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Data Acquisition and Real Time Monitoring Using Sensor Network for Efficient Usage of Water

Kamatchi P.M[1], Priyadharshini G[2], Sangeetha A[3], Saranya A[4], Sathia buvaneswari K[5]

Professor, Computer Science and Engineering, Krishnasamy College of Engineering & Technology, Cuddalore,India[1]

Student, Computer Science and Engineering, Krishnasamy College of Engineering & Technology, Cuddalore,India[2-5]

Abstract: In Agriculture is the basic source in all around the world the farmer can process the field conceptual model to produce the crops. Each and every action in the field can have some measurement such how to spread the seed in the field, how much of chemical and physical parameter can be used in the field like manure, water etc. The water is the most available source in today lifestyle of the all the living things.
In this project, IOT modernization helps in get together data on condition like atmosphere, protection, temperature and productivity of a surrounding area. Harvest online assessment enables level of water. In addition to that water level sensor is placed in this field, if it is excess water the motor gets automatically pumps the water into the outer area. Internet of the things(IOT) is an ecosystem of connected physical objects that are accessible through the internet. Real time monitoring data can be utilized and performance can be tracked.
Hence high yield can be achieved. This project is mainly focused on improving the agriculture fields' yield by providing a monitoring system with effective and efficiency usage of water resources. Thus further development in this project will lead to a greater efficiency in the field of agriculture.

Keywords: Arduino board, soil moisture sensor, humidity and temperature sensor, Wi-Fi module, motor etc.

I. INTRODUCTION

India has agriculture as its primary occupation. According to IBEF (India Brand Equity Foundation), 58% of the people living in rural areas in India are dependent on agriculture. As per the Central Statistics Office 2nd advised estimate, the contribution of agriculture to the Gross Value Addition (India) is estimated to be roughly around 8% which is very significant contribution. Under such a scenario, the usage of water especially the fresh water resource by agriculture will be enormous and according to the current market surveys it is estimated that agriculture uses 85% of available freshwater resources worldwide, and this percentage will continue to be dominant because of population growth and increased food demand. This calls for planning and strategies to use water sensibly by utilizing the advancements in science and technology.
There are many systems to achieve water savings in various crops, from basic ones to more technologically advanced ones. One of the existing systems uses thermal imaging to monitor the plant water status and irrigation scheduling. Automation of irrigation systems is also possible by measuring the water level in the soil and control actuators to irrigate as and when needed instead of predefining the irrigation schedule, thus saving and hence utilizing the water in a more sensible manner.
An irrigation controller is used to open a solenoid valve and apply watering to bedding plants (impatiens, petunia, salvia, and vinca rosea) when the volumetric water content of the substrate drops below a set point. The emerging global water crisis: In addition to managing scarcity and conflict between water users, the available fresh water is further contaminated by the human and animal population and the pollution levels have increased at an alarming rate.
This if continues, will be leading to limitation of food production which in turn will affect the human productivity and thus the entire ecosystem will be affected in the years to come. The primary and the most important reason for this problem is the tremendous increase in the population which has increased at a rate which is faster than the food production rate. This population growth especially in water short countries will directly have an impact on its growth on the world map.

The food production needs to be increased by at least 50% for the projected population growth. Agriculture accounts for 85% of freshwater consumption globally. This leads to the water availability problem and thus calls for a sincere effort in sustainable water usage. For a variety of reasons, feasible expansion of irrigated agriculture will be able to

