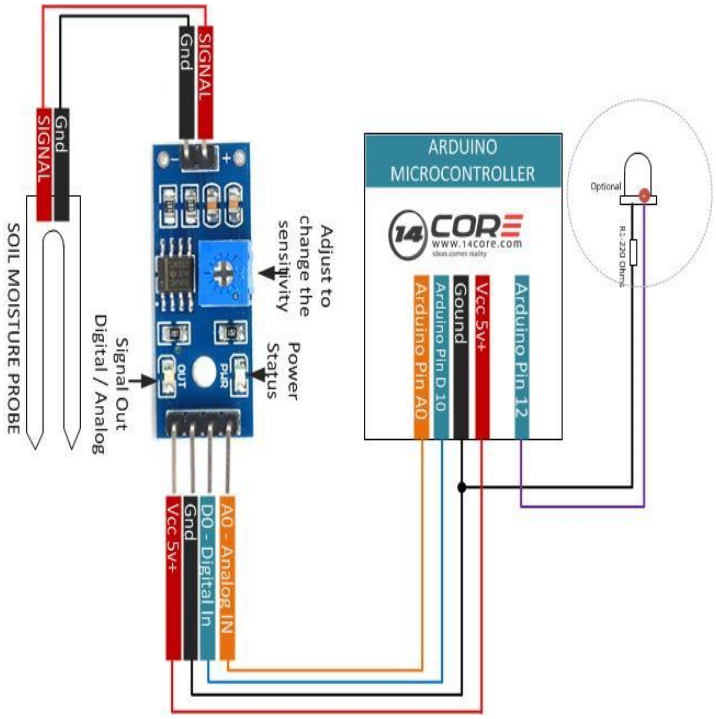


Soil moisture sensors measure the volumetric water content in soil. Since the direct gravimetric measurement of free soil moisture requires removing, drying, and weighting of a sample, soil moisture sensors measure the volumetric water content indirectly by using some other property of the soil, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content.

The relation between the measured property and soil moisture must be calibrated and may vary depending on environmental factors such as soil type, temperature, or electric conductivity. Reflected microwave radiation is affected by the soil moisture and is used for remote sensing in hydrology and agriculture. Portable probe instruments can be used by farmers or gardeners.

Soil moisture sensors typically refer to sensors that estimate volumetric water content. Another class of sensors measure another property of moisture in soils called water potential; these sensors are usually referred to as soil water potential sensors and include tensiometers and gypsum blocks.

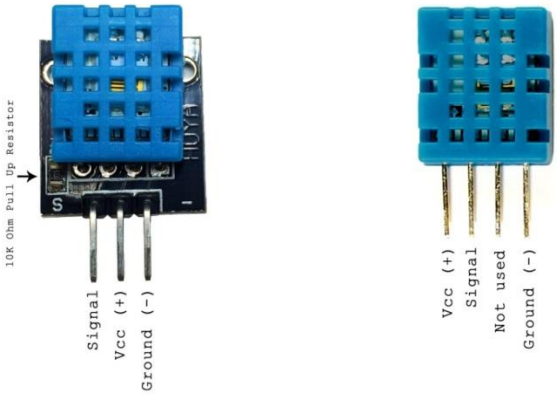
Pin diagram:



2.4 Rain drop sensor:

A rain sensor or *rain switch* is a switching device activated by rainfall. There are two main applications for rain sensors. The first is a water conservation device connected to an automatic irrigation system that causes the system to shut down in the event of rainfall. The second is a device used to protect the interior of an automobile from rain and to support the automatic mode of windscreen wipers. An additional application in professional satellite communications antennas is to trigger a rain blower on the aperture of the antenna feed, to remove water droplets from the mylar cover that keeps pressurized and dry air inside the wave-guides.

2.5 Humidity sensor:



This DFRobot DHT11 Temperature & Humidity Sensor features a temperature & humidity sensor complex with a calibrated digital signal output. By using the exclusive digital-signal-acquisition technique and temperature & humidity sensing technology, it ensures high reliability and excellent long-term stability. This sensor includes a resistive-type humidity measurement component and an NTC

Temperature measurement component, and connects to a high-performance 8-bit microcontroller, offering excellent quality, fast response, anti-interference ability and cost-effectiveness. Each DHT11 element is strictly calibrated in the laboratory that is extremely accurate on humidity calibration. The calibration coefficients are stored as programmes in the OTP memory, which are used by the sensor's internal signal detecting process. The single-wire serial interface makes system integration quick and easy. Its small size, low power consumption and up-to-20 meter signal transmission making it the best choice for various applications, including those most demanding ones. The component is 4-pin single row pin package. It is convenient to connect and special packages can be provided according to users' request.

3. TECHNICAL SPECIFICATIONS

Overview:

Item	Measurement Range	Humidity Accur-acy	Temperature Accura-cy	Resolution	Package
DHT 11	20-90%RH 0-50 °C	±5% RH	±2°C	1	4Pin Single Row

4. ELECTRONIC CHARACTERISTICS

VDD=5V, T = 25°C (unless otherwise stated)

	Conditions	Minimum	Typical	Maximum
Power Supply	DC	3V	5V	5.5V
Current Supply	Measuring	0.5mA		2.5mA
	Average	0.2mA		1mA
	Standby	100uA		150uA
Sampling Period	Second	1		

Note: Sampling period at intervals should be no less than 1 second.

5. HARDWARE & SOFTWARE REQUIREMETS

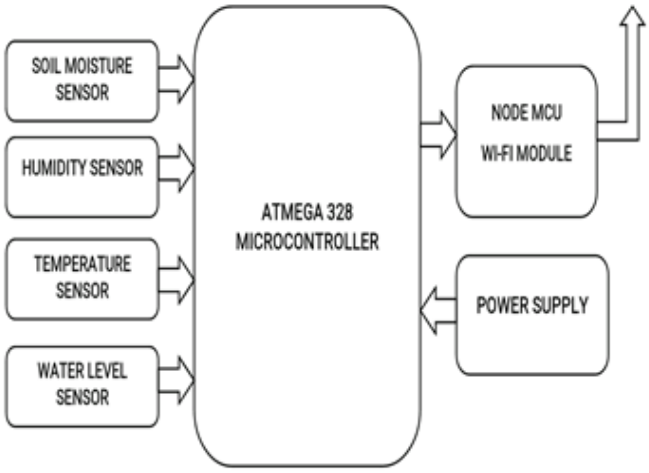
1. Hardware Requirements:-

- Atmega328 microcontroller
- Soil moisture sensor
- Humidity sensor
- Temperature sensor
- Urea level sensor
- Wi-Fi module
- Power supply

2. Software Requirements:-

- Arduino ide
- Proteus simulation
- Dreamweaver
- Mysql
- Wamp

6. ARCHITECTURE DIAGRAM



CONCLUSION:

Thus, this system avoids over irrigation, under irrigation, top soil erosion and reduce the wastage of water. The main advantage is that the system's action can be changed according to the situation (crops, weather conditions, soil etc.). By implementing this system, agricultural, horticultural lands, parks, gardens, golf courses can be irrigated. Thus, this system is cheaper and efficient when compared to other type of automation system. In large scale applications, high sensitivity sensors can be implemented for large areas of agricultural lands.

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