Smart Green Farming Management System Using IOT (EPS8266)

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Abstract: To many people, the term "IoT" or "Internet of Things" conjures images of latest gadgets like Google Glass, Apple Watch or even self- driving cars. In fact, some of the most innovative and practical applications are happening in the Industrial Internet of Things (IIoT) – smart cities, smart agriculture, smart factories, etc. However, the application of IoT in agriculture can have the greatest impact.

The Internet of Things is transforming the agriculture industry like never before by empowering farmers and growers to deal with the enormous challenges they face. Till now, agriculture has been a high-risk, labor-intensive, low-reward industry. Farmers are very likely to be impacted by unexpected environmental changes, economic downturns, and many other risk factors.

This work is primarily about the improvement of current agricultural practices by using modern technologies for better yield. This work provides a model of a smart Greenhouse, which helps the farmers to carry out the work in a farm automatically without the use of much manual inspection.

Greenhouse, being a closed structure protects the plants from extreme weather conditions namely: wind, ultraviolet radiations, and insect and pest attacks. The irrigation of agriculture field is carried out using automatic drip irrigation, which operates according to the soil moisture threshold set accordingly so as optimal amount of water is applied to the plants. Based on data from soil health. Proper water management tanks are constructed and they are filled with water after measuring the current water level using an ultrasonic sensor. Plants are also provided the requisite wavelength light during the night using growing lights. Temperature and air humidity are controlled by humidity and temperature sensors and a fogger is used to control the same.

Keywords: arduino(atmega328), Iot, soil sensor, ultrasonic sensor, humidity and

Temperature sensor, relay, light, Dc fan, buzzer.

I. Introduction

Agriculture in India is still carried out in conventional way and lags behind in integrating modern technologies. Around 55 percentage of Indian population has been engaged in agri-culture and allied activities which constitute only 15 percent of GDP so it becomes much important for the stakeholders involved to come out of the conventional agricultural practices and modernize the agriculture using technology. The economic contribution of agriculture to India's GDP is steadily declining with the country's broad-based economic growth while large number of people continues to work in agricultural sector. Hence, there is an immediate need to improve the system, which can increase the yield and produce healthy organic food.

II. Problems Encountered In The Agricultural Sector

Places like Punjab, which receive ample amount of water through river and canal irrigation system, faces problem of soil salinity due to excess irrigation. Places with limited water supply like Rajasthan, faces problem of acute water shortage for agriculture.

Excessive use of fertilizers, insecticides and pesticides makes the soil dependent on them, erodes fertility, in- are full. Storage containers (vegetables and fruits) are provided with ultrasonic sensors to estimate the volume and send a mail to an e commerce company. This eliminates the requirement of middleman. The various problems of the agricultural system and the solution adopted by us are explained in detail in the following sections.

III. Literature Serve

Although India receives ample amount of precipitation and have many large river systems but still only one third of the total agricultural land is connected via canal irrigation system. Remaining majority of the portion is dependent on monsoon or tube wells. Places with excess water faces problem of land sanity due to over irrigation and water logging. Water collected on the surface also blocks pores in the soil and kills beneficial microorganisms. Alternatively, places with limited supply of water cannot do irrigation throughout the growing season because the requirement of water often exceeds the supply due to conventional type of irrigation like sprinkler or in case allowing the water to just irrigate the field directly from water drainage Channels. Effects of excessive and irregular irrigation.