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accommodate only a portion of this increased demand, and the rest must come from an increase in the productivity of rain fed agriculture. In the absence of coordinated planning and international cooperation at an unprecedented scale, the next half century will be plagued by a host of severe water related problems, threatening the wellbeing of many terrestrial ecosystems and drastically impairing human health, particularly in the poorest regions of the world. In this paper, a smart and intelligent agriculture system which can help the farmer to utilize the water level sensibly and also take care of other discrepancy factors like unrequited animal entry into the fields are discussed. The system consists of a microcontroller and sensors like moisture, temperature, humidity, motion etc. but not limited to only these. The system uses both wired and wireless connections for the communication between the sensors, microcontroller and the internet.
The system also consists of an android application which allows the user to give his/her input based on which the watering will be controlled. Smart Agriculture System is proposed in this paper which will use concept of IOT, WSN and cloud computing to help farmer plan an irrigation schedule for his farm through a agriculture profile which can be edited as per his/her requirements. Based on the users input an automated irrigation system is developed to optimize water use for agricultural crops.
The system has a distributed wireless network for soil- moisture and temperature sensors placed in the root zone of the plants. Smart agriculture is an emerging concept, because IOT sensors are capable of providing information about agriculture fields and then act upon based on the user input. In this Paper, it is proposed to develop a Smart agriculture System that uses advantages of cutting edge technologies such as Arduino, IOT and Wireless Sensor Network. The paper aims at making use of evolving technology i.e. IOT and smart agriculture using automation. Monitoring environmental conditions is the major factor to improve yield of the efficient crops. The feature of this paper includes development of a system which can monitor temperature, humidity, moisture and even the movement of animals which may destroy the crops in agricultural field through sensors using Arduino board and in case of any discrepancy send a SMS notification as well as a notification on the application developed for the same to the farmer's smartphone using Wi-Fi/3G/4G. The system has a duplex communication link based on a cellular-Internet interface that allows for data inspection and irrigation scheduling to be programmed through an android application. Because of its energy autonomy and low cost, the system has the potential to be useful in water limited geographically isolated areas.

II. LITERATURE REVIEW

An easy way to comply with the conference paper formatting requirements is to use this document as a template and simply type your text into it.

A. *sensor networks data acquisition and task management for decision support of smart agriculture[1]*

In increase population of people in the world, so the feeding the food in traditional manner is not possible nowadays. Then the researchers and industry experts think an alternative way to develop the production food in the world. To design smart farming technique that explains how the agriculture is connected to today's technology of internet of things. Such way to design step by step process in which order the farmers perform their necessary tasks in the agriculture. In this concept internet of things is very helpful to the farmer to collect data in sensor like what are the condition and take the action to related problem

B. *smart agriculture system using sensors for agricultural task automation[2]*

In this author study to describe the smart irrigation method of agriculture. Here how much physical and chemical parameter measured of soil using sensors like moisture content of soil, nutrient level, potential of hydrogen (PH value) of the soil is used in smart farming technique. What level of quantity green manure, compost and water irrigation on the crops using a smart irrigator, which is mounted on a movable overhead crane system.

C. *iot based smart agriculture[3]*

In irrigation of crop method only is not smart farming technique. In different weather and the environment condition can arises challenges in the farmer. Temperature and humidity levels of environment can be measured. Sense animal invasion in the field, measure weather condition that gathers the data and send to real time status through internet. In this case arises another major problem using continuously internet connection. So we move another way SMS. The farmer directly can send SMS using GSM module of mobile app.

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III.RELATED WORK

Swaraj C M [4] in study to provide the farmer in early days identifies the soil condition in traditional manner. The farmer cannot understand the atmospheric condition, riskiness about the crops. The use internet of things can identify the real time status of environment condition and cultivation land condition in anywhere and anytime with in your living place. In this author explained to how we get real time status using internet of things. In this paper use different types of sensor in some of the challenges identify the agriculture land such as soil moisture sensor, temperature sensor, humidity sensor, infrared sensor, tilt sensor. Here we use one software application that collect the internet's of things device data. Here the collect and view sensor data the soil moisture sensor used to measure soil condition in the field, temperature sensor used to measure the surrounded air temperature, tilt sensor used alert the farmer if any tree fallen and infrared sensor help to alert the farmer in any fire can occur in surrounded area. In such all sensor data can be gathered using Think speak application. It shows the plotted graph structure in the real time update. [5-15].

IV. OUR CONTRIBUTION

In an IOT can used many applications in the world in our contribution we can improve the smart agriculture in world using internet of things. In agricultural area can face many problems involved that lead to farmer to reduce the profit. We used to propose to identify the problem in early and prevent the problem using Think view application. In thinkspeak application used to monitor the data collected from the soil moisture and temperature & humidity sensor that can be monitored analog model. In this paper the soil moisture sensor can identify the level of water in the agricultural field and if have excess water in the agricultural land that can automatically pump out in outer area of the field. In this technique can used any weather condition in the environment. Hence this lead to protect the crops in the field and reduce the farmer loss of the crops.

