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SMART BEARABLE AGRICULTURE SOLUTION USING IoT AND AI TOWARDS EFFECTIVE FARMING

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Abstract

Traditional agriculture is transforming into smart agriculture due to the prominence of the Internet of Things (IOT). Low-cost and low-power are the key factors to make any IOT network useful and acceptable to the farmers. We have proposed a low-power, low-cost IOT network for smart agriculture. For monitoring the soil moisture content, we have used an in-house developed sensor. In the proposed network, the IITH mote is used as a sink and sensor node which provides low-power communication. We have evaluated our network with state-of-the-art networks, proposed for agriculture monitoring. Power and cost are the two metrics used for evaluation of these networks. Results show that the proposed network consumes less power and has on average 83% prolonged lifetime at a lower cost compared to previously proposed network in the agriculture field.

Introduction

The Agriculture Parameters are utilizing an IOT Technology and system availability that draw in these objects to assemble and deal information. "The IOT enables things selected recognized or potentially forced remotely crosswise over completed the process of existing configuration, manufacture open gateways for all the additional obvious merge of the substantial earth into PC based frameworks, in addition to acknowledging overhauled capacity, precision and cash interconnected favoured stance. Precisely when IOT is extended with sensors and actuators, the improvement modifies into an occasion of the all the extra wide category of electronic physical structures, which in like manner incorporates headways, for instance, clever grids, splendid homes, canny moving and smart urban groups. All is especially specific through its introduced figuring configuration anyway can interoperate within the current Internet establishment.

Keywords

IoT, Agriculture, IITH, ARDUINO UNO, SENSORS, ESP8266 WIFI.

Related Work

T. Vineela et al, presented a IoT Based Agriculture Monitoring and Smart Irrigation System Using Raspberry Pi. The new scenario of decreasing water, drying up of rivers and tanks, unpredictable environment, present an urgent need of proper utilization of water. To cope up with this use of temperature and moisture, sensors are placed at suitable locations for monitoring the crops. After research in the agricultural field, researchers found that the yield of agriculture is decreasing day by day. However, use of technology in the field of agriculture plays an important role in increasing the production as well as in reducing the man power. Some of the research attempts are done for betterment of farmers that provide systems which use technologies helpful for increasing the agricultural yield. The cloud computing devices create a whole computing system from sensors to tools that observe data from agricultural field and accurately feed the data into the repositories. This idea proposes a novel methodology for smart farming by linking a smart sensing system and smart irrigation system through wireless communication technology.

Ayush Kumar and at al utilized IoT and picture handling to locate the supplement and mineral insufficiencies that influence the yield development. M.K. Gayathri and at al advance the quick improvement of agrarian modernization and help to acknowledge brilliant answer for horticulture and productively explain the issues identified with ranchers. Zhou Zhongwei and at al have proposed a technique to picture and follow rural items in inventory network. Li Sanbo and at al centre around the equipment engineering, arrange design and programming process control of the exactness water system framework. Smash and atal have proposed an approach to direct water in rural fields. Bo Yifan and atal have concentrated on the investigation on the use of distributed computing and the web of things in horticulture and ranger service. M.V. Latte and at al have utilized shading and example investigation to recognize numerous insufficiencies in paddy leaf pictures

A. Anusha, A. Guptha, G. Sivanageswar Rao, Ravi Kumar Tenali et al, presented a Model for Smart Agriculture Using IOT. The more up to date situation of diminishing water tables, evaporating of waterways and tanks, unusual condition present a dire need of appropriate usage of water. To adapt up to this utilization of temperature and dampness sensor at appropriate areas for observing of yields is executed A calculation created with edge estimations of temperature and soil dampness can be modified into a microcontroller-based passage to control water amount. The framework can be fuelled by photovoltaic boards and can have a duplex correspondence connect dependent on a cell Internet interface that permits information examination and water system planning to be customized through a page. The mechanical advancement in Wireless Sensor Networks made it conceivable to use in checking and control of nursery parameter in accuracy horticulture.

