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Modern cultivating method and monitoring using IOT with Cloud

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ABSTRACT

Most of the population (70%) in India depends on agriculture which affects the growth of the nation. In order to solve this problem there is only one solution that is smart agriculture by adding new technological methods instead of present traditional agriculture methods. The major challenges in traditional agriculture such as proper monitoring of the soil health and the environment, with adjusting the irrigation as well as the plant clear. Traditional system results in either excessive use of pesticides or under use of water which produces less efficient and less productive crops. The proposed work is about having control over the irrigation and monitoring the agricultural field using IoT. The system connects physical sensing devices with the cloud and connects the irrigation control mechanism with the cloud.from the cloud with the help of Wi-Fi the collected and analyzed data is sent to the owner or the particular user. This makes a huge analysis and problem solving capability to the overall architecture ***. Results have shown that we can aggravate data in real time with extremely low latency and based on that we can take the*** decisions.

Keywords-- Internet of Things (IoT) , Cloud Computing, Wi-Fi technology , Sensors (soil moisture, temperature, humidity, water level) , Raspberry Pi 3 kit.

1.Introduction

Almost all countries population is depending on agriculture by using water and land resources optimally. Still most of the countries depending on labor work and they do not use proper pest/disease control, crop management and quality management systems. Hence in addition to that, still in traditional agriculture they don't use proper optimal uniform water distribution in field. Hence, a IoT (Wi-Fi) technology based agricultural monitoring system is greatly required for IT people, farmers in developing countries which gives a proper management of the crops.

The existing system has lots of disadvantages in which the proper monitoring is not possible. For example consider the scenario, for the land of 3 to 4 acres man power is able to monitor the growth of the plant and find out if there are any discomforts in it. But when it comes to huge land of cultivation , i.e for 200 or 300 acres man power is not possible to maintain the land. In that cases we need an automation system which can monitor the crops regularly and send reports. Our system with the help of the Raspberry Pi 3 kit along with the sensors collect the information and send to the cloud. From the cloud the collected information is sent the particular user.

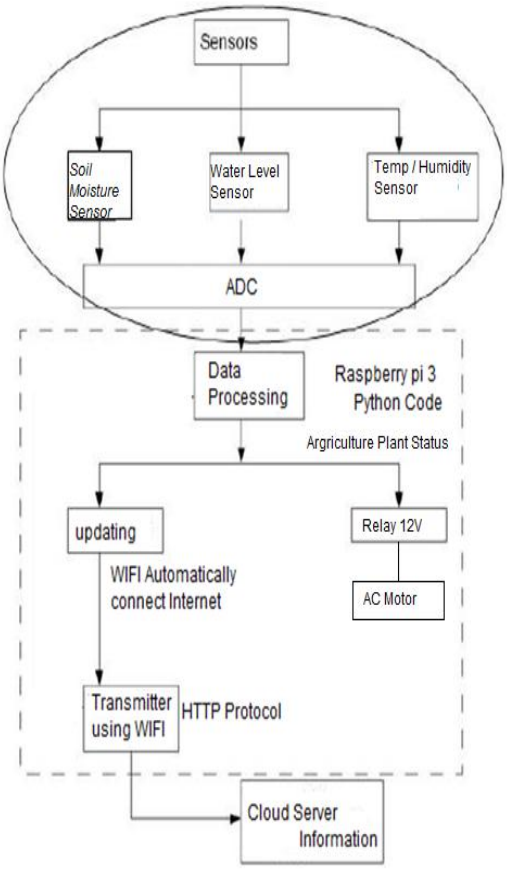
Sensor is a device which detects and responds to sometype of input from physiocal environmrent. The specific input could be light ,heat ,motion,moisture,pressure,or anyone of a great number of other environmental phenomena.

The soil moisture sensor is a simple and easy moisture sensor that can be used for the detection of soil moisture. The module outputs a high level, when soil

moisture is inadequate, the output is low level. Using the sensor produces a watering device automatically.

A humidity sensor (or hygrometer) senses, measures and reports the relative humidity in the air. It therefore measures both moisture and air temperature. Relative humidity is the ratio of actual moisture in the air to the highest amount of moisture thabe held at that air temperature.