V. SYSTEM ARCHITECTURE

In this section system architecture is most important to understand overall outline of the system. In order to tracking the environment condition, we use soil moisture and temperature & humidity sensor. The soil moisture sensor is a hardware device that can be used to measure high Accuracy of water content in the soil. The temperature & humidity condition in present in the surrounded air. The collected information send to arduino IDE to work the hardware and identify the level of water then automatically pump out the water in outer area of the field using motor. At same time the data can monitoring using thinkspeak application.

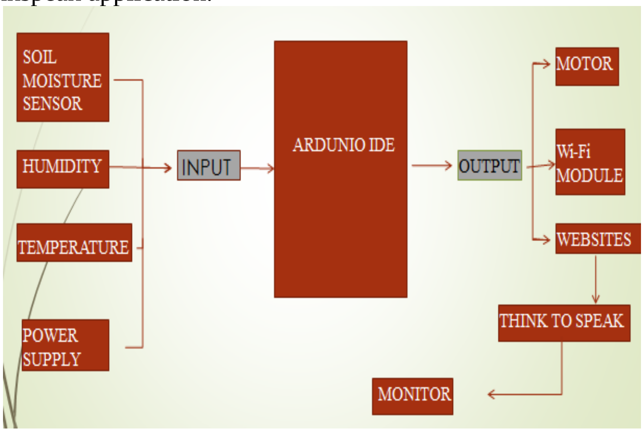

Fig.1 system architecture

VI. DESCRIPTION

A. *node mcu*

NodeMCU is an open source IoT platform. It helps to connected bridge between sensor devices and Wi-Fi modules. In NodeMCU can connected ESP8266 WiFi it contain 32 bits. In our project used LoLiN NodeMCU that clock speed 80 MHZ, it contain 4 MB/ 64 KB of flash memory or SRAM, and it takes input voltage of 4.5 volt to 10 volt.

A NodeMCU board begins with arduino.cc on non AVR processors and then used in arduino due, they need to change the arduino IDE so that it would be relatively easy to change the IDE to support alternative tool chains to allow arduino C/C++ to be compiled for these new processors. By using arduino IDE to collect the software component to compile an arduino C/C++ source file to the support MCU machine language.

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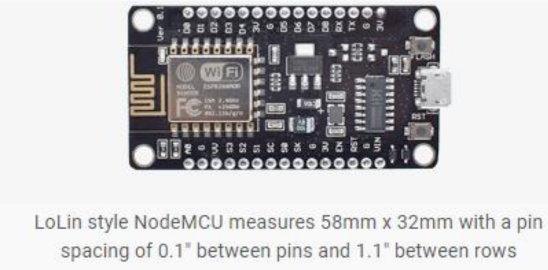

Fig.2 LoLin NodeMCU

	LoLin NodeMCU
Microcontroller	ESP-8266 32-bit
NodeMCU Model	Clone LoLin
NodeMCU Size	58mm x 32mm
Carrier Board Size	n/a
Pin Spacing	1.1" (27.94mm)
Clock Speed	80 MHz
USB to Serial	CH340G
USB Connector	Micro USB
Operating Voltage	3.3V
Input Voltage	4.5V-10V
Flash Memory/SRAM	4 MB / 64 KB
Digital I/O Pins	11
Analog In Pins	1
ADC Range	0-3.3V
UART/SPI/I2C	1 / 1 / 1
WiFi Built-In	802.11 b/g/n
Temperature Range	-40C - 125C
Product Link	NodeMCU

Fig.3 specification of LoLin NodeMCU

B. *iot (internet of things)*

IOT is collection of data and exchange of physical data from sensors over internet. In this paper we have proposed to use IOT to collect data from sensors and transfer it over internet so that the physician and owner can have access to it anytime. It also helps for primary of the particular person.

C. *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 weighing 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.

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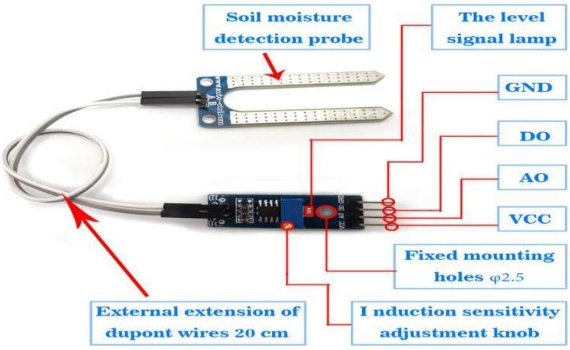

Fig.4 Soil moisture sensor

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.