Fig (1): Soil Sensor Out Put

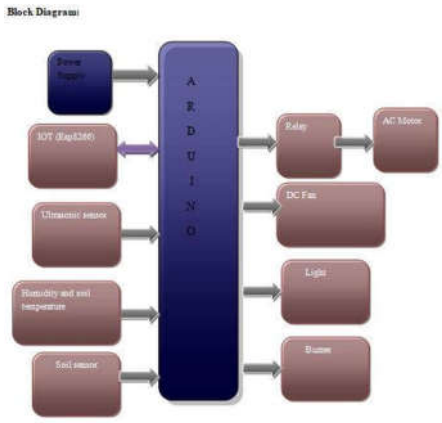

Fig (2): Smart Green Farming Management System Using IOT (EPS8266) Block Diagram

IV. Arduino Uno

The arduino Uno is a microcontroller board based on the ATmega328, It has 14 digital input/output pins, 6 analog input, a 16 MHZ crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. The Uno differ from all preceding boards in that it does not use the FTDI USB to serial driver chip."UNO" means one in Italian and is named to mark the upcoming release of arduino 1.0. The Uno is the latest in a series of USB Arduino boards and reference model for Arduino platform. The Arduino Uno can power via the USB connection or with external power supply. External power can come either from an AC to DC adapter or battery. The board can operate on an external supply of 6 to 20 volts. If supply with less than 7v, however, the 5v pin may supply less than five volts and the board may be unstable. The Ttmega328 has 32 KB of flash memory for storing code .It has also 2KB of SRAM and 1KB of EEPROM. The Arduino software includes a serial monitor which allows simple textual data to be send to and from the Arduino board, The RX and TX LEDs on the board will flash when data is being transmitted via the USB to serial chip and USB connection to the computer.

A Software Serial library allows for serial communication on any of the UNO's digital pins, the arduino software includes a wire library to simplify use of the I2C bus. Arduino is open source hardware and software, which are license under the GNU lesser General public license, which is permitting the manufacture of Arduino board and software distribution by anyone

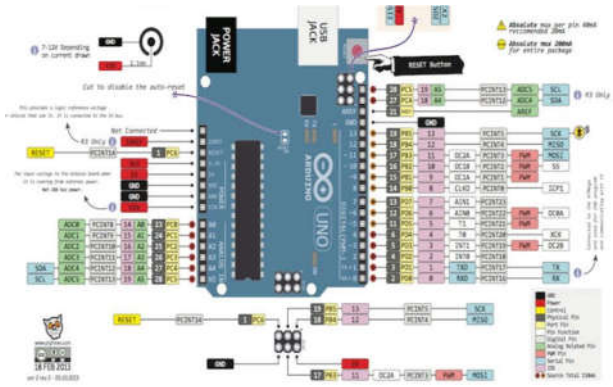

Fig (3): Arduino Uno (Atmega328) Pin Out

The Arduino are programmed using a dialect of feature from programming language C and C++. In addition to using traditional compiler tool chains, the Arduino provide integrated development environment (IDE) based on processing language project.

V. IOT (ESP8266)

As Internet of Things is quickly becoming a reality, it is intriguing more and more developers as well as prospective users. In a simplistic view, IoT can be seen as a sophisticated network of things. Things that are not just typical computers or mobile phones or machines but the things like door-lock, diapers, watches or anything you believe in to make life smarter and easier. It is excellent combination of multiple technologies to enable better life. The Internet of Things is the collection of objects on the internet or network that humans rely on to make their lives easier.

Espressif's ESP8266EX delivers highly integrated Wi-Fi SoC solution to meet users' continuous demands for efficient power usage, compact design and reliable performance in the Internet of Things industry. With the complete and self-contained Wi-Fi networking capabilities, ESP8266EX can perform either as a standalone application or as the slave to a host MCU. When ESP8266EX hosts the application, it promptly boots up from the flash. The integrated highspeed cache helps to increase the system performance and optimize the system memory. Also, ESP8266EX can be applied to any microcontroller design as a Wi-Fi adaptor through SPI / SDIO or I2C / UART interfaces. ESP8266EX integrates antenna switches, RF balun, power amplifier, low noise receive amplifier, filters and power management modules. The compact design minimizes the PCB size and requires minimal external circuitries. Besides the Wi-Fi

functionalities, ESP8266EX also integrates an enhanced version of Tensilica's L106 Diamond series 32-bit processor and on-chip SRAM. It can be interfaced with external sensors and other devices through the GPIOs. Software Development Kit (SDK) provides sample codes for various applications.