A temperature sensor is a device , typically a a thermocouple or RTD that provides temperature measurement through an electrical signal. Hence, here we use RTD (Resistance Temperature Detector) is a variable resistor that will change its electrical resistance in a direct proportion that is repeatable and similarly linear manner.



Water level sensors are used to detect the level of substances that can flow which include liquids, slurries, granular materials and powders. Such measurements are used to determine the amount of materials within a closed container.

Raspberry pi plugs into computer monitor or tv and uses the standard keyboard and mouse. It is a low cost credit card sized computer that enables people of all ages to explore computing .Here we use RPi3 model includes the 802.11 Wi-Fi ,Bluetooth 4.0, and a quad – core 64bit ARM ,cortex A53 running at 1.2 GHz.

The input to an analog to digital convertor (ADC) consists of a voltage that varies among theoretically infinite number of values. The output iof the ADC , in contrast, has defined certain levels of states.

Relays are switches that open and close circuits electromechanically or electronically. When a relay contact is not energized when it is an open contact. They control one circuit by opening and closing another ciruit.

An Ac motor is an electric motor driven by an alternating current(AC). The AC motor commonlyconsists of two basic parts, an outside stator having coils supplied with alternative current to produce rotating magnetic field , and an inside rotor attached to the output shaft producing a second rotating magnetic field.

A cloud server is a logical server which is built and delivered through cloud platform over the internet. Cloud servers possess and exhibit similar capabilities and functionality to a typical server but are accessed remotely by a cloud service provider. A cloud server may also be called a virtual server or virtual private server. Here we use a private cloud which is purchased and owned by a private owner.

The cloud is used to store data and information of the user. The cloud is more secured by providing user name and password which can be accessed only by the owner. Cloud computing relies on sharing of resource coherence and economics of scale and public utility.

Hyper Text Transfer Protocol is a protocol is used to transfer the data over the web. It is the part of internet protocol and defines commands and services used for transmitting web pages and data.

2. System Overview

In applications dealing with a large number of fixed sensors, the use of distributed decision schemes supported in service oriented information systems is a common approach to control architectures.

Block Diagram:

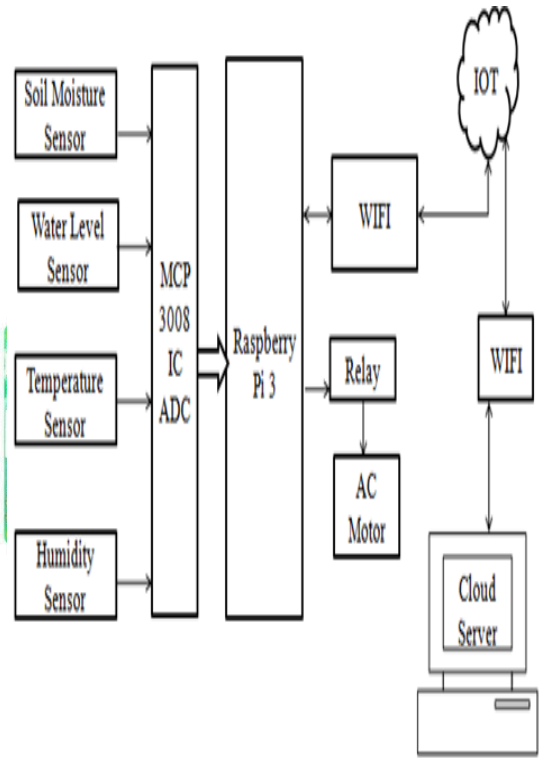


Figure1. Block Diagram

This architecture is defined on the following operational assumptions,

- When the water level is low
- When the soil does not consists any moisture
- When to switch the motor for the plants
- To send the collected information to the cloud.

3. Raspberry Pi 3:

Raspberry Pi3 is a small computer developed by the Raspberry Pi foundation , a UK charity which provide low cost computers and free software to students. Raspberry Pi supports three Linux-based operating systems. It has fewer connectivity options and it is a cheaper version. The final version of Raspberry Pi is an educational version. It is a pre-loaded educational software.