D. *humidity sensor*

Humidity Sensor is one of the most important devices that has been widely in consumer, industrial, biomedical, and environmental etc. applications for measuring and monitoring Humidity.

Humidity is defined as the amount of water present in the surrounding air. This water content in the air is a key factor in the wellness of mankind. For example, we will feel comfortable even if the temperature is 00C with less humidity i.e. the air is dry.

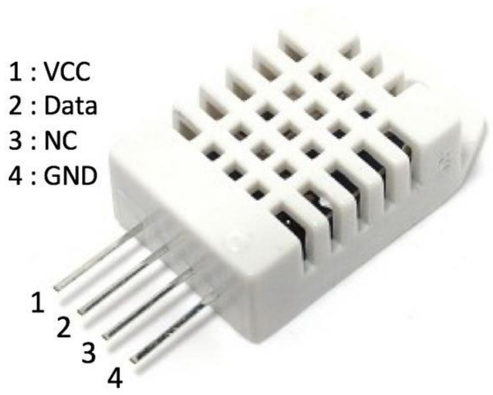

Fig.5 DHT22 Sensor

But if the temperature is 100C and the humidity is high i.e. the water content of air is high, then we will feel quite uncomfortable. Humidity is also a major factor for operating sensitive equipment like electronics, industrial equipment, electrostatic sensitive devices and high voltage devices etc. Such sensitive equipment must be operated in a humidity environment that is suitable for the device.

Hence, sensing, measuring, monitoring and controlling humidity is a very important task. Some of the important areas of application for sensing, measuring and controlling Humidity are mentioned below.

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I. *Domestic:* Sensing and controlling humidity in our homes and offices is important as higher humidity conditions will affect the blood flow. Other areas include cooking, indoor plantation etc.

II. *Industrial**:*** In industries like refineries, chemical, metal, or other industries where furnaces are used, high humidity will reduce the amount of oxygen in the air and hence reduces the firing rate. Other industries like food processing, textile, paper etc. also need control of humidity.

III. *Agriculture**:*** Irrigation techniques like drip irrigation need accurate moisture content for plants. Also, the moisture in the soil plays an important role in the proper growth of the plant. Other areas where humidity control is required is indoor vegetation.

IV. *Electronics and Semiconductor**:*** Almost all electronic devices are rated with a range of humidity values in which they work as expected. Generally, this value will be something like 10% – 50% Humidity. Semiconductor Fabs (Fabrication Plants) should maintain very precise temperature and humidity values as even minute difference can show a huge impact in the production.

V. *Medical**:*** Medical equipment like ventilators, incubators, sterilizers etc. need humidity control. It is also used in pharmaceutical plants and biological processes.

All the above mentioned and many other applications need sensing of Humidity and is done using Humidity Sensors. Before discussing about Humidity Sensors, its types and working principle, we will first see some important terms and definitions related to Humidity.

E. *power supply*

A power supply is an electrical device that supplies electric power to an electrical load. The primary function of a power supply is to convert electric current from a source to the correct voltage, current, and frequency to power the load. As a result, power supplies are sometimes referred to as electric power converters. Some power supplies are separate standalone pieces of equipment, while others are built into the load appliances that they power. Examples of the latter include power supplies found in desktop computers and consumer electronics devices. Other functions that power supplies may perform include limiting the current drawn by the load to safe levels, shutting off the current in the event of an electrical fault, power conditioning to prevent electronic noise or voltage surges on the input from reaching the load, power-factor correction, and storing energy so it can continue to power the load in the event of a temporary interruption in the source power (uninterruptible power supply).

All power supplies have a power input connection, which receives energy in the form of electric current from a source, and one or more power output connections that deliver current to the load. The source power may come from the electric power grid, such as an electrical outlet, energy storage devices such as batteries or fuel cells, generators or alternators, solar power converters, or another power supply. The input and output are usually hardwired circuit connections, though some power supplies employ wireless energy transfer to power their loads without wired connections. Some power supplies have other types of inputs and outputs as well, for functions such as external monitoring and control.