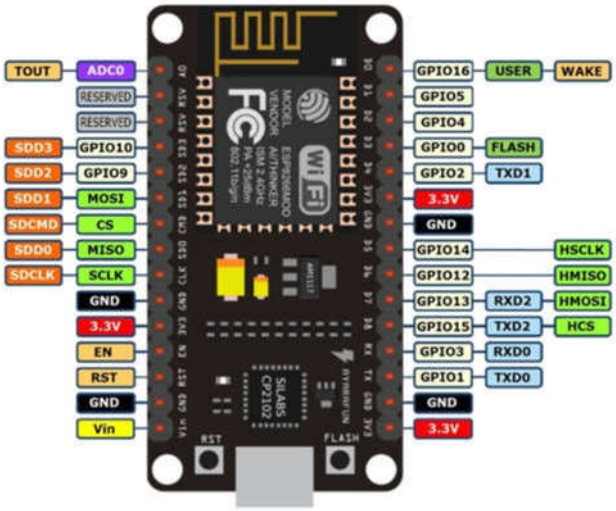

Fig (4): IOT (ESP8266) Pin Out

Fig (5): IOT Communication Network

VI. WI-FI Protocol

- 802.11 b/g/n support
- 2 x Wi-Fi interface, supports infrastructure BSS Station mode / P2P mode / SoftAP mode support
- Hardware accelerators for CCMP (CBC-MAC, counter mode), TKIP (MIC, RC4), WAPI (SMS4), WEP (RC4), CRC
- 802.11n support (2.4 GHz)
- Supports MIMO 1×1 and 2×1, STBC, and 0.4 µs guard interval
- WMM
- UMA compliant and certified
- Antenna diversity and selection (software managed hardware)
- Configurable packet traffic arbitration (PTA) with dedicated slave processor based design provides flexible and exact timing Bluetooth co-existence support for a wide range of Bluetooth Chip vendor.

VII. Soil Moisture Sensor

The two copper leads act as the sensor probes. They are immersed into the specimen soil whose moisture content is under test. The

conductivity of soil depends upon the amount of moisture present in it. It increases with increase in the water content of the soil that forms a conductive path between two sensor probes leading to a close path to allow current flowing through.

Fig (6): soil sensor pin outs

VIII. Humidity Temperature Module (DTH22)

The **DHT22** is a basic, low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermostat to measure the surrounding air, and spits out a digital signal on the data pin (no analog input pins needed). DHT22 capacitive humidity sensing digital temperature and humidity module is one that contains the compound has been calibrated digital signal output of the temperature and humidity sensors. Application of a dedicated digital modules collection technology and the temperature and humidity sensing technology, to ensure that the product has high reliability and excellent long-term stability. The sensor includes a capacitive sensor wet components and a high-precision temperature measurement devices, and connected with a high-performance 8-bit microcontroller. The product has excellent quality, fast response, strong anti-jamming capability, and high cost. Standard single-bus interface, system integration quick and easy. Small size, low power consumption, signal transmission distance up to 20 meters, making it the best choice of all kinds of applications and even the most demanding applications.

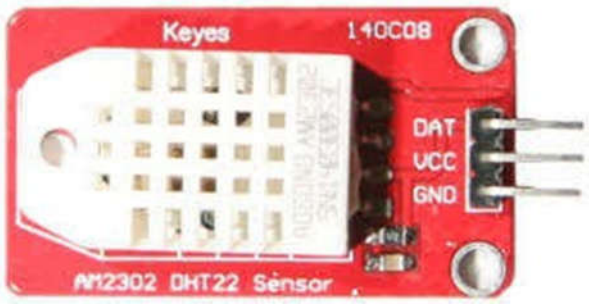

Fig (7): DHT22 sensor module output pins

IX. Technical Specifications

Model: DHT22

□	Power supply	: 3.3-6V DC
□	Output signal	:Digital signal via single-bus
□	Sensing element	: Polymers capacitor
□	Operating range	:Humidity 0-100%RH; temperature -40~80Celsius

Accuracy	: Humidity +-2%RH(Max +-5%RH); temperature <+-0.5Celsius
Resolution or sensitivity	: Humidity 0.1%RH; temperature 0.1Celsius
Repeatability	:Humidity +-1%RH; temperature +-0.2Celsius
Humidity hysteresis	: +-0.3%RH
Long-term Stability	: +-0.5%RH/year
Sensing period	: Average: 2s
Interchangeability	: Fully interchangeable
Dimensions small size	:14*18*5.5mm; big size 22*28*5mm

X. Ultrasonic Sensor

Ultrasonic sensors emit short, high-frequency sound pulses at regular intervals. These propagate in the air at the velocity of sound. If they strike an object, then they are reflected back as echo signals to the sensor, which itself computes the distance to the target based on the time-span between emitting the signal and receiving the echo.

As the distance to an object is determined by measuring the time of flight and not by the intensity of the sound, ultrasonic sensors are excellent at suppressing background interference.

Virtually all materials which reflect sound can be detected, regardless of their color. Even transparent materials or thin foils represent no problem for an ultrasonic sensor.

XI. Specification:

The ultrasonic range sensor detects objects in it's path and can be used to calculate the range to the object. It is sensitive enough to detect a 3cm diameter broom handle at a distance of over 2m.

Voltage - 5v

Current - 0mA Typ. 50mA Max.