Internet of Things (IoT) (Xia et al., 2012) has come up which incorporates multiple aspects that targets making human life more comfortable. One such domain where it could be

effective is agriculture. With the improvements in wireless telephony, internet and various government initiatives, these technologies have now started reaching the farmers. In developed countries, farmers are much more technologically educated and with the proper use of the latest technological advancements, their crop yield is huge. Even though we have information available about the farm technical parameters, it is still not easy for farmers to access and use them. Thus, it is essential to have simple and less expensive techniques by which the necessary help can be provided to the farmers. With the evolution of IoT it is possible to rectify these problems and reach to the end user with proper information and deliver better results. Smart farming is a well-established subject in itself with broad areas of work like: water management (Gutierrez et al., 2014), crop care (Mahlein et al., 2012), animal tracking (Floyd, 2015), care and management (Wang et al., 2010), farm management systems (Kaloxylos et al., 2012), helplines, etc. as shown. There are unending advantages of putting technology with the farmers' experience, such as, improved crop quality and yield, water savings by its efficient utilization via proper irrigation mechanisms, high quality dairy products, good quality leather. All of this is achieved but, along with the generation of huge data at the back end, that needs to be taken care of. Data is having size worth Exabytes, Zetabytes, etc., and the how's, where's, what's related with it is not easy as it seems to be. Companies today (McAfee et al., 2012), (Davenport and Dyché, 2013) are coming up with sections dedicated to handle this huge amount of generated data, technically termed as Big Data (Manyika et al., 2011). It has thus become a major aspect today to think about handling this huge data, without losing any of it. Data generated in case of smart farming techniques is mainly obtained via the sensors, Radio Frequency Identification (RFID) (Juels, 2006) tags, bio-chips implanted in the fields, in the animal farms or the animal body.

Existing System

Horticulture is the foundation of our Nation. In long time past days agriculturists used to figure the ripeness of soil and influenced presumptions to develop which to kind of product. They didn't think about the dampness, level of water and especially climate condition which horrible an agriculturist more. They utilize pesticides in view of a few suspicions which made lead a genuine impact to the yield if the supposition isn't right. The profitability relies upon the last phase of the harvest on which agriculturist depends.

Proposed System

To improve the efficiency of the product there by supporting both rancher and country we need to utilize the innovation which appraises the nature of harvest and giving recommendations. The Internet of things (IOT) is revamping the agribusiness engaging the farmers by the broad assortment of techniques, for instance, accuracy and conservative cultivation to go up against challenges in the field. IOT advancement aids in social affair information on conditions like atmosphere, temperature and productivity of soil, harvest web watching engages area of weed, level of water, bug acknowledgment, animal interference in to the field, alter improvement, cultivation. IOT utilize farmers to get related with his residence from wherever and at whatever point.

Remote sensor frameworks are used for checking the farm conditions and little scale controllers are used to control and robotize the property shapes. The framework gives a promising ease remote arrangement just as remote controlling for exactness water system.

Module Description

A module is a software component or part of a program that contain one or more routines. One or more independently developed modules make up a program. It consists of two main modules they are,

- Hardware
- Software

HARDWARE:

1. ARDUINO UNO

The Microcontroller used here is an Arduino UNO. The UNO is a Microcontroller board based on ATMEGA 328P.

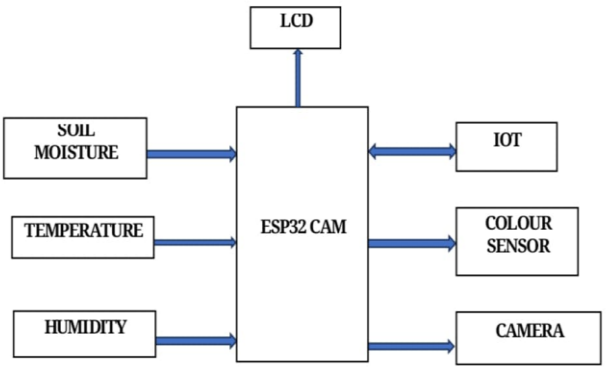
The ATMEGA 328P has 32kB of flash memory for storing code. The board has 14 digital input and output pins, 6 analog inputs, 16 MHz quartz crystal, USB, an ICSP circuit and a reset button. The UNO can be programmed with the Arduino software.

2. SENSORS

a sensor is a device, module, machine, or subsystem whose purpose is to detect events or changes depends upon transducer in its environment and send the information to other electronics, frequently a microcontroller. A sensor is always used with other electronics.