VII. SOFTWARE USED

A program for Arduino hardware may be written in any programming language with compilers that produce binary machine code for the target processor. Atmel provides a development environment for their 8-bit AVR and 32-bit ARM Cortex-M based microcontrollers: AVR Studio (older) and Atmel Studio (newer). Arduino is an open-source hardware and software company, project and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices and interactive objects that can sense and control both physically and digitally. Its products are licensed under the GNU Lesser General Public License (LGPL) or the GNU

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General Public License(GPL), permitting the manufacture of Arduino boards and software distribution by anyone. Arduino boards are available commercially in preassembled form or as do-it-yourself (DIY) kits.
Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards or breadboards (shields) and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers. The microcontrollers are typically programmed using a dialect of features from the programming languages C and C++. In addition to using traditional compiler tool chains, the Arduino project provides an integrated development environment (IDE) based on the Processing language project.

The Arduino project started in 2003 as a program for students at the Interaction Design Institute Ivrea in Ivrea, Italy, aiming to provide a low-cost and easy way for novices and professionals to create devices that interact with their environment using sensors and actuators. Common examples of such devices intended for beginner hobbyists include simple robots, thermostats and motion detectors.
The name Arduino comes from a bar in Ivrea, Italy, where some of the founders of the project used to meet. The bar was named after Arduin of Ivrea, who was the margrave of the March of Ivrea and King of Italy from 1002 to 1014.

The Arduino integrated development environment (IDE) is a cross-platform application (for Windows, macOS, Linux) that is written in the programming language Java. It originated from the IDE for the languages Processing and Wiring. It includes a code editor with features such as text cutting and pasting, searching and replacing text, automatic indenting, brace matching, and syntax highlighting, and provides simple one-click mechanisms to compile and upload programs to an Arduino board. It also contains a message area, a text console, a toolbar with buttons for common functions and a hierarchy of operation menus. The source code for the IDE is released under the GNU General Public License, version 2.
The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub main() into an executable cyclic executive program with the GNU tool chain, also included with the IDE distribution. The Arduino IDE employs the program avr dude to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware.

A sketch is a program written with the Arduino IDE. Sketches are saved on the development computer as text files with the file extension .ino. Arduino Software (IDE) pre-1.0 saved sketches with the extension .pde.
A minimal Arduino C/C++ program consist of only two functions:
`setup()`: This function is called once when a sketch starts after power-up or reset. It is used to initialize variables, input and output pin modes, and other libraries needed in the sketch.
`loop()`: After `setup()` function exits (ends), the `loop()` function is executed repeatedly in the main program. It controls the board until the board is powered off or is rese

Most Arduino boards contain a light-emitting diode (LED) and a current limiting resistor connected between pin 13 and ground, which is a convenient feature for many tests and program functions. A typical program used by beginners, akin to Hello, World!, is "blink", which repeatedly blinks the on-board LED integrated into the Arduino board. This program uses the functions `pinMode()`, `digitalWrite()`, and `delay()`, which are provided by the internal libraries included in the IDE environment. This program is usually loaded into a new Arduino board by the manufacturer.
The Arduino project was started at the Interaction Design Institute Ivrea (IDII) in Ivrea, Italy. At that time, the students used a BASIC Stamp microcontroller at a cost of $50, a considerable expense for many students. In 2003 Hernando Barragán created the development platform Wiring as a Master's thesis project at IDII, under the supervision of Massimo Banzi and Casey Reas. Casey Reas is known for co-creating, with Ben Fry, the Processing development platform. The project goal was to create simple, low cost tools for creating digital projects by non-engineers. The Wiring platform consisted of a printed circuit board (PCB) with an ATmega168 microcontroller, an IDE based on Processing and library functions to easily program the microcontroller. In 2003, Massimo Banzi, with David Mellis, another IDII student, and David Cuartielles, added support for the cheaper ATmega8 microcontroller to Wiring. But instead of continuing the work on Wiring, they forked the project and renamed it Arduino.

The source code for the IDE is released under the GNU General Public License, version 2.[3] The Arduino IDE supports the languages C and C++ using special rules of code structuring, The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two

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The initial Arduino core team consisted of Massimo Banzi, David Cuartielles, Tom Igoe, Gianluca Martino, and David Mellis, but Barragán was not invited to participate.