SPECIFICATION AND PERFORMANCE:

Raspberry Pi 3 the Broadcom GPU is a very capable graphics core capable of hardware decoding and several high definition video formats. It has memory configuration of 1 GB RAM. The storage is MicroSDHC slot and it has graphics in Broadcom VideoCore IV which is 300 MHZ/400 MHZ. The power configuration is 1.5 W to 6.7 W(maximum under stress).

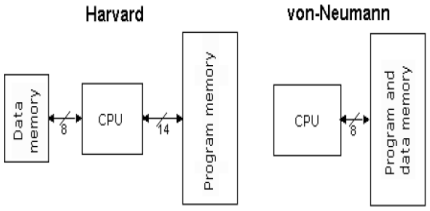
As for the specifications, the Raspberry Pi is a credit card sized computer powered by the Broadcom BCM2835 system_on_a_chip (SoC). The SoC includes 32-bit processor. It is powered by a 5V microUSB AC charger or atleast 4 AA batteries (with a bit of hacking)

4. Hardware principle

CISC and RISC

Hardware architecture is a newer concept than Von-Neumann's. It rose out of the need to speed up the work of a microcontroller. In Harvard architecture, data bus and address bus are separate. Thus a greater flow of data is possible through the central processing unit, and of course, a greater speed of work. Separating a program from data memory makes it further possible for instructions not to have to be 8-bit words. It is also typical for Harvard architecture to have fewer instructions than von-Neumann's, and to have instructions usually executed in one cycle.

Microcontrollers with Harvard architecture are also called "RISC microcontrollers". RISC stands for Reduced Instruction Set Computer. Microcontrollers with von-Neumann's architecture are called 'CISC microcontrollers'. Title CISC stands for Complex Instruction Set Computer. Since PIC18F452 is a RISC microcontroller, that means that it has a reduced set of instructions, more precisely 35 instructions. All of these instructions are executed in one cycle except for jump and branch instructions. PIC18F452 usually reaches results of 2:1 in code compression and 4:1 in speed in relation to other 8-bit microcontrollers in its class.



Program Memory Organization

A 21-bit program counter is capable of addressing the 2-Mbyte program memory space. Accessing a location between the physically implemented memory and the 2-Mbyte address will cause a read of all '0's (a NOP instruction). The PIC18F252 and PIC18F452 each have 32 Kbytes of FLASH memory, while the PIC18F242 and PIC18F442 have 16 Kbytes of FLASH.

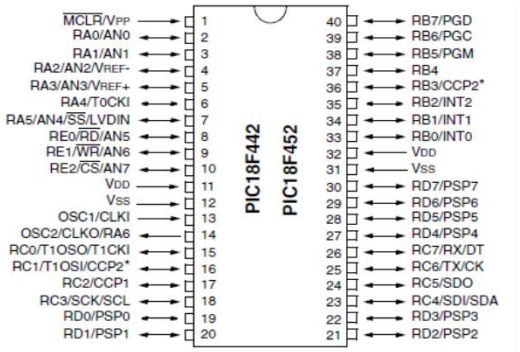
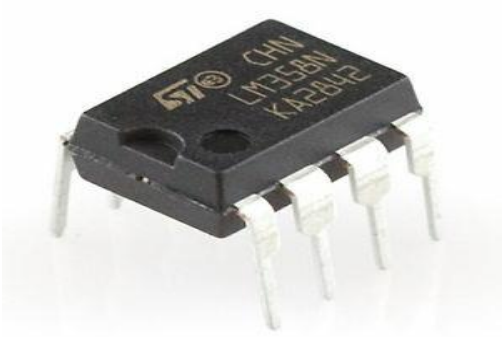


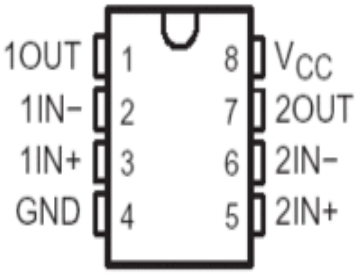
Figure4.Pin diagram

A.SOIL MOISTURE SENSOR:

A soil moisture sensor measures the quantity of water contained in a material, such as soil on a volumetric or gravimetric basis. To obtain an accurate measurement, a soil temperature sensor is also required for calibration. Here we use LM358 sensor.