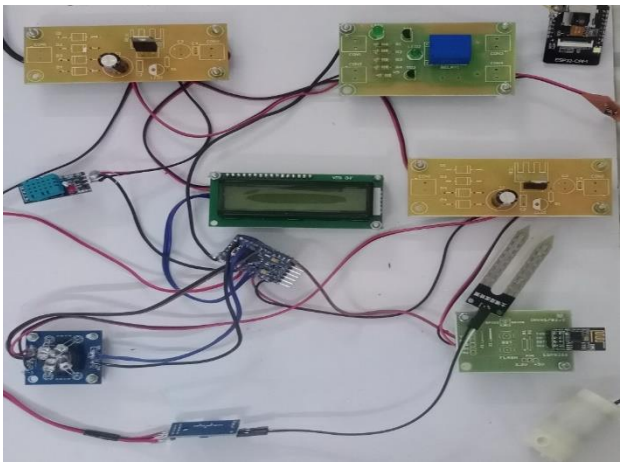
3. ESP8266 WIFI

The ESP8266 Arduino compatible module is a low-cost Wi-Fi chip with full TCP/IP capability, and the amazing thing is that this little board has a MCU (Micro Controller Unit) integrated which gives the possibility to control I/O digital pins via simple and almost pseudo-code like programming language. This device is produced by Shanghai-based Chinese manufacturer, Espresso if Systems.



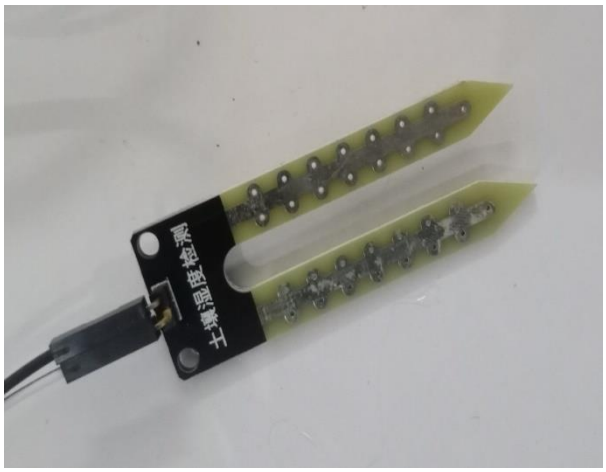
Results and Discussion

Precisely when IOT is extended with sensors and actuators, the improvement modifies into an occasion of the all the extra wide category of electronic physical structures, which in like manner incorporates headways, for instance, clever grids, splendid homes, canny moving and smart urban groups.



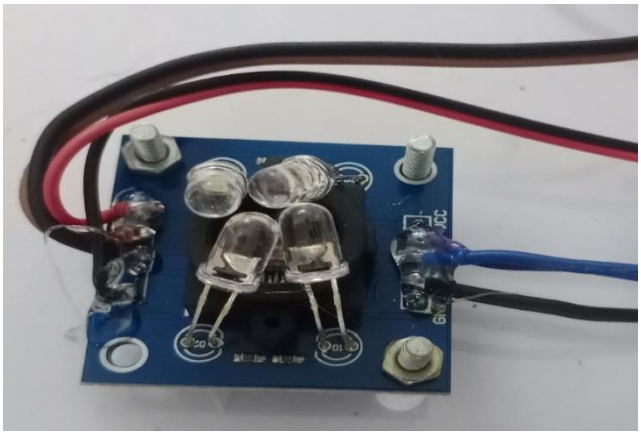
Soil Moisture Sensor:

These sensors measure the volumetric water content not directly with the help of some other rules of soil like dielectric constant, electrical resistance, otherwise interaction with neutrons, and replacement of the moisture content. The relation among the calculated property as well as moisture of soil should be adjusted & may change based on ecological factors like temperature, type of soil, otherwise electric conductivity. The microwave emission which is reflected can be influenced by the moisture of soil as well as mainly used in agriculture and remote sensing within hydrology.