Following the completion of the Wiring platform, lighter and less expensive versions were distributed in the open-source community.

It was estimated in mid-2011 that over 300,000 official Arduinos had been commercially produced, and in 2013 that 700,000 official boards were in users' hands.

In October 2016, Federico Musto, Arduino's former CEO, secured a 50% ownership of the company. In April 2017, Wired reported that Musto had "fabricated his academic record.... On his company's website, personal LinkedIn accounts, and even on Italian business documents, Musto was until recently listed as holding a PhD from the Massachusetts Institute of Technology. In some cases, his biography also claimed an MBA from New York University." Wired reported that neither University had any record of Musto's attendance, and Musto later admitted in an interview with Wired that he had never earned those degrees.

Around that same time, Massimo Banzi announced that the Arduino Foundation would be "a new beginning for Arduino." But a year later, the Foundation still hasn't been established, and the state of the project remains unclear.

The controversy surrounding Musto continued when, in July 2017, he reportedly pulled many Open source licenses, schematics, and code from the Arduino website, prompting scrutiny and outcry

In early 2008, the five co-founders of the Arduino project created a company, Arduino LLC, to hold the trademarks associated with Arduino. The manufacture and sale of the boards was to be done by external companies, and Arduino LLC would get a royalty from them. The founding bylaws of Arduino LLC specified that each of the five founders transfer ownership of the Arduino brand to the newly formed company.

At the end of 2008, Gianluca Martino's company, Smart Projects, registered the Arduino trademark in Italy and kept this a secret from the other cofounders for about two years. This was revealed when the Arduino company tried to register the trademark in other areas of the world (they originally registered only in the US), and discovered that it was already registered in Italy. Negotiations with Gianluca and his firm to bring the trademark under control of the original Arduino company failed. In 2014, Smart Projects began refusing to pay royalties. They then appointed a new CEO, Federico Musto, who renamed the company Arduino SRL and created the website arduino.org, copying the graphics and layout of the original arduino.cc. This resulted in a rift in the Arduino development team.

In January 2015, Arduino LLC filed a lawsuit against Arduino SRL.

In May 2015, Arduino LLC created the worldwide trademark Genuino, used as brand name outside the United States.

At the World Maker Faire in New York on October 1, 2016, Arduino LLC co-founder and CEO Massimo Banzi and Arduino SRL CEO Federico Musto announced the merger of the two companies.

By 2017 Arduino AG owned many Arduino trademarks. In July 2017 BCMI, founded by Massimo Banzi, David Cuartielles, David Mellis and Tom Igoe, acquired Arduino AG and all the Arduino trademarks. Fabio Violante is the new CEO replacing Federico Musto, who no longer works for Arduino AG.

Arduino is open-source hardware. The hardware reference designs are distributed under a Creative Commons Attribution Share-Alike 2.5 license and are available on the Arduino website. Layout and production files for some versions of the hardware are also available.

Although the hardware and software designs are freely available under copyleft licenses, the developers have requested the name Arduinoto be exclusive to the official product and not be used for derived works without permission. The official policy document on use of the Arduino name emphasizes that the project is open to incorporating work by others into the official product. Several Arduino-compatible products commercially released have avoided the project name by using various names ending in -duino.

An early Arduino boardwith an RS-232 serial interface (upper left) and an Atmel ATmega8 microcontroller chip (black, lower right); the 14 digital I/O pins are at the top, the 6 analog input pins at the lower right, and the power connector at the lower left.

Most Arduino boards consist of an Atmel 8-bit AVR microcontroller (ATmega8, ATmega168, ATmega328, ATmega1280, ATmega2560) with varying amounts of flash memory, pins, and features. The 32-bit Arduino Due, based on the Atmel SAM3X8E was introduced in 2012. The boards use single or double-row pins or female headers that facilitate connections for programming and incorporation into other circuits. These may connect with add-on modules termed shields. Multiple and possibly stacked shields may be individually addressable via an I²C serial bus. Most boards