Frequency - 40 KHz

Max Range - 3 m

Min Range - 3 cm

Sensitivity - Detect 3cm diameter broom handle at > 2 m

Input Trigger - 10uS Min. TTL level pulse

Echo Pulse - Positive TTL level signal, width proportional to range.

Small Size - 43mm x 20mm x 17mm height

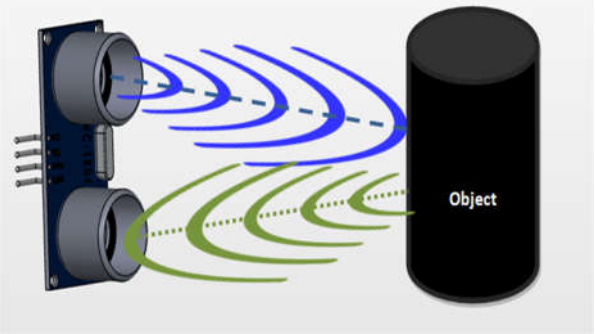

Fig (8): Ultrasonic Sensor

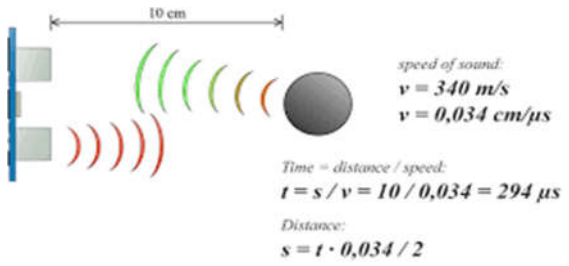

Fig (9): Ultrasonic Sensor Distance Calculation Formula

XII. Software Implementation

The software part programming through Arduino Uno software (IDE). It is easy to write code and upload it to the board's and C++ language are used for programming.

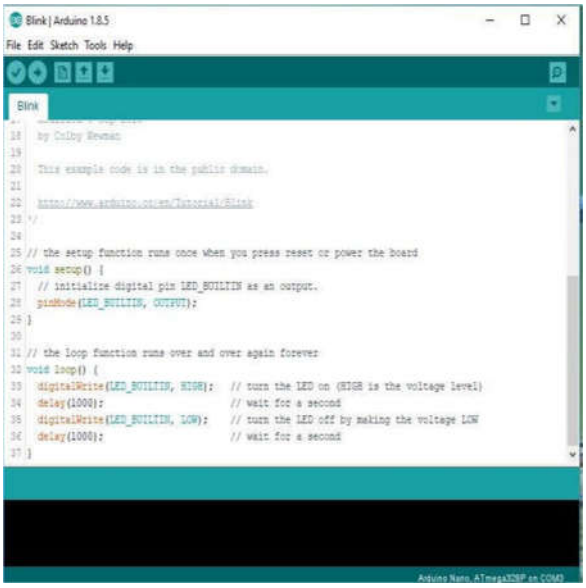

Fig (10): Arduino IDE Software Coding

XIII. Mechanism

An arduino based Greenhouse Automation is designed.

The arduino can be programmed with arduino software• (IDE).

Internet of Things concept is used for showing the sensed data on web portal page.

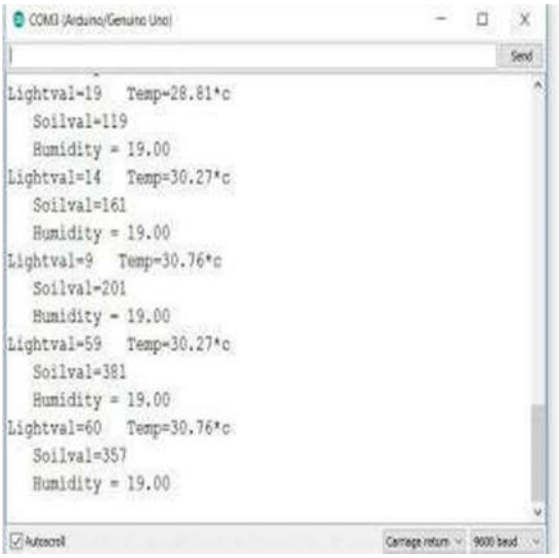

Fig (11): Serial Monitoring Output Of Atmospheric Sensor's

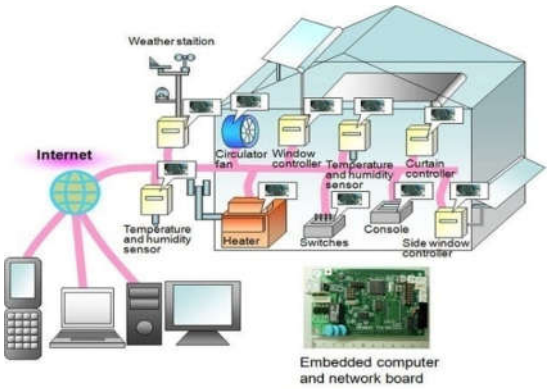

Fig (11): IOT Communication Network

XIV. Advantages

- Total automation of greenhouses / nurseries / bio tech parks.