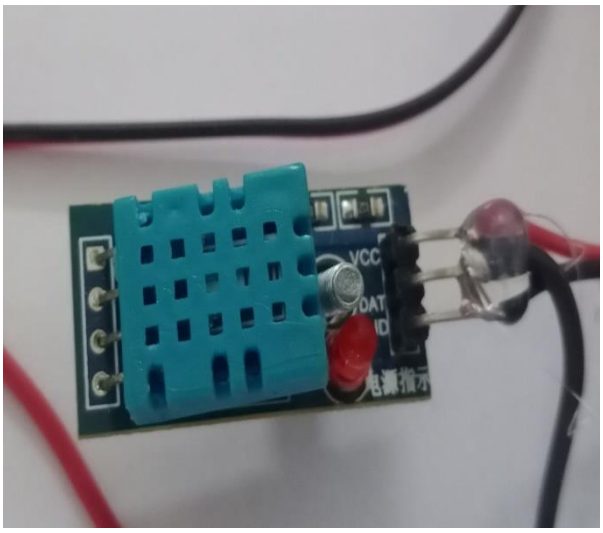
Colour Sensor:

This sensor usually detects colour in RBG scale. This sensor can categorize the colour as red, blue or green. These sensors are also equipped with filters to reject the unwanted IR light and UV light. To detect the colour of material three main types of equipment are required. A light source to illuminate the material surface, a surface whose colour has to be detected and the receivers which can measure the reflected wavelengths. Colour sensors contain a white light emitter to illuminate the surface.



Temperature Sensor:

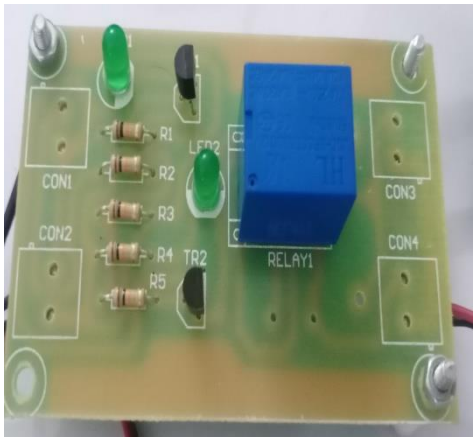
Its devices that provide readable temperature measurements via an electrical signal. The most basic way to measure temperature is using a thermometer; these measures how hot or cold something is. With advances in technology, we now have access to a variety of temperature sensors that are much more accurate.



Humidity Sensor:

Humidity sensors work by detecting changes that alter electrical currents or temperature in the air. There are three basic types of humidity sensors: capacitive, resistive and thermal. All three types will monitor minute changes in the atmosphere in order to calculate the humidity in the air.

Mini Pro:



ESP8266 Wifi Device:

The ESP8266 WiFi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network. The ESP8266 is capable of either hosting an application or offloading all WiFi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much WiFi-ability as a WiFi Shield offers (and that's just out of the box)! The ESP8266 module is an extremely cost-effective board with a huge, and ever growing, community.

Wifi Camera:

Wireless cameras work by transmitting the camera's video through a radio (RF) transmitter. The video is sent to a receiver that is connected to a built-in storage device or through cloud storage. Through your monitor or receiver, you'll have an easy link to access all of your image or video clips.

Conclusion and Future Work

Agriculture are gradually being replaced and enhanced by more sophisticated and accurate digital and electronic device. A high percentage of agriculture revenue is lost to power loss, incorrect methods of practicing. This is reduced by the use of smart sensors. The proposal is to perform the agriculture in smart and more efficient way. In addition, this method advocates for the use of the Internet of Things. Internet of Things has enabled the agriculture crop monitoring easy and efficient to enhance the productivity of the crop and hence profits for the farmer. Sensors of different types are used to collect the information of crop conditions and environmental changes and this information is transmitted through network to the farmer/devices that initiates corrective actions. Farmers are connected and aware of the conditions of the agricultural field at anytime and anywhere in the world.

By further enhancement of this project farmers can bring large areas of land under cultivation. Only the exact amount of fungicide and pesticide can be used. The system can further be improved by incorporating new self-learning techniques which could deployed

in the cloud to understand the behaviour of the sensing data and can take autonomous decisions. The other problem farmers are facing is the crop destruction by the wild animals. So, the future work includes the design of the system that may monitor the farm by installing sensors at the boundary of farm and camera module which may take a snapshot once the sensor detects the entrance and transmit the real time pictures by integrating it with other information.

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