The LM358 is a low power dual operational amplifier integrated circuit originally introduced by National Semiconductor. It is used in detector circuits.



The abbreviation LM358 indicates an 8-pin integrated circuit, comprising two operational amplifiers at low power. The LM358 is designed for general use as amplifiers, high-pass filters, low band pass filters, and analog adders.

B. HUMIDITY SENSOR:

DHT11 is a humidity sensor which features digital temperature & humidity sensor complex with a calibrated digital signal output. Its single-bus operation, extremely small size and low consumption enable it to be used in HVAC, automotive, weather stations, dehumidifier and other applications. Single-bus data format is used for communication and synchronization between MCU and DHT11 sensor. One communication process is about 4ms. Data consists of decimal and integral parts, and the specific format will be described below. Current decimal part is for future expansion which is read as zero now. The operation process is as below: a complete data transmission is 40bit, and the sensor sends higher data bit first.

Humidity measurement can be done using electronic hygrometers. Electronic type hygrometers or humidity sensors can be broadly divided into two categories namely capacitive sensing effects and resistive sensing effects. Resistive type humidity sensors pick up changes in the resistance value of the sensor element in response to the change in the humidity. Thick film conductor of precious metals like gold, ruthenium oxide is printed and culminated in the shape of the comb to form an electrode. Then a polymeric film is applied on the electrode; the film acts as a humidity sensing film due to the existence of movable ions. Change in impedance occurs due to the change in the number of movable ions.

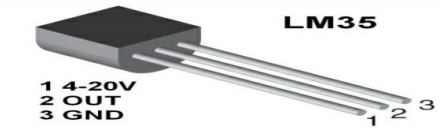
C.WATER LEVEL INDICATOR:

Here we use the concept of i-ball method. Whenever there is a shortage of water there exists the 5V of current with the help of this we can ON or OFF the motor.

D.TEMPERATURE SENSOR:

The temperature sensor is used to measure the hotness or the coldness of an object . Here we use LM35 sensor which measures accurately with the help of the thermistor. The operating temperature range is from -55°C to 150°C. The LM35 is an integrated circuit sensor that can be used to measure temperature with an electrical output proportional to the temperature. The LM35 does not require any external calibration or trimming and maintains an accuracy of +/-0.4°C at room temperature and +/-0.8°C over a range of 0°C to +100°C.Another important characteristic of the LM35 is that it draws only 60 micro amps from its supply and possesses a low self-heating capability. The LM35 comes in many different packages such as TO-92 plastic transistor-like package,T0-46 metal can transistor-like package,8-lead surface mount SO-8 small outline package.

There are two transistors in the center of the drawing. One has ten times the emitter area of the other. This means it has one tenth of the current density, since the same current is going through both transistors. This causes a voltage across the resistor R1 that is proportional to the absolute temperature, and is almost linear across the range. The "almost" part is taken care of by a special circuit that straightens out the slightly curved graph of voltage versus temperature. The amplifier at the top ensures that the voltage at the base of the left transistor (Q1) is proportional to absolute temperature (PTAT) by comparing the output of the two transistors. The amplifier at the right converts absolute temperature (measured in Kelvin) into either Fahrenheit or Celsius, depending on the part (LM34 or LM35).The little circle with the "i" in it is a constant current source circuit. The two resistors are calibrated in the factory to produce a highly accurate temperature sensor. The integrated circuit has many transistors in it -- two in the middle, some in each amplifier, some in the constant current source, and some in the curvature compensation circuit. All of that is fit into the tiny package with three leads.