- Can be used domestically.
- Easy to use, install, operate & troubleshoot.
- Useful for small scale farmers &green house owners. Low cost setup.
- Ease of maintenance
- Accessing the data from any remote place.
- Less power consumption
- Very faster communication
- Reducing human efforts
- Less cost
- High security

Fig (12): Farming Design

XV. APPLICATIONS:

1. Agriculture weather monitoring sytem
2. Agriculture protect from species
3. Home automation(water level monitoring)
4. Industrial device control
5. Bore well detection
6. Street light control device using ultrasonic sensor
7. Iot robotics
8. Iot security system

A. Flow Chat

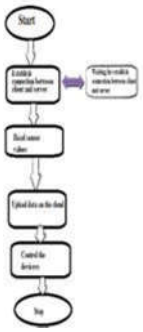

Fig (13): flow chart

B. Output

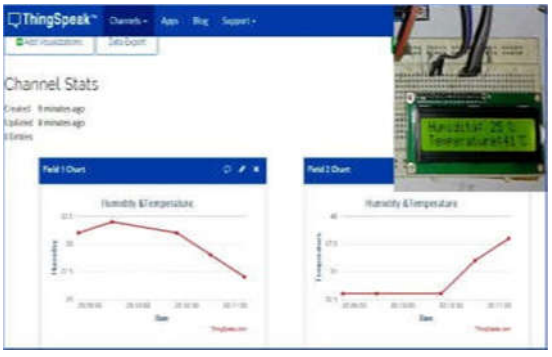

Fig (14): think speak output

Fig (15): Smart Green Farming Management System Using IOT (EPS8266) Final Output Result

C. Future Scope

The Smart Greenhouse can be further upgraded in many ways and can be used in wide agricultural applications. It can be placed and operated in any of the environmental conditions to grow any kind of vegetation. Non-conventional energy sources such as solar panels[10], wind mills are used to supply power to the automatic greenhouse equipments and Peltier effect for cooling purpose. Soil-less farming can be performed to further improve the nutritional value. Integration of farming with IoT can make it much more efficient and profitable activity. Smart Greenhouse has a bright scope of future in agriculture field and it will create a revolution in the way the agriculture is carried out in India.

Last but not least, in next generation we can add cam to the green Smart green farming management system. Buy using this method we can live monitor the data.

Fig (15): Future Expected Output

D. Schematic diagram

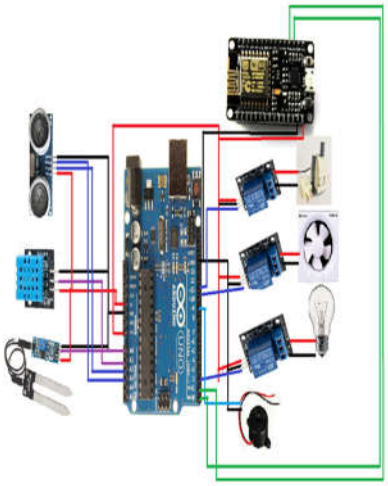

Fig (16): Schematic diagram

Conclusion

In this paper, we proposed a greenhouse environment mobile monitoring system that integrates temperature and humidity sensor, light sensor into a device to collect the information of greenhouse environment. Users can check and control the status of greenhouse environment in real time. Based on the characteristics of sensor node, such as low energy wastage, short communication range limited and self-organized, and combined with the requirements of actual application guide us the application architecture and services. Then we have introduced the selection and construction of hardware platform, protocol design, monitoring center, the mobile control client software in detail. After the actual deployment of our system on a testing environment, the test results indicate that our system is able to complete the design goals. Our system can be widely used in various. Greenhouse and related fields, and has wide application foreground. In future work, we hope to deploy this system in the long-term, and accurately measure the performance of this system. Further research about reducing energy consumption, prolonging network lifetime and increasing the scope of the system will also be carried out.

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