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include a 5 V linear regulator and a 16 MHz crystal oscillator or ceramic resonator. Some designs, such as the LilyPad, run at 8 MHz and dispense with the onboard voltage regulator due to specific form-factor restrictions.
Arduino microcontrollers are pre-programmed with a boot loader that simplifies uploading of programs to the on-chip flash memory. The default boot loader of the Arduino UNO is the optiboot boot loader. Boards are loaded with program code via a serial connection to another computer. Some serial Arduino boards contain a level shifter circuit to convert between RS-232 logic levels and transistor–transistor logic(TTL) level signals. Current Arduino boards are programmed via Universal Serial Bus (USB), implemented using USB-to-serial adapter chips such as the FTDI FT232. Some boards, such as later-model Uno boards, substitute the FTDI chip with a separate AVR chip containing USB-to-serial firmware, which is reprogrammable via its own ICSP header. Other variants, such as the Arduino Mini and the unofficial Boarduino, use a detachable USB-to-serial adapter board or cable, Bluetooth or other methods. When used with traditional microcontroller tools, instead of the Arduino IDE, standard AVR in-system programming (ISP) programming is used.
An official Arduino Uno R2 with descriptions of the I/O locations
The Arduino board exposes most of the microcontroller's I/O pins for use by other circuits. The Diecimila, Duemilanove, and current Uno provide 4 digital I/O pins, six of which can produce pulse-width modulated signals, and six analog inputs, which can also be used as six digital I/O pins. These pins are on the top of the board, via female 0.1-inch (2.54 mm) headers. Several plug-in application shields are also commercially available. The Arduino Nano, and Arduino-compatible Bare Bones Board and Boarduino boards may provide male header pins on the underside of the board that can plug into solder less breadboards.
Many Arduino-compatible and Arduino-derived boards exist. Some are functionally equivalent to an Arduino and can be used interchangeably. Many enhance the basic Arduino by adding output drivers, often for use in school-level education, to simplify making buggies and small robots. Others are electrically equivalent, but change the form factor, sometimes retaining compatibility with shields, sometimes not. Some variants use different processors, of varying compatibility.

VIII. RESULT ANALYSIS

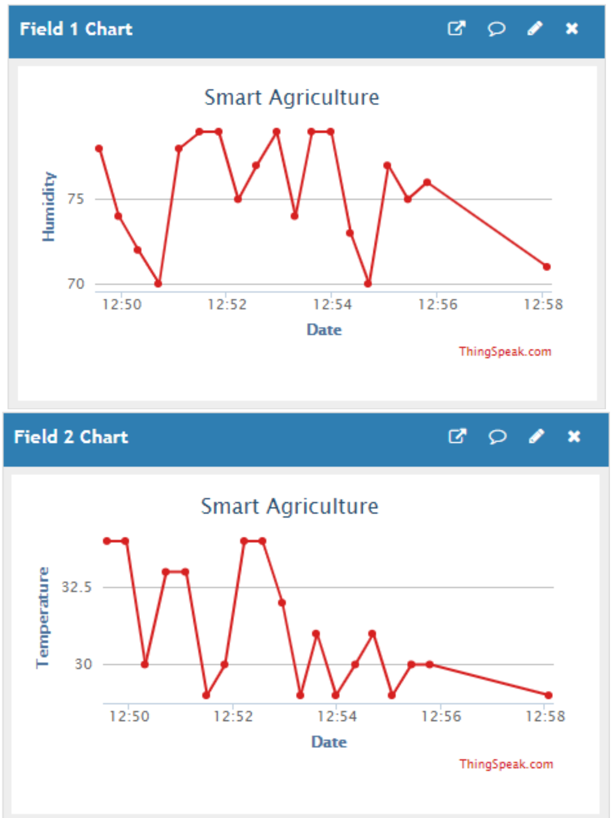

Fig.6 temperature and humidity data collection in thinkspeak application

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IX. CONCLUSION

IOT based smart agriculture system can prove to be very helpful for farmers since over as well as less irrigation is not good for agriculture. Threshold values for climatic conditions like humidity, temperature, moisture can be fixed based on the environmental conditions of that particular region. The sensing phase involves the sensing of the physical parameters which includes temperature, moisture, humidity and motion. All these sensors are attached to the NodeMCU microcontroller board. This board acts as the IOT gateway in the developed system as it has the capacity to transmit the data to the cloud. This transmission is done using Wi-Fi ESP8266 module

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