DC MOTOR:

The relationship between torque vs speed and current is linear as shown left; as the load on a motor increases, Speed will decrease. The graph pictured here represents the characteristics of a typical motor. As long as the motor is used in the area of high efficiency (as represented by the shaded area) long life and good performance can be expected. If voltage in continuous applied to a motor in a locked rotor condition, the motor will heat up and fail in a relatively short time. Therefore it is important that there is some form of protection against high temperature rises. A motor's basic rating point is slightly lower than its maximum efficiency point. A DC motor converts direct current electrical power into mechanical power. DC or direct current motor works on the principal, when a current carrying conductor is placed in a magnetic field, it experiences a torque and has a tendency to move. This is known as motoring action. When magnetic field and electric field interact they produce a mechanical force. Thus, a DC motor can be used at a voltage lower than the rated voltage. But, below 1000 rpm, the speed becomes unstable, and the motor will not run smoothly. However, using the motor outside this range will result in high temperature rises and deterioration of motor parts.





- Supply voltage: 5v DC
- Very reliable and low cost
- Speed: 1000rpm
- The field can be permanent magnet

APPLICATIONS

- Electric traction.
- Vacuum cleaner.
- Small DC motors are used in tools, toys, and appliances.
- The universal motor can operate on direct current but is a lightweight motor used for portable power tools and appliances.

SINGLE RELAY BOARD:

Relays are simple switches which are operated both electrically and mechanically. Relays consist of a n electromagnet and also a set of contacts. The switching mechanism is carried out with the help of the electromagnet. The main operation of a relay comes in places where only a low-power signal can be used to control a circuit. It is also used in places where only one signal can be used to control a lot of circuits. They were used to switch the signal coming from one source to another destination. The high end applications of relays require high power to be driven by electric motors and so on. Such relays are called contactors.

A relay is an electromechanical switch which is activated by an electric current. A single relay board arrangement contains driver circuit, power supply circuit and isolation circuit. A relay is assembled with that circuit. The driver circuit contains transistors for switching operations. The transistor is use for switching the relay. An isolation circuit prevents reverse voltage from the relay which protects the controller and transistor from damage. The input pulse for switching the transistor is given from the microcontroller unit. It is used for switching of a single device.

- Input voltage: $12V_{DC}$
- Driver unit: ULN2003A
- Isolation unit: In4007
- Fast

APPLICATIONS:

- Ac load Switching applications
- Dc load Switching applications
- Motor switching applications

HDMI TO VGA CONVERTOR:

This converting the HDMI digital signal to VGA analog signal It enables the PC, Laptop DVD, PS3, Xbox360 Sky HD, Apple TV and other HD device to be connected to VGA monitor, projector or other display for education, business presentation, commercial promotion, conference, exhibition, etc. It supports the high definition output of 720P or 1080P. PORTABLE HDMI TO VGA ADAPTER connects a computer, laptop, tablet or other device with HDMI to a monitor or projector with a VGA port; A VGA cable (sold separately) is required to connect from the adapter to a monitor or projector; Carry this lightweight adapter in your laptop bag for a business presentation from your computer or use it on the desktop to extend your screen to a monitor

The HDMI to VGA Converter is your affordable solution for transferring HDMI signal into VGA and Audio signal. The Converter gives you the freedom to use HDMI devices with your existing VGA display devices, including monitors and projectors. You can avoid costly and unnecessary upgrades of your VGA devices with this simple unit. Implementation of a standardized multimedia interface was driven by a highly competitive consumer market where time to market is a critical factor.



FEATURES:

- Input voltage: 5v
- L x W x H: 7" x 1.65" x 0.59"
- Use with Apple TV, gaming consoles, and many other HDMI devices
- Wide variety of resolutions possible, from 640 x 480 to 1920 x 1080 (1080p)

APPLICATIONS:

- Apple TV
- Gaming consoles

FUTURE WORKS:

We can find the affected plants by this system.we can take the reports from the affected plants and send to the server from that we can analyse which type of disease has been affected to the plants. Since it is an automated system the use of man power is less so we can have control of more acres of land and monitor it accordingly. The data collected also will be useful for us to find the growth of the plants. From tgis system we could able to take the actions in a timely manner.we can also able to monitor the growth of the plant by placing the cameras.

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